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

C203357

CONTRACT AND
CONTRACT BONDS

FOR CONTRACT NO. C203357

WBS	41188.3.FS1 IMS-085-1(106)3
T.I.P NO.	I-4928
COUNTY OF	GASTON
THIS IS THE	SCALES CONTRACT
ROUTE NUMBER	I 85 LENGTH 2.244 MILES
LOCATION	I-85 NBL WEIGH STATION FROM SR-1302 (CROWDERS MOUNTAIN RD) TO SR-1307 (EDGEWOOD RD).
CONTRACTOR	SLOAN CONSTRUCTION A DIVISION OF REEVES CONSTRUCTION COMPANY
ADDRESS	250 PLEMMONS ROAD DUNCAN, SC 29334
BIDS OPENED	MARCH 18, 2014
CONTRACT EXECUTION	APR 16 2014

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

PROPOSAL

Revised 3-11-14

DATE AND TIME OF BID OPENING: **MARCH 18, 2014 AT 2:00 PM**

CONTRACT ID	C203357
WBS	41188.3.FS1
FEDERAL-AID NO.	IMS-085-1(106)3
COUNTY	GASTON
T.I.P. NO.	I-4928
MILES	2.244
ROUTE NO.	I 85
LOCATION	I-85 NBL WEIGH STATION FROM SR-1302 (CROWDERS MOUNTAIN RD) TO SR-1307 (EDGEWOOD RD).
TYPE OF WORK	WEIGH STATION, GRADING, DRAINAGE, PAVING, LIGHTING & CULVERT

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 <u>SCALES</u> PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C203357 IN GASTON 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. **C203357**; 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. **C203357** in **Gaston 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.

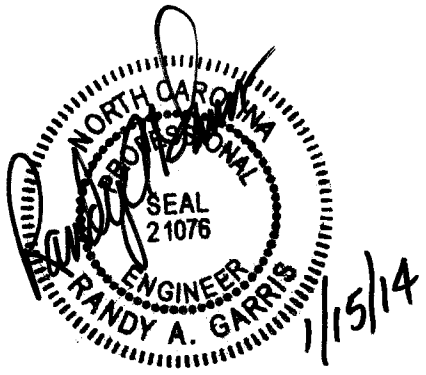
The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2012* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the 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

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GENERAL

CONTRACT TIME AND LIQUIDATED DAMAGES:
(8-15-00) (Rev. 12-18-07) 108 SP1 G07 A

The date of availability for this contract is **April 28, 2014**, except that work in jurisdictional waters and wetlands shall not begin until a meeting between the DOT, Regulatory Agencies, and the Contractor is held as stipulated in the permits contained elsewhere in this proposal. This delay in availability has been considered in determining the contract time for this project.

The completion date for this contract is **November 15, 2017**.

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

The liquidated damages for this contract are **Two Hundred Dollars ($200.00)** per calendar day. These liquidated damages will not be cumulative with any liquidated damages which may become chargeable under Intermediate Contract Time Number 1.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:
(7-1-95) (Rev. 2-21-12) 108 SP1 G13 A

Except for that work required under the Project Special Provisions entitled *Planting, Reforestation* and/or *Permanent Vegetation Establishment* and NCDOT ITS and Signal Project Special Provisions Systems Warranty, included elsewhere in this proposal, the Contractor will be required to complete all work included in this contract and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is **April 28, 2014**.

The completion date for this intermediate contract time is **November 15, 2016**.

The liquidated damages for this intermediate contract time are **Two Thousand Dollars ($2,000)** per calendar day.

Upon apparent completion of all the work required to be completed by this intermediate date, a final inspection will be held in accordance with Article 105-17 and upon acceptance, the Department will assume responsibility for the maintenance of all work except *Planting, Reforestation* and/or *Permanent Vegetation Establishment System Warranty*. The Contractor will be responsible for and shall make corrections of all damages to the completed roadway caused by his planting operations, whether occurring prior to or after placing traffic through the project.

INTERMEDIATE CONTRACT TIME NUMBER 2 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 a lane of traffic on **I-85 NB** during the following time restrictions:

DAY AND TIME RESTRICTIONS

One Lane on I-85 NB
Monday thru Sunday 6:00 a.m. to 8:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **I-85 NB**, 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 **8:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 p.m.** the following Tuesday.

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

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

5. For **Independence Day**, between the hours of **6:00 a.m.** the day before Independence Day and **8:00 p.m.** the day after Independence Day.

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

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

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

8. For **Christmas**, between the hours of **6:00 a.m.** the Friday before the week of Christmas Day and **8:00 p.m.** the following Tuesday after the week of Christmas Day.

9. For **any NASCAR Car Racing event at the Charlotte Motor Speedway**, between the hours of **6:00 a.m.** the **Wednesday before the first race** and **8:00 p.m.** the **Monday after the last race**.

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 **Five Hundred Dollars** (**$500.00**) per **fifteen (15) minute time period**.

INTERMEDIATE CONTRACT TIME NUMBER 3 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 a lane of traffic on **I-85 NB** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Two Lanes on I-85 NB
Monday thru Sunday 6:00 a.m. to 10:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **I-85 NB**, 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 **8:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 p.m.** the following Tuesday.

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

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

5. For **Independence Day**, between the hours of **6:00 a.m.** the day before Independence Day and **8:00 p.m.** the day after Independence Day.

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

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

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

8. For **Christmas**, between the hours of **6:00 a.m.** the Friday before the week of Christmas Day and **8:00 p.m.** the following Tuesday after the week of Christmas Day.

9. For **any NASCAR Car Racing event at the Charlotte Motor Speedway**, between the hours of **6:00 a.m.** the **Wednesday before the first race** and **8:00 p.m.** the **Monday after the last race**.

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 **Two Thousand Five Hundred Dollars ($2,500.00)** per **fifteen (15) minute time period**.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 10-15-13) 108 SP1 G14 E

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

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 5:00 a.m. to 12:00 Midnight

The maximum allowable time for **overhead sign and structure installation** is **fifteen (15)** minutes for **I-85 and all Ramps & Loops**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

The liquidated damages are **Two Thousand Five Hundred Dollars ($2,500.00)** per **fifteen (15)**-minute time period.

PERMANENT VEGETATION ESTABLISHMENT:

(2-16-12) (Rev. 10-15-13) 104 SP1 G16

Establish a permanent stand of the vegetation mixture shown in the contract. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish permanent vegetation on all erodible areas within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the applicable section of the *2012 Standard Specifications*. All work required for initial vegetation planting shall be performed as a part of the work necessary for the completion and acceptance of the Intermediate Contract Time (ICT). Between the time of ICT and Final Project acceptance, or otherwise referred to as the vegetation establishment period, the Department will be responsible for preparing the required National Pollutant Discharge Elimination System (NPDES) inspection records.

Once the Engineer has determined that the permanent vegetation establishment requirement has been achieved at an 80% vegetation density (the amount of established vegetation per given area to stabilize the soil) and no erodible areas exist within the project limits, the Contractor will be notified to remove the remaining erosion control devices that are no longer needed. The Contractor will be responsible for, and shall correct any areas disturbed by operations performed in permanent vegetation establishment and the removal of temporary erosion control measures, whether occurring prior to or after placing traffic on the project.

Payment for *Response for Erosion Control*, *Seeding and Mulching*, *Repair Seeding*, *Supplemental Seeding*, *Mowing*, *Fertilizer Topdressing*, *Silt Excavation*, and *Stone for Erosion Control* will be made at contract unit prices for the affected items. Work required that is not represented by contract line items will be paid in accordance with Articles 104-7 or 104-3 of the *2012 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

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
7	Unclassified Excavation
9	Borrow Excavation
57	11 ½" PCC Pavement Ramps (With Dowels)

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
3 thru 4	Building Items
97 thru 106	Guardrail
107 thru 109	Fencing
113 thru 140	Signing
154 thru 160	Long-Life Pavement Markings
167	Permanent Pavement Markers
168 thru 196	Lighting
197 thru 203	Utility Construction
204 thru 231	Erosion Control
232 thru 304	Signals/ITS System

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 **$3.1476** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

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

Description	Units	Fuel Usage Factor Diesel
Unclassified Excavation	Gal/CY	0.29
Borrow Excavation	Gal/CY	0.29
Class IV Subgrade Stabilization	Gal/Ton	0.55
Aggregate Base Course	Gal/Ton	0.55
Sub-Ballast	Gal/Ton	0.55

Asphalt Concrete Base Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	2.90
Open-Graded Asphalt Friction Course	Gal/Ton	2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	2.90
Aggregate for Cement Treated Base Course	Gal/Ton	0.55
Portland Cement for Cement Treated Base Course	Gal/Ton	0.55
__" Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to __" Pavement	Gal/SY	0.245

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-21-13) 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:

	Fiscal Year	Progress (% of Dollar Value)
2014	(7/01/13 - 6/30/14)	8% of Total Amount Bid
2015	(7/01/14 - 6/30/15)	51% of Total Amount Bid
2016	(7/01/15- 6/30/16)	33% of Total Amount Bid
2017	(7/01/16 - 6/30/17)	8% of Total Amount Bid

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

DISADVANTAGED BUSINESS ENTERPRISE:

(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).doc

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where DBEs quoted on the project. This sheet is submitted with good faith effort packages.
http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls

DBE Goal

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

Disadvantaged Business Enterprises **12.0%**

(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®.

(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 (2nd and 3rd tier subcontractors).

(C) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(D) (1) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

(E) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(F) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs. Contact within 7 days from the bid opening the Business Development Manager in the Business Opportunity and Work Force Development Unit to give notification of the bidder's inability to get DBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the DBE goal.

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

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the DBE goal.

(2) The bidders' past performance in meeting the DBE goals.

(3) The performance of other bidders in meeting the DBE goal. For example, when the apparent successful bidder fails to meet the DBE goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the DBE goal, but meets or exceeds the average DBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

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

Non-Good Faith Appeal

The 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. 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 D

Subsurface information is available on the roadway and structure portions of this project.

LOCATING EXISTING UNDERGROUND UTILITIES:
(3-20-12) 105 SP1 G115

Revise the *2012 Standard Specifications* as follows:

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

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

RESOURCE CONSERVATION:
(5-21-13) 104-13 SP1 G118

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

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

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

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

DOMESTIC STEEL:
(4-16-13) 106 SP1 G120

Revise the *2012 Standard Specifications* as follows:

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

All steel and iron products that are permanently incorporated into this project shall be produced in the United States except minimal amounts of foreign steel and iron products may be used provided the combined material cost of the items involved does not exceed 0.1% of the total amount bid for the entire project or $2,500, whichever is greater. If invoices showing the cost of the material are not provided, the amount of the bid item involving the foreign material will be used for calculations. This minimal amount of foreign produced steel and iron products permitted for use is not applicable to high strength fasteners. Domestically produced high strength fasteners are required.

PORTABLE CONCRETE BARRIER - (Partial Payments for Materials):
(7-1-95) (Rev. 8-16-11) 1170-4 SP1 G121

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of portable concrete barrier, provided that these materials have been delivered on the project and stored in an acceptable manner, and further provided the documents listed in Subarticle 109-5(C) of the *2012 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2012 Standard Specifications* will apply to the portable concrete barrier.

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.

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

(A) The Contractor shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department. The Contractor will not be responsible for damage due to faulty design, normal wear and tear, for negligence on the part of the Department, and/or for use in excess of the design.

(B) Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Contractor is responsible for invoking the warranted repair work with the manufacturer. The Contractor's responsibility shall be limited to the term of the manufacturer's guarantee. NCDOT would be afforded the same warranty as provided by the Manufacturer.

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

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project.

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

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.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev 9-18-12) 105-16, 225-2, 16 SP1 G180

General

Schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting sedimentation and turbidity of surface waters. Comply with the requirements herein regardless of whether or not a National Pollution discharge Elimination System (NPDES) permit for the work is required.

Establish a chain of responsibility for operations and subcontractors' operations to ensure that the *Erosion and Sediment Control/Stormwater Pollution Prevention Plan* is implemented and maintained over the life of the contract.

(A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control/Stormwater Supervisor to manage the Contractor and subcontractor operations, insure compliance with Federal, State and Local ordinances and regulations, and manage the Quality Control Program.

(B) *Certified Foreman* - Provide a certified, trained foreman for each construction operation that increases the potential for soil erosion or the possible sedimentation and turbidity of surface waters.

(C) *Certified Installer* - Provide a certified installer to install or direct the installation for erosion or sediment/stormwater control practices.

(D) *Certified Designer* - Provide a certified designer for the design of the erosion and sediment control/stormwater component of reclamation plans and, if applicable, for the design of the project erosion and sediment control/stormwater plan.

Roles and Responsibilities

(A) *Certified Erosion and Sediment Control/Stormwater Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring the erosion and sediment control/stormwater plan is adequately implemented and maintained on the project and for conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. Perform the following duties:

(1) Manage Operations - Coordinate and schedule the work of subcontractors so that erosion and sediment control/stormwater measures are fully executed for each operation and in a timely manner over the duration of the contract.

(a) Oversee the work of subcontractors so that appropriate erosion and sediment control/stormwater preventive measures are conformed to at each stage of the work.
(b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.
(c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.
(d) Implement the erosion and sediment control/stormwater site plans requested.
(e) Provide any needed erosion and sediment control/stormwater practices for the Contractor's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
(f) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Contractor in jurisdictional areas.
(g) Conduct all erosion and sediment control/stormwater work in a timely and workmanlike manner.
(h) Fully perform and install erosion and sediment control/stormwater work prior to any suspension of the work.
(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.

(j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces or any location where sediment leaves the Right-of-Way.

(k) Have available a set of erosion and sediment control/stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel as well as regulatory agencies.

(2) Requirements set forth under the NPDES Permit - The Department's NPDES Stormwater permit (NCS000250) outlines certain objectives and management measures pertaining to construction activities. The permit references *NCG010000, General Permit to Discharge Stormwater* under the NPDES, and states that the Department shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program for construction activities disturbing one or more acres of land. The Department further incorporates these requirements on all contracted bridge and culvert work at jurisdictional waters, regardless of size. Some of the requirements are, but are not limited to:

(a) Control project site waste to prevent contamination of surface or ground waters of the state, i.e. from equipment operation/maintenance, construction materials, concrete washout, chemicals, litter, fuels, lubricants, coolants, hydraulic fluids, any other petroleum products, and sanitary waste.

(b) Inspect erosion and sediment control/stormwater devices and stormwater discharge outfalls at least once every 7 calendar days, twice weekly for construction related *Federal Clean Water Act, Section 303(d)* impaired streams with turbidity violations, and within 24 hours after a significant rainfall event of 0.5 inch that occurs within a 24 hour period.

(c) Maintain an onsite rain gauge or use the Department's Multi-Sensor Precipitation Estimate website to maintain a daily record of rainfall amounts and dates.

(d) Maintain erosion and sediment control/stormwater inspection records for review by Department and Regulatory personnel upon request.

(e) Implement approved reclamation plans on all borrow pits, waste sites and staging areas.

(f) Maintain a log of turbidity test results as outlined in the Department's Procedure for Monitoring Borrow Pit Discharge.

(g) Provide secondary containment for bulk storage of liquid materials.

(h) Provide training for employees concerning general erosion and sediment control/stormwater awareness, the Department's NPDES Stormwater Permit NCS000250 requirements, and the applicable requirements of the *General Permit, NCG010000.*

(i) Report violations of the NPDES permit to the Engineer immediately who will notify the Division of Water Quality Regional Office within 24 hours of becoming aware of the violation.

(3) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions/conditions of permits. The quality control program shall:

(a) Follow permit requirements related to the Contractor and subcontractors' construction activities.
(b) Ensure that all operators and subcontractors on site have the proper erosion and sediment control/stormwater certification.
(c) Notify the Engineer when the required certified erosion and sediment control/stormwater personnel are not available on the job site when needed.
(d) Conduct the inspections required by the NPDES permit.
(e) Take corrective actions in the proper timeframe as required by the NPDES permit for problem areas identified during the NPDES inspections.
(f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch/seed or vegetative cover on a section-by-section basis.
(g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.
(h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.
(i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
(j) The Contractor's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.

(B) *Certified Foreman* - At least one Certified Foreman shall be onsite for each type of work listed herein during the respective construction activities to control erosion, prevent sedimentation and follow permit provisions:

(1) Foreman in charge of grading activities
(2) Foreman in charge of bridge or culvert construction over jurisdictional areas
(3) Foreman in charge of utility activities

The Contractor may request to use the same person as the Level II Supervisor and Level II Foreman. This person shall be onsite whenever construction activities as described above are taking place. This request shall be approved by the Engineer prior to work beginning.

The Contractor may request to name a single Level II Foreman to oversee multiple construction activities on small bridge or culvert replacement projects. This request shall be approved by the Engineer prior to work beginning.

(C) *Certified Installers* - Provide at least one onsite, Level I Certified Installer for each of the following erosion and sediment control/stormwater crew:

(1) Seeding and Mulching
(2) Temporary Seeding
(3) Temporary Mulching
(4) Sodding
(5) Silt fence or other perimeter erosion/sediment control device installations
(6) Erosion control blanket installation
(7) Hydraulic tackifier installation
(8) Turbidity curtain installation
(9) Rock ditch check/sediment dam installation
(10) Ditch liner/matting installation
(11) Inlet protection
(12) Riprap placement
(13) Stormwater BMP installations (such as but not limited to level spreaders, retention/detention devices)
(14) Pipe installations within jurisdictional areas

If a Level I *Certified Installer* is not onsite, the Contractor may substitute a Level II Foreman for a Level I Installer, provided the Level II Foreman is not tasked to another crew requiring Level II Foreman oversight.

(D) *Certified Designer* - Include the certification number of the Level III-B Certified Designer on the erosion and sediment control/stormwater component of all reclamation plans and if applicable, the certification number of the Level III-A Certified Designer on the design of the project erosion and sediment control/stormwater plan.

Preconstruction Meeting

Furnish the names of the *Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers* and *Certified Designer* and notify the Engineer of changes in certified personnel over the life of the contract within 2 days of change.

Ethical Responsibility

Any company performing work for the North Carolina Department of Transportation has the ethical responsibility to fully disclose any reprimand or dismissal of an employee resulting from improper testing or falsification of records.

Revocation or Suspension of Certification

Upon recommendation of the Chief Engineer to the certification entity, certification for *Supervisor, Certified Foremen, Certified Installers* and *Certified Designer* may be revoked or suspended with the issuance of an *Immediate Corrective Action (ICA), Notice of Violation (NOV),* or C*ease and Desist Order* for erosion and sediment control/stormwater related issues.

The Chief Engineer may recommend suspension or permanent revocation of certification due to the following:

(A) Failure to adequately perform the duties as defined within this certification provision.
(B) Issuance of an ICA, NOV, or Cease and Desist Order.
(C) Failure to fully perform environmental commitments as detailed within the permit conditions and specifications.
(D) Demonstration of erroneous documentation or reporting techniques.
(E) Cheating or copying another candidate's work on an examination.
(F) Intentional falsification of records.
(G) Directing a subordinate under direct or indirect supervision to perform any of the above actions.
(H) Dismissal from a company for any of the above reasons.
(I) Suspension or revocation of one's certification by another entity.

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

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

Chief Engineer
1536 Mail Service Center
Raleigh, NC 27699-1536

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

The Chief Engineer will hear the appeal and make a decision within 7 days of hearing the appeal. Decision of the Chief Engineer will be final and will be made in writing to the certificant.

If a certification is temporarily suspended, the certificant shall pass any applicable written examination and any proficiency examination, at the conclusion of the specified suspension period, prior to having the certification reinstated.

Measurement and Payment

Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers and *Certified Designer* will be incidental to the project for which no direct compensation will be made.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 3-19-13) 105-16, 230, 801 SP1 G181

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

If during any operating day, the downstream water quality exceeds the standard, the Contractor shall do all of the following:

(A) Either cease discharge or modify the discharge volume or turbidity levels to bring the downstream turbidity levels into compliance, or

(B) Evaluate the upstream conditions to determine if the exceedance of the standard is due to natural background conditions. If the background turbidity measurements exceed the standard, operation of the pit and discharge can continue as long as the stream turbidity levels are not increased due to the discharge.

(C) Measure and record the turbidity test results (time, date and sampler) at all defined sampling locations 30 minutes after startup and at a minimum, one additional sampling of all sampling locations during that 24-hour period in which the borrow pit is discharging.

(D) Notify DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2012 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

The discharge shall be closely monitored when water from the dewatering activities is introduced into jurisdictional wetlands. Any time visible sedimentation (deposition of sediment) on the wetland surface is observed, the dewatering activity will be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation will be considered an indication of possible adverse impacts on wetland use.

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

Contractor's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Contractor.

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix,* available at http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/TurbidityReductionOptionSheet.pdf to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

The Contractor may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

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

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".

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING - METHOD III:

(4-6-06) (Rev. 1-17-12) 200 SP2 R02B

Perform clearing on this project to the limits established by Method "III" shown on Standard Drawing No. 200.03 of the *2012 Roadway Standard Drawings*.

BURNING RESTRICTIONS:

(7-1-95) 200, 210, 215 SP2 R05

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

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02) 235, 560 SP2 R45 B

Description

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *2012 Standard Specifications*.

Measurement and Payment

When the Contractor elects to obtain material from an area located beneath a proposed fill sections which does not require excavation for any reason other than to generate acceptable shoulder and fill slope material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow* or *Shoulder Borrow* in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation or clearing and grubbing operations that is placed directly on shoulders or slope areas, will not be measured separately for payment, as payment for the work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulders or slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *2012 Standard Specifications*.

PIPE INSTALLATION:

(11-20-12) 300 SP3 R01

Revise the *2012 Standard Specifications* as follows:

Page 3-1, Article 300-2, Materials, line 23-24, replace sentence with:

Provide foundation conditioning geotextile in accordance with Section 1056 for Type 4 geotextile.

NCDOT APPROVED PIPE LINER:

Furnish and install pipe liner as shown at recommended locations on the plans. Pipe liner should be from NCDOT Approved Product Listing for drainage pipe liners at the following link or an approved equal:

https://connect.ncdot.gov/resources/Products/Pages/default.aspx

Pipe liner is subject to approval by the Engineer.

NCDOT Approved Pipe Liner will be measured and paid as the actual number of linear feet of pipe liner that has been incorporated into the completed and accepted work.

Pay Item	**Pay Unit**
NCDOT Approved Pipe Liner	Linear Foot

ASPHALT PAVEMENTS - SUPERPAVE:

(6-19-12) (Rev. 2-18-14) 605, 609, 610, 650, 660 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.

TABLE 605-1
APPLICATION RATES FOR TACK COAT

Existing Surface	Target Rate (gal/sy)
	Emulsified Asphalt
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.

TABLE 605-2
APPLICATION TEMPERATURE FOR TACK COAT

Asphalt Material	Temperature Range
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:

TABLE 610-1
DESIGN MIXING TEMPERATURE AT THE ASPHALT PLANT[A]

Binder Grade	HMA JMF Temperature	WMA JMF Temperature Range
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:

TABLE 610-5
PLACEMENT TEMPERATURES FOR ASPHALT

Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F
S9.5C, S12.5C	45°F
S9.5D, S12.5D	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:

TABLE 650-1
OGAFC GRADATION CRITERIA

Grading Requirements	**Total Percent Passing**		
Sieve Size (mm)	*Type FC-1*	*Type FC-1 Modified*	*Type FC-2 Modified*
19.0	-	-	100
12.5	100	100	**80** - 100
9.50	75 - 100	75 - 100	55 - **80**
4.75	25 - 45	25 - 45	15 - **30**
2.36	5 - 15	5 - 15	5 - **15**
0.075	1.0 - 3.0	1.0 - 3.0	2.0 - 4.0

Page 6-50, Table 660-1 MATERIAL APPLICATION RATES AND TEMPERATURES, lines 1-2, replace Note A in Table 660-1 with the following:

A. Use No. 6M, No. 67, No. 5 and No. 78M aggregate for retreatment before an asphalt overlay on existing pavement based on the width of the cracks in the existing pavement. Choose No. 78M for sections of roadway where the average width of existing cracks is 1/4" or less in width, No. 67 for sections of roadway where the average width of existing cracks are 1/4" to 5/8" in width and choose No. 5 for sections of roadway where the existing crack widths are greater than 5/8".

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 **$559.29** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **February 1, 2014**.

FINAL SURFACE TESTING NOT REQUIRED:
(5-18-04) (Rev. 5-15-12) 610 SP6 R45

Final surface testing is not required on this project.

OIL/WATER SEPARATOR:

Description

This work consists of constructing an oil/water separator in adjacent to the weigh station in accordance with the plans and as directed by the Engineer.

Construction Methods

Construct oil/water separator to accommodate draining from the adjacent weigh station static scales. Oil/water separator shall be designed by the Cntractor in accordance with the International Plumbing Code (IPC) Chapter 10, Section 1003 and Subsection 1003.4. This work does not include the oil/water separator located inside the Weigh Station Inspection Building which is covered under the inspection building plans and provisions.

Measurement and Payment

Oil/Water Separator will be measured and paid in units of each. Such price includes, but is not limited to, all material, labor, design of the separator, and other work required to construct the separator as shown in the plans and as directed by the Engineer.

Payment will be made under:

Pay Item	**Pay Unit**
Oil/Water Separator	Each

SLUICE GATE:
(7-1-95) (Rev. 3-17-09) 838 SP8 R20

Description

This work consists of the construction of a sluice gate on an endwall in accordance with the details in the plans, the applicable requirements of Section 838 of the *2012 Standard*

Specifications, in accordance with the manufacturer's recommendations and as directed by the Engineer.

Materials

Sluice gates shall meet the manufacturer's recommendations for the corresponding pipe size. Due to variations in individual manufacturer's products, a slight variation from the size specified may be allowed. Submit the proposed catalog cut to the Engineer for approval prior to use.

Construction Methods

Provide a gate that forms a watertight seal when closed.

Measurement and Payment

____" *Sluice Gate* will be measured and paid as each for the actual number of sluice gates incorporated into the completed and accepted work. Such prices and payment will be full compensation for all materials, labor, tools, equipment and incidentals necessary to complete the work.

The endwall will be measured and paid in accordance with Article 838-4 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
____" Sluice Gate	Each

CONVERT EXISTING TRAFFIC BEARING DROP INLET TO TRAFFIC BEARING JUNCTION BOX:

(1-1-02) (Rev. 7-18-06) 840, 859 SP8 R50

At the proper phase of construction, convert the existing Traffic Bearing Drop Inlet at locations indicated in the plans or where directed, to Traffic Bearing Junction Box in accordance with the details in the plans and the applicable requirements of Sections 840 and 859 of the *2012 Standard Specifications*.

Convert Existing Traffic Bearing Drop Inlet to Traffic Bearing Junction Box will be measured and paid as each, completed and accepted. Such price and payment is considered full compensation for all equipment, materials, labor, tools, and incidentals necessary to complete each conversion satisfactorily.

Payment will be made under:

Pay Item	Pay Unit
Convert Existing Traffic Bearing Drop Inlet To Traffic Bearing Junction Box	Each

GUARDRAIL ANCHOR UNITS, TYPE M-350:

(4-20-04) (Rev. 1-17-12) 862 SP8 R60

Description

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

Materials

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

The guardrail anchor unit (SRT-350) as manufactured by:

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

The guardrail anchor unit (FLEAT) as manufactured by:

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

The guardrail anchor unit (REGENT) as manufactured by:

Energy Absorption Systems, Inc.
One East Wacker Drive
Chicago, Illinois 60601-2076
Telephone: 888-32-ENERGY

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

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

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Guardrail Anchor Units, Type M-350	Each

GUARDRAIL ANCHOR UNITS, TYPE 350 TL-2:

(10-21-08) (Rev. 8-16-11) 862 SP8 R64

Description

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

Materials

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

Guardrail anchor unit (ET-Plus) manufactured by:

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

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

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

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 2 in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

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

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Guardrail Anchor Units, Type 350 TL-2	Each

GUARDRAIL ANCHOR UNITS, TYPE 350:

(4-20-04) (Rev. 8-16-11) 862 SP8 R65

Description

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

Materials

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

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

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

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

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

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

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

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail Anchor Units, Type 350	Each

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	Pay Unit
Impact Attenuator Units, Type 350	Each

PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:

(10-15-02) (Rev. 10-20-09) 410 SP8 R105

Description

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

Materials

Item	Section
Plain Rip Rap	1042
Filter Fabric	1056

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three dimensional structure. The mat shall have the following minimum physical properties:

Property	Test Method	Value Unit
Light Penetration	ASTM D6567	9 %
Thickness	ASTM D6525	0.40 in
Mass Per Unit Area	ASTM D6566	0.55 lb/sy
Tensile Strength	ASTM D6818	385 lb/ft
Elongation (Maximum)	ASTM D6818	49 %
Resiliency	ASTM D1777	>70 %
UV Stability *	ASTM 4355	≥80 %
Porosity (Permanent Net)	ECTC Guidelines	≥85 %
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0 lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0 ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1,000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) The chemical and physical properties of the mat used, and
(B) Conformance of the mat with this specification.

Construction Methods

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *2012 Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Preformed Scour Holes with Level Spreader Aprons will be measured and paid as the actual number incorporated into the completed and accepted work. Such price and payment will be full compensation for all work covered by this provision.

Payment will be made under:

Pay Item	Pay Unit
Preformed Scour Hole with Level Spreader Aprons	Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 5-21-13) 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	Section
Conduit	1091-3
Grout, Nonshrink	1003
Polymer Slurry	411-2(B)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the *2012 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly

materials so materials are kept clean and free of damage. 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

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:

NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)	
Anchor Rod Diameter, inch	**Requirement**
≤ 1 1/2	1/3 turn (2 flats)
> 1 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 che cking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	**Requirement, ft-lb**
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

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

(13) Do not grout under base plate.

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. 1-21-14) 1000, 1005, 1024, 1050, 1056, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092 SP10 R01

Revise the *2012 Standard Specifications* as follows:

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

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

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

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

Page 10-1, Article 1000-2, MATERIALS, line 16, add the following to the table of item references:

Item	**Section**
Type IL Blended Cement	1024-1

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.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4,500	0.381	0.426	-	-	3.5	-	639	715	-	-
AA Slip Form	4,500	0.381	0.426	-	-	1.5	-	639	715	-	-
Drilled Pier	4,500	-	-	0.450	0.450	-	5-7 dry 7-9 wet	-	-	640	800
A	3,000	0.488	0.532	0.550	0.594	3.5	4	564	-	602	-
B	2,500	0.488	0.567	0.559	0.630	2.5	4	508	-	545	-
B Slip Formed	2,500	0.488	0.567	-	-	1.5	-	508	-	-	-
Sand 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 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE, replace with the following:

TABLE 1005-1
AGGREGATE GRADATION - COARSE AGGREGATE

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

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

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

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

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

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

All fencing material and accessories shall meet Section 106.

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

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

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

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

TABLE 1056-1
GEOTEXTILE REQUIREMENTS

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

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

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

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

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

TABLE 1078-1
REQUIREMENTS FOR CONCRETE

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

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

(B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.

(C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.

(D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.

(E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

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

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

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

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

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

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

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

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

Table 1081-1
Properties of Mixed Epoxy Resin Systems

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

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

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

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

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

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

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

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

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

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

1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS

(A) General

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

(B) Classification

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

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

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

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

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

(C) Requirements

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

(D) Prequalification

Refer to Subarticle 1081-1(E).

(E) Acceptance

Refer to Subarticle 1081-1(F).

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

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076. Metallized sheet piles shall be metallized in accordance to the Project Special Provision "Thermal Sprayed Coatings (Metallization)" with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating. The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness. The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

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

The epoxy shall meet Article 1081-4.

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

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

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

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

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

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

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

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

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

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

TABLE 1092-3
MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A
(Candelas Per Lux Per Square Meter)

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

SELECT MATERIAL, CLASS III, TYPE 3:
(1-17-12) 1016, 1044 SP10 R05

Revise the *2012 Standard Specifications* as follows:

Page 10-39, Article 1016-3, CLASS III, add the following after line 14:

Type 3 Select Material

Type 3 select material is a natural or manufactured fine aggregate material meeting the following gradation requirements and as described in Sections 1005 and 1006:

Percentage of Total by Weight Passing							
3/8"	#4	#8	#16	#30	#50	#100	#200
100	95-100	65-100	35-95	15-75	5-35	0-25	0-8

Page 10-39, Article 1016-3, CLASS III, line 15, replace "either type" with "Type 1, Type 2 or Type 3".

Page 10-62, Article 1044-1, line 36, delete the sentence and replace with the following:

Subdrain fine aggregate shall meet Class III select material, Type 1 or Type 3.

Page 10-63, Article 1044-2, line 2, delete the sentence and replace with the following:

Subdrain coarse aggregate shall meet Class V select material.

SHOULDER AND SLOPE BORROW:
(3-19-13) 1019 SP10 R10

Use soil in accordance with Section 1019 of the *2012 Standard Specifications*. Use soil consisting of loose, friable, sandy material with a PI greater than 6 and less than 25 and a pH ranging from 5.5 to 7.0.

Soil with a pH ranging from 4.0 to 5.5 will be accepted without further testing if additional limestone is provided in accordance with the application rates shown in Table 1019-1A. Soil type is identified during the soil analysis. Soils with a pH above 7.0 require acidic amendments to be added. Submit proposed acidic amendments to the Engineer for review and approval. Soils with a pH below 4.0 or that do not meet the PI requirements shall not be used.

TABLE 1019-1A
ADDITIONAL LIMESTONE APPLICATION RATE TO RAISE pH

pH TEST RESULT	Sandy Soils Additional Rate (lbs. / Acre)	Silt Loam Soils Additional Rate (lbs. / Acre)	Clay Loam Soils Additional Rate (lbs. / Acre)
4.0 - 4.4	1,000	4,000	6,000
4.5 - 4.9	500	3,000	5,000
5.0 - 5.4	NA	2,000	4,000

Note: Limestone application rates shown in this table are in addition to the standard rate of 4000 lbs. / acre required for seeding and mulching.

No direct payment will be made for providing additional lime or acidic amendments for Ph adjustment.

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.

PERMANENT SEEDING AND MULCHING:

(7-1-95) 1660 SP16 R02

The Department desires that permanent seeding and mulching be established on this project as soon as practical after slopes or portions of slopes have been graded. As an incentive to obtain an early stand of vegetation on this project, the Contractor's attention is called to the following:

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660 in the *2012 Standard Specifications* and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

Percentage of Elapsed Contract Time	Percentage Additive
0% - 30%	30%
30.01% - 50%	15%

Percentage of elapsed contract time is defined as the number of calendar days from the date of availability of the contract to the date the permanent seeding and mulching is acceptably completed divided by the total original contract time.

PROJECT SPECIAL PROVISIONS

GEOTECHNICAL

GEOTEXTILE FOR PAVEMENT STABILIZATION: **(1-21-14)**

Description

Furnish and place geotextile for pavement stabilization in accordance with the contract. Geotextile for pavement stabilization may be required to prevent pavement cracking and provide separation between the subgrade and pavement section at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextiles	1056

Provide Type 5 geotextile for geotextile for pavement stabilization that meets the following requirements:

GEOTEXTILE FOR PAVEMENT STABILIZATION REQUIREMENTS		
Property	**Requirement (MARV[A])**	**Test Method**
Tensile Strength @ 5% Strain (MD & CD[A])	1,900 lb/ft	ASTM D4595
Ultimate Tensile Strength (MD & CD[A])	4,800 lb/ft	ASTM D4595
Melting Point	300° F	ASTM D276

A. Define "minimum average roll value" (MARV), "machine direction" (MD) and "cross-machine direction" (CD) in accordance with ASTM D4439.

Construction Methods

Notify the Engineer when the roadbed is completed within 2" of subgrade elevation. The Engineer will sample and test subgrade soils for quality to determine if geotextile for pavement stabilization is required at locations shown in the plans and other locations as directed. For subgrades without stabilization, allow 24 days to determine if geotextile for pavement stabilization is required. For stabilized subgrades with geotextile for pavement stabilization, stabilize subgrade soils to 12" beyond the base course as shown in the plans.

Place geotextile for pavement stabilization on subgrades immediately below pavement sections as shown in the plans and in slight tension free of kinks, folds, wrinkles or creases. Install geotextiles with the MD perpendicular to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextiles in the MD so splices or overlaps are parallel to the roadway centerline. Extend geotextile for pavement stabilization 12" beyond the base course as shown in the plans.

Completely cover subgrades with geotextile for pavement stabilization so geotextiles are adjacent to each other in the CD, i.e., perpendicular to the MD. The CD is the direction of the width or short dimension of the geotextile roll. Overlapping geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that base course will be placed to prevent

lifting the edge of the top geotextile.

For asphalt base courses, asphalt mixture temperatures in the truck may not exceed 315° F at the time of placement. Do not damage geotextile for pavement stabilization when constructing base courses. Place and compact base courses in accordance with the *Standard Specifications*. Do not operate heavy equipment on geotextiles any more than necessary to construct pavement sections. Replace any damaged geotextiles to the satisfaction of the Engineer.

Measurement and Payment

Geotextile for Pavement Stabilization will be measured and paid in square yards. Geotextiles will be measured along subgrades as the square yards of exposed geotextiles before placing base courses. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Pavement Stabilization* will be full compensation for providing, transporting and placing geotextiles.

Payment will be made under:

Pay Item	Pay Unit
Geotextile for Pavement Stabilization	Square Yard

POLYURETHANE GROUT INJECTION (SPECIAL)

DESCRIPTION

The work specified in this Special Provision consists of filling the voids and improving the subsurface conditions by means of polyurethane grout injection. The subgrade improvement shall be conducted by injecting high density polyurethane grout into the subsurface. The polyurethane should be capable of filling the present voids and improving the very loose to loose granular substrata beneath the existing and new culverts.

All installation procedures and equipment shall be in accordance with this Special Provision and manufacturer's recommendations. Polyurethane material injection (filling voids and densifying soils) shall be performed at the locations specified in the plans.

The term "polyurethane material" used in this Special Provision refers to high density water blown formulation exhibiting the physical characteristics and properties as described herein. The purpose of the polyurethane grout injection is specifically used to provide the following:

1. To fill the voids underneath the culvert structure.
2. To densify the soil while limiting additional soil movement. The polyurethane grout injection product should mix with the soil to become a homogenous unit in order to prevent future migration of fines.
3. To provide adequate compressible strength/bearing strength to support the embankment fill and highway traffic.

Procedures shall include a construction site survey, preparing the site, injection of the polyurethane material, corresponding material testing, and the finalized project report.

Personnel: Provide the services of the Polyurethane Grout Injection (PGI) Supervisor for the work under this Special Provision meeting the following requirements:

1. Certification by the manufacturer of the high density polyurethane material as having the necessary competence to accomplish the work.
2. A minimum of 3 years of experience of supervising similar work.

Provide the experience record and certification of the PGI Supervisor to the Resident Engineer and the NCDOT Geotechnical Operations Engineer, a minimum of 2 weeks prior to beginning work.

QUALITY CONTROL

Include the following under this Special Provision in the Quality Control Plan:

1. List and size of proposed equipment including methods to provide the minimum diameter injection holes, pumping units, and types of heave monitoring leveling equipment.
2. A list of construction methods used for the preparation of the site including methods for measurements concerning culvert lifting requirements and clearing of debris.
3. A construction site survey that includes the elevations of the ground surface and related structures, existing distress, photographs of the existing distress, and locations of the underground utilities potentially affected by this work.
4. A list of construction methods used to perform the injection of the polyurethane grout with a detailed sequence of injection operations
5. Manufacturer information pertaining to the approved polyurethane materials with the current specifications.

MATERIALS

Grout Description: The polyurethane material used for the subgrade improvement shall be dual-component high density polyurethane. The material shall be a closed cell, hydro-insensitive, high density polyurethane system that upon injection results in rapid expansion and curing in both dry and wet environments without dilution.

Grout Properties: The material shall exhibit the following physical characteristics and properties:

Property	Value	ASTM Test Method
Material Density, pcf	4.0 Minimum	D1622 with conditioning
Compressive Strength, psi	60 Minimum	D1621 with conditioning

Cure Time: The material shall reach a minimum compressive strength of 45 psi within 30 minutes after the last injection of material.

Certification: The material characteristics must be certified by the manufacturer. Submit appropriate documentation to the Engineer. The certified report shall specify that the material meets all the requirements in this Special Provision.

EQUIPMENT REQUIREMENTS

Include a pumping unit capable of injecting material to depths of 15 feet with electric generating capabilities necessary to support the grouting operations under a surrounding pressure of 70 feet of overburden materials. Provide equipment capable of precisely controlling the rate of flow of material as required to achieve the desired results while minimizing blowback and blowouts. Provide equipment with a certified flow meter or volumetric measurement device having a visual readout to measure the amount of material injected at each location.

Provide equipment with pressure and temperature control devices capable of maintaining proper temperature and proportionate mixing of the polyurethane component materials.

Provide pneumatic or electric drilling equipment capable of efficiently drilling 5/8-3/4 inch diameter injection holes through the culvert floor slab structure without damaging the integrity of the existing structure. Provide injection holes on a typical 3-5 ft pattern or as based on the accepted grouting plan, with spacing not to exceed 5 ft. unless approved by the Engineer.

Provided grout injection tubing that is to be installed with a pneumatic hammer to insure immediate contact with the surrounding soils to minimize travel along the annulus.

Provide laser levels, target readers, zip levels and other measuring devices capable of monitoring movement at the surface of the culvert floor slab to verify that the injected subsoils have been properly densified and stabilized without adversely affecting the existing grade.

Provide all necessary equipment such as electric generators, compressors, heaters, hoses, containers, valves, and gauges to efficiently conduct and control the work.

CONSTUCTION METHODS

Preparation: Measurements of the culvert floor slab surface shall be made, in cooperation with the Engineer, to ensure no movement of the surface occurs during the injection operations. A proper leveling unit(s) shall be set in place and properly adjusted prior to beginning injection. The required grout injection holes shall be drilled at the locations and spacing shown on the Polyurethane Grout Injection Plan sheets, or as directed by the Engineer.

Quality Control: If a two-component polyurethane is used, perform a quality check, in the presence of the Engineer, using flow meters and/or measurement devices, on the ratio of the polyurethane components provided by the injection system. Perform a test shot of material from one gun at a time with a minimum of 1 gallon of each material, comparing the output in gallons of resin to the gallons of activator to determine the injection ratio. If the ratio is less than 0.95 or greater than 1.05, the system is to be checked for problems, adjusted, and the ratio rechecked

until a proper ratio is obtained. Repeat the quality check for all injection guns. Following these checks and adjustments, and prior to performing the work each day, reset the measurement devices on the pumping units to zero.

Injection Placement: The polyurethane grout shall be injected through a steel pipe beginning at the specified depth, as shown on the Polyurethane Grout Injection Point Plan, under the existing and new culvert floor slab structures. After the injection pipe has been installed, grout should be injected until a significant pressure increase is observed on the back pressure gauge. The injection pipe shall be withdrawn 1-foot and the process repeated.

The pumping unit rate of injection shall be controlled at all times to prevent culvert floor slab heave. Excessive polyurethane material extruding from cracks or the drilled holes shall be removed from the area and the drilled holes sealed properly to the full depth of the culvert floor slab section. The approved leveling unit(s) shall be used to monitor the elevation of the culvert floor slab to ensure that no heave has taken place.

A level control system shall be installed and operated by the Contractor during the injection operation. The monitoring shall be carried out to detect movement within a 10 foot radius from the point of injection whenever injection is occurring, or as approved by the Engineer. Continuously monitor using either a laser level or dial indicator micrometer during injection to determine if culvert floor slab movement of the adjoining culvert structure has occurred. Inject grout gradually to avoid excessive force build up. If culvert floor slab movement exceeds the previously measured settlement, take corrective actions necessary to stop the movement and perform repairs. Immediately notify the Engineer if signs of movement such as new culvert floor slab cracks, increased size of existing cracks, or separation of joints between the two sections are observed. Repair any damage to the structures caused during the work to the satisfaction of the Engineer, at no cost to the Department.

Remove excessive polyurethane material extruding from cracks or the drilled holes. Seal the drilled holes to the full depth of the culvert floor slab section with cement grout. Allow the polyurethane material to cure before allowing traffic on to the improved area.

FINAL INJECTION REPORT

Submit to the Engineer a report documenting the polyurethane material injection and instrumentation. The report shall contain injection volumes per port of injection, duration of injection at each port, problems encountered during construction, and resolutions made, as well as all the associated testing results. In addition, provide as-built injection drawings and grade readings. Submit these items prior to final acceptance.

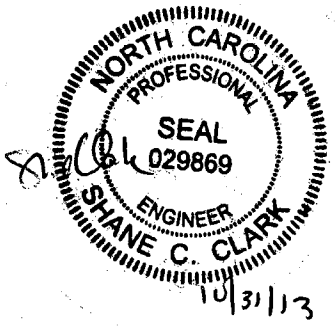
MEASUREMENT AND PAYMENT

Polyurethane Grout Injection will be measured and paid in pounds as recorded by a calibrated and certified metering device. The contract unit price for *Polyurethane Grout Injection* will be full compensation for providing designs, submittals, labor, tools, equipment, excavating, backfilling, hauling and removing excavated materials and any incidentals necessary to construct install *Polyurethane Grout Injection*. No additional payment will be made and no extension of completion date or time will be allowed for repairing damage caused by *Polyurethane Grout Injection*.

Price and payment will be full compensation for all work specified in this Special Provision.

Payment will be made under:

Polyurethane Grout Injection	Pounds



Asphaltic Concrete Grinding Specification

Perform grinding with abrasive grinding equipment, designed specifically for grinding pavement surfaces to close tolerances, utilizing diamond-cutting blades with a minimum cutting width of 36" in accordance with ASTM 1318-02. Such equipment shall accurately establish slope elevations and profile grade controls. The finished pavement surface 200' before and 100' after the WIM sensor array shall meet the following smoothness requirement.

Grind the entire lanes where the WIM sensors are installed. Ground surfaces shall not be smooth or polished. Provide a surface texture consisting of parallel groves between 0.09 inches and 0.13 inches wide with a land area between the groves of 0.060 inches to 0.110 inches and the differences between the peaks and ridges and the bottom of the grooves of approximately 1/16 inch.

Grind the pavement so the cross slope does not exceed 3%. The surface shall be ground to achieve a surface smoothness from 200 feet in advance and 100 beyond the WIM sensors. Check using a 6-in. (150-mm) diameter circular plate 0.125-in. (3 mm) thick that cannot be passed beneath a 20-ft (6-m) long straightedge when the straightedge is positioned and maneuvered in the following manner.

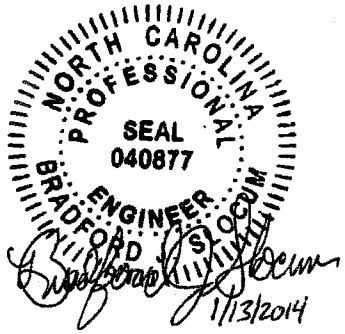
Pick up residue from grinding operations by means of a vacuum attachment to the grinding machine and do not allow the residue to flow across the pavement nor be left on the surface of the pavement. Dispose of the residue from grinding concrete pavement.

Beginning at the longitudinal center of the WIM system sensors, or sensor array, place the straightedge along each respective lane edge with the end furthest from the sensors at the distances from the longitudinal center of the sensors as indicated below. Then pivot the straightedge about its end, and sweep the end nearest the sensors between the lane edges while checking clearance beneath the straightedge with the circular plate.

Lane Edge	Longitudinal Distance From Center of Sensors (Ft.)												
Right	20	30	44	60	76	92	108	124	140	156	172	188	204
Left	20	36	52	68	84	100	116	132	148	164	180	196	212

When the straightedge is laid on finished pavement in a direction longitudinal with centerline or transverse to centerline, the surface shall not vary more than 0.125 inches (1/8") from the lower edge. If there are areas still outside of specification, the pavement should have a total regrind, spot bump grinding shall not be allowed.

This work is incidental to the other pay items in the contract.



NONWOVEN GEOTEXTILE INTERLAYER:

(01-13-14) SPI 10-07

Description

Furnish and install a nonwoven geotextile interlayer at locations shown on the plans.

General

Schedule a Pre-Pave Meeting at least 3 weeks prior to paving to discuss installation and construction procedures for the nonwoven geotextile interlayer with representatives from the Contractor including Paving Superintendent, Subcontractor, Geotextile Manufacturer, Engineer, Roadway Inspector, Area Roadway Construction Engineer, Division Construction Engineer, and the State Pavement Construction Engineer.

Materials

The geotextile interlayer shall be constructed of a non-woven needle-punched geotextile, with no thermal treatment (calendaring or IR). The material shall be resistant to chemicals, mildew, and rot and shall not have any tears or holes that will adversely affect the in-situ performance and physical properties of the installed material.

Furnish with each shipment a Type 3 Certification in accordance with Article 106-3 of the *Standard Specifications* certifying that the paving mat is a non-woven needle-punched geotextile with no thermal treatment (calendaring or IR) meeting the requirements shown:

Physical Properties of Non-Woven Geotextile Interlayer			
Property	**Test Method**	**Units**	**Value**
Minimum Mass per unit area	ASTM D 5261	oz/yd^2	15.0
Minimum thickness under load (a) at 2 kPa (0.29 psi) (b) at 20 kPa (2.9 psi) (c) at 200 kPa (29 psi)	ASTM D 5199	in	(a) 0.12 (b) 0.10 (c) 0.04
Minimum wide-width tensile strength	ASTM D 4595	lb/ft	685
Maximum wide-width elongation	ASTM D 4595	%	130
Minimum water permeability in normal direction under load (pressure) at 20 kPa (2.9 psi)	Mod. ASTM D 5493 or ASTM D 4491	ft/s	$3.3x10^{-4}$
Minimum in-plane water permeability (transmissivity) under load (pressure) (a) at 20kPa (2.9 psi) (b) at 200kPa (29 psi)	Mod. ASTM D 6574 or ASTM D 4716	ft/s	(a) $1.6x10^{-3}$ (b) $6.6x10^{-4}$
Minimum weather resistance retained strength	ASTM D 4355 at 500 hrs. exposure	%	60
Alkali resistance, minimum polypropylene/polyethylene	Manufacturer certification of polymer	%	96

Note: Requirements must be met for 95 percent of samples.

General Requirements

A trained and experienced installer, certified by the Geotextile Manufacturer, shall be present on-site during the installation of the geotextile and until the crew has a comfort level working with this material.

Ensure that any potential for keying of the two cementitious layers is minimized through proper repair techniques. Clean the underlying surface to remove loose debris before applying the interlayer. Roll the geotextile out on the underlying layer. The geotextile shall be tight and without excess wrinkles and folds. No more than 650 feet of geotextile shall be installed in advance of the paving operation at a given time. The interlayer shall be placed no more than 3 days before concrete placement.

Keep driving on the interlayer to a minimum. Tight radius turns and excessive acceleration and braking shall be avoided.

The geotextile shall be secured to the underlying layer with pins or nails punched through 2 to 2.75 inch galvanized washers or disks every 6 feet or less. Additional fasteners shall be used as needed to ensure that the geotextile does not shift or fold before or during concrete placement. Edges of the geotextile shall overlap by 8 +/- 2 inches. No more than three layers of geotextile shall overlap at any location. Transverse seams of adjacent rolls shall be staggered to prevent four layers from coinciding at any location. The free edge of the geotextile shall extend beyond the edge of the new concrete into a location that facilitates drainage.

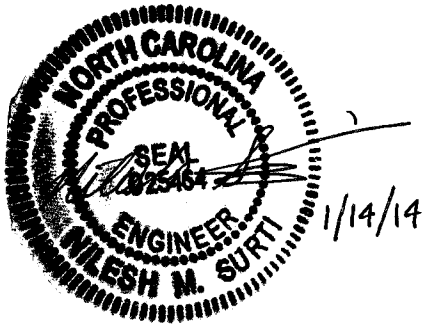
Measurement and Payment

Nonwoven Geotextile Interlayer will be measured and paid at the contract unit price per square yard. In measuring this quantity, the length will be the actual length installed, measured along the surface. The width will be the width measured along the underlying layer that has been acceptably placed. No separate measurement will be made for overlapping fabric.

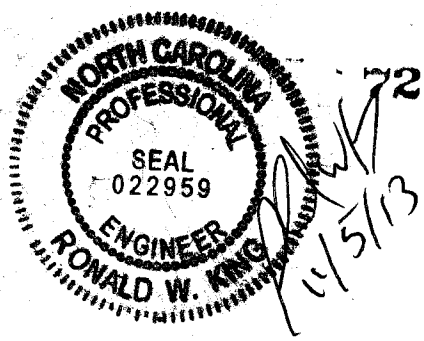
The contract prices for this section shall include but not be limited to furnishing all labor, materials, tools, equipment and other incidentals necessary to perform the required work.

Payment will be made under:

Pay Item	**Pay Unit**
Nonwoven Geotextile Interlayer	Square Yard



TIP # I-4928 Gaston County



OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

Description

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.*

Materials

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

(A) Unit weight (γ) = 120 lb/cf,

(B) Friction angle (ϕ) = 30°,

(C) Cohesion (c) = 0 lb/sf and

(D) Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation

above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 6th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

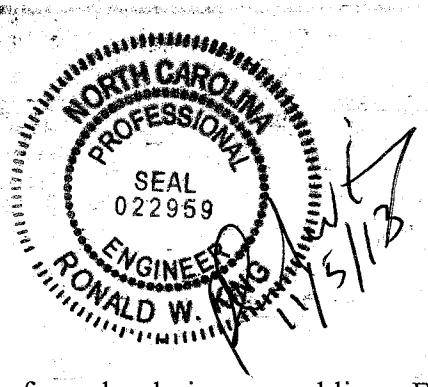
Measurement and Payment

Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown on the accepted submittals. The contract unit price for *Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

TIP # I-4928 **Gaston** **County**

Payment will be made under:

Pay Item	**Pay Unit**
Overhead Footings	Cubic Yard



OVERHEAD SIGN SUPPORTS:

Description

Design, fabricate, furnish and erect various types of overhead sign assemblies. Fabricate supporting structures using tubular members of either aluminum or steel. The types of overhead sign assemblies included in this specification are span structures, cantilever structures and sign structures attached to bridges.

Materials

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

Construction Methods

A. General

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

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

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

Erect sign panels in accordance with the requirements for Type A or B signs as indicated in the plans or Roadway Standard Drawings. Field drill two holes per connection in the Z bars for attaching signs to overhead structures. Provide two U-bolts at each U-bolt connection such as each truss chord to sign hanger and each truss chord to walkway support or light support. Provide two U-bolts at each U-bolt connection where ends of truss chords are supported. The minimum diameter of all U-bolts is ½ inch.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When

assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

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

For high strength bolted connections, use direct tension indicators. Galvanize bolts, nuts and washers in accordance with the Standard Specifications.

B. Shop Drawings

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

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

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

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

Allow 40 days for initial working drawing review after the Engineer receives them. If revisions to working drawings are required, an additional 40 days shall be required for review and approval of the final working drawings.

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

C. Design and Fabrication

The following criteria govern the design of overhead sign assemblies:

Design shall be in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009* and the 2010 and 2011 Interim Revisions.

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

- Overhead cantilever sign structures shall include galloping loads (exclude four-chord horizontal trusses).
- The natural wind gust speed in North Carolina shall be assumed to be 11.6 mph.
- The fatigue importance category used in the design, for each type of structure, shall be for:
- Cantilever structures with span greater than 50 feet – Fatigue Category I.
-
- Cantilever structures with span less than or equal to 50 feet – Fatigue Category II.
- Non-cantilever structures – Fatigue Category II

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

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

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

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

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

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

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

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

Where fa = Computed axial compression stress at base of post

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

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

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

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

- M - bending moment at the critical section of the base plate induced by one anchor bolt
- P - anchoring force of each anchor bolt
- D_1 - horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
- D_2 - horizontal distance between the face of the upright and the face of the anchor bolt nut

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

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

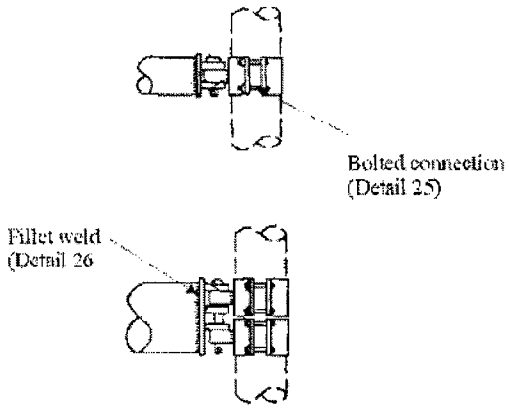
- Uprights, foundations, and trusses that support overhead signs shall be designed in accordance with the Overhead and Dynamic Message Sign Foundations Project Special Provision for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments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

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

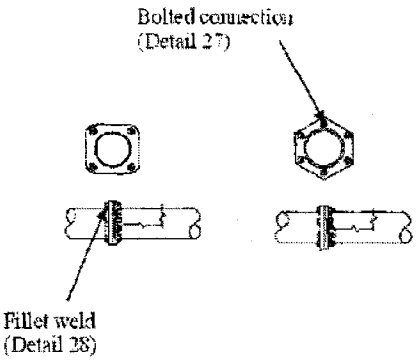
For non-cantilevered monotube sign support structures, the following table and figures are considered as a required addition to the Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009:

Construction	Detail	Stress Category	Application	Example
Mechanically Fastened Connections	25. Bolts in Tension	D	Beam column connection for monotube structures	16
Fillet Weld Connections	26. Fillet welded with one side normal to applied stress	E'	Beam column connection for monotube structures	17
Mechanically Fastened Connections	27. High strength bolts in tension	D	Monotube or truss-chord splice	17
Fillet Weld Connections	28. Fillet welded with one side normal to applied stress	E'	Monotube or truss-chord splice	17
Mechanically Fastened Connections	29. U-bolts tied to transverse truss column to keep chords in place	D	Horizontal truss connection with vertical truss	18
Mechanically Fastened Connections	30. Net section of full-tightened, high tension bolts in shear	B	Truss bolted joint	18

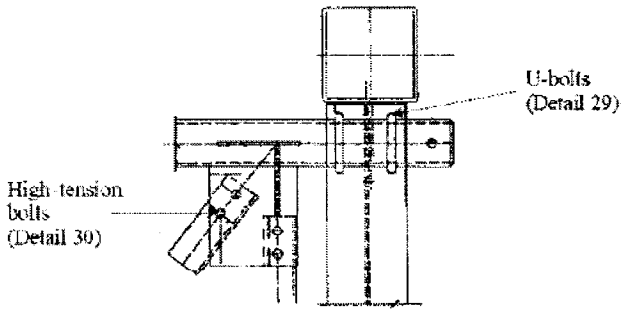
Add to the Specifications. Figure 11-1:



Beam-Column Connection for monotube structure
Example 16



Monotube beam splice
Example 17



Beam-Column Connection for Truss Structure
Example 18

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

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

Horizontal components of the supporting structures for overhead signs may be of a truss design or a design using singular (monotube) horizontal members to support the sign panels.

Truss or singular member centerline must coincide with the centerline of sign design area shown on the structure line drawing.

Provide permanent camber in addition to dead load camber in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.* Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

Use cantilever sign structures that meet the following design criteria:

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

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

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

Compensation

The work covered by this section will be paid for at the contract lump sum for each *Supports, Overhead Sign Structure @ Sta* _____. Such price will be full compensation for all work covered by this specification includes all design, fabrication, construction, transportation, and erection of the complete overhead sign structure, supporting structure, hardware, lighting support brackets, preparing and furnishing shop drawings, and attaching the signs to the overhead assembly.

Payment will be made under:

Supports, Overhead Sign Structure @ Sta _____	Lump Sum

WORK ZONE TRAFFIC CONTROL
Project Special Provisions

Law Enforcement:
(05/14/2013)

Description

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to control traffic in lane closures and direct traffic through intersections in accordance with the contract.

Construction Methods

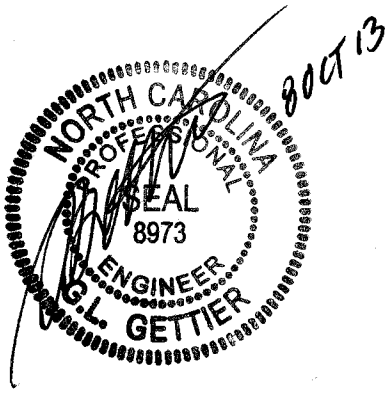
Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

Measurement and Payment

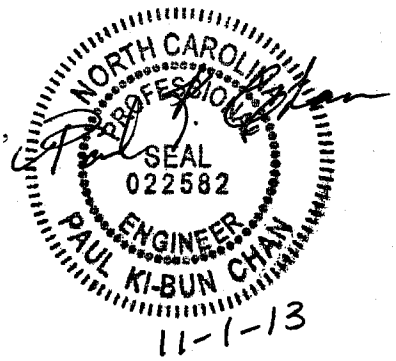
Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

Pay Item	Pay Unit
Law Enforcement	Hour



PROJECT SPECIAL PROVISIONS
HYDROSTATIC WEIGHING SYSTEMS,
AREA LIGHTING AND ITS POWER



1.00 DESCRIPTION

The work described by the following special provisions consists of the complete manufacturing, furnishing, installation, testing, training, and servicing for an operating hydrostatic scale system. It also includes the furnishing, installing, connecting, and placing into satisfactory operating condition of area and roadway lighting and equipment disconnects at locations shown on the plans.

Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (Standard Specifications). The Contractor shall provide all materials necessary to complete the work.

The Contractor or his designated subcontractor(s) shall have valid licenses to accomplish the work including but not limited to the following.

- North Carolina Electrical Contractors License as prescribed in Chapter 87 of the General Statutes.

- Scale Technician License from the NC Department of Agriculture and Consumer Services Standards Division.

The Static Scale manufacturer shall have a minimum of five years experience in weighing systems of the type and size described in these special provisions. A list of at least three customer references, which have purchased and installed weighing systems similar to those specified herein shall be provided. The list shall include the contact name, organization, phone number, address, date of installation, and description of systems purchased for each reference.

Evaluation and final acceptance of all submittals shall be the responsibility of the Engineer.

1.10 REFERENCES USED

References used in these special provisions include but are not limited to the following:

- North Carolina Department of Transportation (NCDOT) Standard Specifications
- National Electrical Code 2011
- Underwriters Laboratories Standards

- NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"

1.20 SCOPE OF WORK

The Contractor shall furnish a complete and operating hydrostatic scale weighing system for legal enforcement of the State of North Carolina laws pertaining to the weighing of trucks consisting of, but not limited to, the following:

- Static Scale Pits
- Static Scale Decks
- Static Scale Weigh Bridges
- Static Scale Load Cells
- Controllers, Cabinets, and Accessories with Interconnect and Power Cabling and Conduit
- Central Command Computers:
- Certified Tests
- Training of Personnel
- Service during Observation Period

The weighing system described in these Special Provisions consists of essentially identical design and installation for each side of the scale building. The hydrostatic scale system will consist of two (2) sets of scales consisting of three decks each.

Each hydrostatic weighing system shall be operated from inside the scale room where it shall be possible to monitor and control the weighing of trucks.

The weighing system operation shall allow the direction of weigh station operations as indicated on overall roadway plan sheets, and in particular the weighing system sheet showing the vehicle flow chart (E15 , Figures 1). These operations include manual selection and direction of vehicles for inspection or other purposes as well as automatic random selection and automatic direction associated with the weigh station operation.

1.30 STANDARD OF PRACTICE

The weighing system by its nature utilizes state of the art concepts and equipment. The Department reserves the right to reject any equipment or system which does not comply with the current standard of practice in all aspects including field reliability, serviceability, accuracy, and function. The burden of proof for standard of practice conformance will be that of the Contractor.

1.40 OPERATIONAL FUNCTIONAL FACILITY

The Contractor shall assure that the completed hydrostatic weighing system meets all operational requirements and needs of the NC DMV Enforcement Section for this weigh station facility. A thirty (30) day test period is required prior to project acceptance.

1.50 TRAINING OF PERSONNEL

The Contractor shall provide training to employees of the Department of Public Safety. The training shall address all aspects of the static scale system operation and minor maintenance.

Each training class shall be composed of a classroom period and a workshop period. Concepts and particular details shall be addressed during the classroom period in a traditional classroom setting manner. During the workshop period each employee shall be taught the operation of the equipment through actual hands on training with installed operating equipment.

The Contractor shall train through classes and shall provide operation manuals for up to thirty (30) employees of the Department of Public Safety.

Additionally, the Contractor shall provide thirty (30) classroom training manuals to allow Department personnel familiar with the weigh station operation to train additional personnel not familiar with weigh station operations.

The Contractor shall provide an outline of the training classes and the training manual for the Engineer's review and comments. The Engineer's comments shall be incorporated into the final training manual and training course outline. The final training manual and course outline shall be approved by the Engineer before beginning the training. The Contractor shall allow thirty (30) days each for the Engineer's review of the outlines and final review and approval.

The training classes shall be held at a site(s) selected by the Engineer, no more than one month before the weigh station is placed in operation.

There will not be any direct payment for the training classes and manuals because they will be considered incidental and included in the overall contract bid items.

1.60 MEASUREMENT AND PAYMENT

All requirements necessary to satisfy the contract and the scope of CONTRACTOR responsibilities described above will not be paid for directly. The cost of such work shall be included in the unit price bid for the various contract items. All necessary documentation shall also be included in the contract bid prices.

1.70 FINAL SYSTEM ACCEPTANCE

The final acceptance of the system shall be based on the satisfactory completion of a system performance test which will be followed by a 180 day system observation period.

A. System Performance Test

Following completion of the stand-alone tests of all equipment and the subsystem tests, the entire complement of subsystems and equipment shall be integrated into one system.

Following this integration, a system performance test shall be conducted by the Contractor.

The system performance test shall, as a minimum, exercise all functional operations of each unit of equipment in the field and in the control center as an integrated system. The test shall also include a thirty (30) day period of normal operations without any failure. Normal operations will be operation of the weigh station by Department personnel in the intended function of weighing trucks.

In the event of a failure of any CONTRACTOR supplied equipment, that portion of the system affected by the failure shall be subjected to an additional 30 day test period. For example, a failed load cell would be repaired and only that cell be tested for 30 more days. However, a failed central computer would require the entire system to be tested for 30 additional days.

B. Observation Period

The Contractor shall be required to maintain the system for 180 days following satisfactory completion of the 30 day system performance test. During this time period the system will be operated in its intended normal truck weighing operational mode.

In the event of a failure, all equipment shall be returned to its operational state not later than seventy-two (72) hours after the Contractor has been provided with notification of the failure. Failures which affect the proper operation of the system(s) shall suspend the timing of the observation period. After the cause of such failures has been determined and corrected, the observation period shall resume.

The Contractor shall have on hand spare parts to make repairs for the satisfactorily completion of the observation period.

The Contractor shall designate a supervisor who will have complete charge of the repair responsibilities. This supervisor shall be given full authority by the Contractor to take such action as may be necessary to insure that maintenance and service is provided in accordance with the requirements of the contract. The supervisor shall work with the Engineer or his designated representative so that the Engineer is informed of all details concerning the Contractor's maintenance and service work. The Contractor's

maintenance and service supervisor or his designated representative shall be on call at all times to receive notification that maintenance and service work is needed.

The Contractor shall keep a detailed maintenance record throughout the observation period. The record shall indicate the date and scope of each maintenance activity. As a minimum, each entry shall include a description of the type of work performed; the cause of the malfunction; the necessary labor, materials and special equipment used; and the time required in completing the activity. The record shall be made available to the Engineer during the observation period, and one copy of the maintenance record shall be submitted to the Engineer within two weeks from the date of the end of the 180-day system observation period.

The observation period is not a part of the work to be completed by the completion date of this project. The observation period shall be warranted by the payment and performance bond.

2.00 STATIC SCALE SYSTEM

2.10 DESCRIPTION

The work described by this division includes the furnishing, constructing and placing into operation, full electronic weighing systems in accordance with the plans and specifications included herein.

The Contractor shall furnish and install complete weighing systems on each side of the weigh station scale building at locations shown in the plans.

The complete systems shall meet the requirements for commercial scales as specified in the National Institute of Standards and Technology (NIST) Handbook No. 44 with current changes.

Each scale system shall include full electronic instrumentation utilizing load cells and solid state devices to provide individual, accumulated and total weights for three (3) scale platforms in pounds. Weights shall be displayed in the building scale room. The consoles shall each contain controls to activate a printer to record individual and total weights.

2.20 SUBMITTALS

A. Catalog Cuts and Shop Drawings

The Contractor shall submit for the Engineer's approval eight (8) sets of complete information on the scale equipment and pit construction. The submittals shall show sufficient information to verify that the proposed equipment and installation meet the requirements of the specifications. The information shall include catalog cuts with specifications and/or drawings for electrical and mechanical components proposed.

Information for approval shall include but is not limited to the following areas:

- basic capacity and rating of weighing system
- scale deck, weigh bridge and anchorage
- scale deck checks
- load cells
- load cell mounting
- load cell junction box
- load cell signal cable
- instrumentation
- pit construction drawing

Within 40 days, the Engineer will return three (3) sets of approved submittals or reasons for rejection to the Contractor. The Contractor shall not deliver materials to the project prior to the approval of catalog cuts or shop drawings.

B. Schematics

Complete electrical schematics "certified for construction" showing all components and interconnections for each part of the weighing system shall be submitted. The schematics shall show wire and terminal numbers, and all devices properly identified with ratings or part numbers according to the best practice of preparing electrical schematics for field use of qualified technicians to install, start up, and maintain the system.

C. Manuals

Operating and Maintenance Manual(s) which completely describe the normal operating and maintenance procedures shall be submitted. The operating procedures shall include all the necessary information for an operator to turn on, operate, check and turn off the system. The maintenance procedures shall include all the necessary information for a qualified technician to trouble shoot, adjust and repair the system, except components requiring such sophisticated test equipment or expertise as is normally reserved for the manufacturer.

D. Parts and Price List

A complete list of parts, with the numbers and description cross-referenced with the schematics and operating and maintenance manuals, so that any part may be readily identified and a replacement ordered shall be submitted. Prices shall be included with parts which are recommended for stock. The "recommended for stock" parts list shall include; load cells, fuses, surge protection components, power supplies, printed circuit boards, readout components, and ink or toner cartridges for printer.

2.30 GUARANTEES AND WARRANTIES

The Contractor shall present to the Department a written guarantee clearly stating the guarantee provisions stipulated below, and executed in a legal manner acceptable to the Engineer.

2.31 Guarantees

The scale equipment, including the instrumentation and load cells shall be guaranteed against malfunction for a minimum of five (5) years.

2.32 Maintenance and Service

For a period of 180 days (6 months) after the Department accepts the scale equipment, the Contractor shall provide a periodic inspection, maintenance, test and calibration of each scale. This shall include emergency servicing of the equipment when the system fails to operate properly. The Department shall be furnished a written report each time periodic and emergency work is performed on the scale system.

Within 3 days (72 hours) after notification the Contractor shall perform tests and inspections to determine the accurate operation of the weighing systems and shall make necessary repairs and/or replacements.

The Contractor shall provide an adequate inventory of replacement parts, manufactured to the scale equipment manufacturer's specifications, to insure that all repairs will be made in a prompt and timely manner.

The Contractor shall provide qualified technicians and proper equipment to perform the maintenance and service work and to conduct tests as follows.

2.40 TESTING

Each scale shall be tested at any time maintenance or service is rendered if such service or maintenance in any way affects the calibration and accuracy of the scale.

Tests shall include a strain test, increasing load test, zero repeatability test and such other tests as required by the NC Department of Agriculture and Consumer Services Standards Division.

2.50 REPORTS AND CERTIFICATIONS

The Contractor shall submit a report, showing work done, parts used, and test results of each inspection or visit. The original copy shall be submitted to the Engineer with copy to the North Carolina Department of Agriculture and Consumer Services, Standards Division, 2109 Blue Ridge Road, Raleigh, NC 27607. In addition, the "service certificate" specified

in General Statute 81A-73 and approved by the Department of Agriculture shall be submitted to the Engineer for any service rendered on any scale or weighing device.

All costs to provide the maintenance and service work as described above shall be included in the contract bid items.

2.51 Calibration

After the entire installation has been completed, the scales shall be tested, calibrated and certified by the manufacturer to be accurate within the accepted tolerance required by the National Institute of Standards and Technology (NIST) Handbook No. 44 with current changes.

The Contractor shall also arrange with the N. C. Department of Agriculture and Consumer Services, Standards Division, to have the scales certified. A NCDA&CS, Standards Division seal of approval shall be on each scale prior to acceptance of the work.

2.60 LOAD CELLS

2.61 Hydrostatic Load Cells

The load cells shall be rigidly attached and shall be mounted in such a manner that any possible motion of the weighbridge will not be detrimental to their operation. The design of this mounting shall include protection from shock loads and contraction and expansion of the weighbridge.

Load cell lines from the cells to the 3" conduit to the scale room building shall be neatly arranged and protected from physical damage during normal cleaning and inspection of the pit. Load cell lines shall be made of grade 316 stainless steel, neatly cut to the required length and shall be continuous, without splice, from the summing totalizer to the load cell.

The load cells shall have a minimum of 100% safe overload rating and an ultimate overload rating of 200% minimum. This shall apply to the linkage of the load cell as well as the load cell itself.

2.62 Grounding

All necessary provisions shall be made to insure a completely grounded scale system in its entirety so as to protect the components from natural occurrences of the environment in which the installation exists, including normal power outages and surges which may be expected to occur. Grounding as shown in the details will be the minimum acceptable and any additional grounding as recommended by the scale equipment manufacturer shall be installed.

All decks shall be bonded together with #4AWG minimum copper conductor. All connections shall be with approved terminal devices and shall be to clean metal surfaces.

In addition to the bonding and grounding of the decks, special circuitry and devices shall be provided to protect the solid state components of the instrumentation. This shall be in the form of isolation transformers, metal oxide semiconductors, resistor/capacitor circuits, shielding and other means as provided by the scale equipment manufacturer for premium electrical protection.

2.7 INSTRUMENTATION

2.71 Specifications

The scale instrumentation shall be solid state microprocessor based units for individual scale and total weight readouts, printer and control and data handling functions. It shall be housed in enclosures as indicated in the plans or these specifications. The weights and total on the readouts and printer shall be one over the other with the top digits indicating the weight on the forward 12' x 12' deck, the next lower set of digits indicating the weight on the center 12' x 14' deck, the next lower set of digits indicating the weight on the 12' x 54' deck, and the lowest readout indicating the total weight on all three decks.

The instrumentation shall be in conformance with NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices".

The digital readouts shall show weight in 20 pound increments and shall indicate accurately to the following full load capacities.

12' x 12' scale	60,000 lbs.
12' x 14' scale	60,000 lbs.
12' x 54' scale	150,000 lbs.
Total	150,000 lbs.

Overload of the scale shall not be detrimental to the electronics up to the ultimate overload rating of the load cells.

The instrumentation and load cells shall have operating temperature ratings which exceed the extremes anticipated at each location.

The system shall be operable in either an automatic or manual mode.

Manual operation shall be similar to the automatic operation, except individual scale weights shall be accumulated as they are selected by individual push-buttons for scale 1, 2 and 3. Multiple individual weighments shall be possible for each scale

and the accumulated weighments shall be displayed with the total and shall be printed when the PRINT key is pressed, after which the system shall revert to the automatic mode.

2.72 Power

All power for all components of the instrumentation including remote display, printers and console shall be supplied through dedicated electrical outlets near the console. It shall be 120 VAC, 60 HZ 20 Amp, 2 wire with equipment grounding conductor.

2.80 MEASUREMENT AND PAYMENT

There will not be any actual measurement for the static scale systems because they will be paid for on a lump sum basis.

Payment for the static scale systems shall be at the lump sum price bid for "_____ Static Scale System" at the appropriate location. Such price and payment will be full compensation for materials, tools, equipment, labor and incidentals necessary to accomplish the work. Included in the work shall be instrumentation.

Payment will be made under:

_____ Static Scale System.....Lump Sum

3.00 ELECTRICAL WORK IN STATIC SCALE PITS

3.10 DESCRIPTION

The work described in this section consists of furnishing and installing (a) lights, switches, receptacles and conductor, (b) conduit for the weighing system load cell lines, and (c) grounding of the scale decks.

3.20 MATERIALS

Unless otherwise noted on the plans, all embedded conduit shall be polyvinyl chloride (PVC) and all exposed conduit shall be rigid galvanized steel (RGS) with threaded connections and hot dipped galvanized fittings.

Light fixtures shall be incandescent, vapor tight, cast iron type with screw on gasketed glass globe, metal guard, with medium base socket rated for 150 watt lamps.

Switches shall be installed with waterproof covers. Receptacles shall be ground fault indicator (GFI) type, labeled as weather resistant and shall have waterproof covers installed over the receptacle.

Ground Rods shall be 5/8" x 8' copper clad steel. The clamp shall be one piece silicone bronze with a socket or hex head screw. All grounding and bonding equipment shall conform to UL Standard 467, "Electrical Grounding and Bonding Equipment".

All electrical conductor used in the static scale pit shall be THHN/THWN and sized as shown on the plans.

3.30 CONSTRUCTION METHODS

Conduit shall be encased in the concrete walls, floor, and pedestals of the pit except where clearly shown otherwise. Fixtures, switches, and receptacles shall not be located on the pit walls where they may be exposed to water from the decks.

All RGS conduit shall be made up wrench tight and have a water proof coating at joints.

Permanent non-harding duct sealer shall be placed around all conduits and ground rods to prevent the entrance of water.

Protection shall be provided at all times against the entrance of water or other foreign matter into the conduit. Conduit shall be plugged or capped when work is temporarily suspended, including nightly stoppage of work.

All conduit shall be clean before installation, and upon completion of the system an approved cleaner with a diameter not less than 85% of the nominal diameter of the conduit shall be snaked through each conduit prior to installing the conductor.

The conduit shall be installed in such a manner that temperature changes will not cause elongation or contraction which might damage the system. Expansion fittings shall be provided where conduit crosses structure expansion joints.

Grounding and bonding jumpers shall be attached to the deck steel with approved lugs, bolts, and washers. The bolts shall be through drilled holes and the area around the holes shall be cleaned of all paint and corrosion which might prevent a good electrical connection. After inspection by the Engineer the exposed raw metal shall be coated with an approved paint.

Conduits between the pit and scale room shall enter the pit through the pit wall at the areas shown on the plans.

Install ¾" PVC conduit from junction box in pit to the mechanical room. Conduit shall be installed prior to scale building floor being poured and prior to final grading.

Wire and cable shall conform to IPCEA specifications and shall have marks for identification (manufacturer's name, type insulation, and gauge of conductor) and the U.L. label. All wire insulation shall be rated at 600 VAC or greater.

No wire shall be pulled through a conduit system until the system is complete and has been cleaned. Approved wire pulling lubricants shall be used. Wires shall be pulled into conduit at a slow steady pace and careful attention given to assure that no wire is damaged.

Joints, taps, and splices will only be permitted at locations indicated on the plans and by the following methods.

3.40 MEASUREMENT AND PAYMENT

The electrical work required by this section when completed and accepted will be paid for at the contract lump sum price for "_____ Pit Electrical Work" at the appropriate location. Such price and payment will be full compensation for all materials, labor, and equipment to provide all the receptacles, lights, switches, ground rods, bonding jumpers and load cell line conduit.

Payment will be made under:

" _____ Pit Electrical Work".....Lump Sum

4.00 LIGHT EMITTING DIODE (LED) LUMINAIRES

4.10 DESCRIPTION

Furnish, install and place into satisfactory operation, LED luminaires on 35' single arm roadway standards and 100' high mount standards as detailed in these Special Provisions.

The Contractor shall supply Holophane LED high mount luminaires, part number HMLED144KASGL5, or approved equal. Any alternate high mount luminaire submitted for approval will require luminaire samples to be submitted to the Department, at no cost to the Department, for evaluation prior to approval.

Evaluation will consist of installation of samples on existing Department owned facilities for a period no shorter than two (2) months prior to approval. Photometric data files in Illuminating Engineering Society (IES) format will be evaluated to determine if proposed alternate high mount luminaire meets or exceeds design critera prior to samples being sent.

High mount luminaire retrofit LED kits are not an acceptable alternative.

For LED roadway luminaires installed on the bracket arm of single arm standards, Contractor shall include all LEDs/light bars, drivers, wiring inside the standard from the circuit conductors to the LED luminaire, in-line breakaway fuseholders with fuses and ground wiring at the pole on the light standards. Third party certified photometric files in IES format are required to be submitted with the catalog cuts for the proposed LED roadway luminaire. Photometric files must show that proposed luminaire will meet or exceed the design shown in the plans.

4.20 MATERIALS

4.21 LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:
  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Report number
  - Date
  - Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
  - Description of luminaire, LED light source(s), and LED driver(s)
  - Goniophotometry
  - Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Roadway luminaire shall be constructed of a single piece die cast aluminum housing. High mount luminaire shall be constructed of low copper 356 cast aluminum. Each luminaire shall be finished gray in color unless otherwise noted.
- Luminaires shall have a minimum L70 rating of 100,000 hours at 25°C. Provide a summary of reliability testing performed for LED driver.
- Roadway luminaires shall have a maximum total power consumption of 200 watts (W) at 480VAC. High mount luminaires shall have a maximum total power consumption of 200W at 120VAC. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Roadway luminaire shall have an IESNA distribution Type II. High mount luminaire shall have an IESNA distribution Type V.
- Luminaire LED modules shall meet dust and moisture rating of IP-65, minimum.
- Luminaire shall have an external label per ANSI C136.15.
- Luminaires shall have an internal label per ANSI C136.22.
- Luminaires shall start and operate in -20°C to +40°C ambient.
- Roadway luminaire shall have an internal bubble level.
- Electrically test fully assembled luminaires before shipment from factory.

- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.0 square feet and 46 lbs for roadway luminaires and 1.6 square feet and 80 lbs. for high mount luminaires.
- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31-2010
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Roadway luminaire shall have a 1.25" to 2.0" adjustable tenon mount for connection to luminaire bracket arm assembly.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.

B. Driver
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20°C to +40°C.
- Shall be rated for 120VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- Roadway luminaires shall have maximum 600mA driver operating current.

C. Surge Suppression
- Integral surge protection shall meet ANSI/IEEE C62.45 procedures based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High 10kV/10kA test, IEC 61000-4-2 (Electrostatic Discharge) 8kV Air/4kV Contact test and IEC 61000-4-4 (Fast Transients).

D. Electromagnetic interference
- Luminaires shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Luminaires shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing
- Luminaires shall be listed for wet locations.
- Luminaires shall be UL listed and labeled.

F. Finish
- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.

- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.

G. Thermal management
- Mechanical design of protruding external surfaces (heat sink fins) on roadway luminaries shall facilitate hose-down cleaning and discourage debris accumulation.
- High mount luminaires shall feature a perforated aluminum environmental guard between the optical housing and the driver housing.

H. Color Quality
- Minimum Color Rendering Index (CRI) of 60 with a Correlated Color Temperature (CCT) of 4000K to 5000K

I. Optics
- High mount luminaire shall feature multi die LED chip on board (COB) technology.
- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.
- High Mount luminaire shall have prismatic glass optics in symmetric distribution and provide overlapping pattern on application space to eliminate darks spots.

J. The following shall be in accordance with corresponding sections of ANSI C136.37
- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines
- Latching and hinging

K. Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and/or email.

4.30 WARRANTY

Provide a minimum five-year warranty covering maintained integrity and functionality of the luminaire housing, wiring, and connections, LED light source(s) and LED driver. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

Warranty period shall begin after project acceptance by the Department.

4.40 CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Securely terminate the wiring for each high mount luminaire and include an equipment grounding conductor to bond the housing to the supply cord grounding conductor.

Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion will be replaced by the Contractor at no additional cost to the Department.

4.50 MEASUREMENT AND PAYMENT

The roadway luminaries measured as provided above will be paid for at the contract unit price per each "Roadway Light Standard Luminaires – LED". Such price and payment will be considered full compensation for providing and installing the LED roadway luminaire on the bracket arm, wiring inside the standard from the circuit conductors to the LED roadway luminaire, in-line breakaway fuseholders with fuses and ground wiring at the pole on the light standard.

The high mount luminaires measured as provided above will be paid for at the contract unit price per each "High Mount Luminaires – LED". Such price and payment will be considered full compensation for providing and installing the LED high mount luminaire on the carrier ring tenon arm and connecting the LED high mount luminaire to the supply cord on the carrier ring.

Payment will be made under:

Roadway Light Standard Luminaire – LED.....	Each
High Mount Luminaire – LED	Each

5.00 LIGHT STANDARDS

5.10 DESCRIPTION

Furnish and install 35 ft. light standards, complete with bracket arm, impact attenuation device and light standard junction box as shown in the plans.

5.20 MATERIALS

Same as section 1404-2 of the Standard Specifications except an 18" polymer concrete (PC) junction box shall be provided with each of the single arm standards. See Section 6.00 below for junction box specifications.

5.30 CONSTRUCTION METHODS

Same as section 1404-3 of the Standard Specifications except install the junction box within two feet of the pole and foundation as shown in detail sheets 1404D01 and 1406D01 on sheet LE8 of the plans.

5.40 MEASUREMENT AND PAYMENT

The quantity of light standards to be paid for will be the actual number of light standards with arm assemblies and junction boxes which have been installed and accepted.

Such price and payment will be considered full compensation for furnishing and installing the standard, bracket arm assembly, impact attenuation device and junction box.

Payment will be made under:

Light Standard, Type MLTS, 35' MH, 6' SA.....Each

6.00 ELECTRICAL JUNCTION BOXES

6.10 DESCRIPTION

Same as Section 1411-1.

6.20 MATERIALS

Same as Section 1411-2, except modify referenced Section 1091-5 as follows:

- Page 10-202, revise paragraph starting on line 9 to read "Provide polymer concrete (PC) boxes which have bolted covers and open bottoms. Provide vertical extensions of 6" to 12" as required by project special provisions."
- Page 10-202, revise sentence beginning on line 14 to read "Other thermoplastic materials may be used for components which are not normally exposed to sunlight."

6.30 CONSTRUCTION METHODS

Same as Section 1411-3.

6.40 MEASUREMENT AND PAYMENT

Same as Section 1411-4.

7.00 EQUIPMENT DISCONNECT

7.10 DESCRIPTION

The work covered in this section involves installing an electrical disconnect for intelligent transportation system (ITS) equipment at the locations shown on the plans.

7.20 MATERIALS

Provide a single pole, 120 VAC circuit breaker (sized as shown on the plans) at all locations except the DMS sign. At the DMS sign provide a double pole 240 VAC circuit breaker. All breakers shall have an interrupting capacity of at least 14,000 A and be installed in a NEMA 3R enclosure. The enclosure should be primed and painted with a premium grade exterior paint before installation to increase corrosion resistance. Install an equipment ground bar and provide a lock in accordance with Section 1400-8 of the Standard Specifications.

Provide an 8' long, 6" x 6" treated wood post and treated wood panel to mount the circuit breaker enclosure and provide a PC30 junction box within two feet of the post. Treated wood post shall conform to Section 1082 of the Standard Specifications.

Provide and install conduit from the circuit breaker enclosure to the junction box. Conduit shall be rigid galvanized steel (RGS) above ground and polyvinyl chloride (PVC) conduit once underground.

Install an 8' ground rod, 5/8" in diameter in the junction box.

7.30 CONSTRUCTION METHODS

Embed treated wood post a minimum of 3' in ground. Thoroughly compact and backfill in 6" layers around post. Remove all unneeded excavated material from the site.

Mount circuit breaker enclosure to wood post. If enclosure is wider than post, first attach a treated wood panel sized a minimum 1" larger, square, to the wood post using exterior grade screws for treated wood, and then attach circuit breaker enclosure to wood panel. Install a PC30 junction box within 2' of the treated wood post. See plan sheets LE5 and LE12 for circuit breaker sizes.

The circuit breaker enclosure shall provide access for two 2" RGS conduits and one ¾" RGS conduit as shown in sheet LE12 of plans. The ¾" conduit and one of the 2" conduits shall terminate in the junction box. The remaining 2" conduit shall terminate at the proposed ITS equipment cabinet. Rigid galvanized steel conduit shall be secured to wood post using galvanized conduit standoffs and brackets and will transition to PVC conduit once underground.

Install a ground rod in the junction box. Run a #4 bare copper grounding conductor in the ¾" conduit from the ground bar in the circuit breaker enclosure to the junction box. Grounding conductor shall be attached to the ground rod in the junction box using exothermic weld.

Due to voltage drops, large conductors have been specified. Refer to plan sheet LE5 for conductor sizes. The Contractor shall use appropriately sized terminal lugs for connecting the conductors to the breaker. Snipping stands of the conductor to fit the lug or the circuit breakers is not permitted.

Power for ITS equipment will be provided from the Main Distribution Panel in the Mechanical Room. See plan sheets LE5 & LE13 and Facilities Design Power Plan for panel positions.

7.40 MEASUREMENT AND PAYMENT

The quantity of equipment disconnects to be paid for will be the actual number of equipment disconnects mounted to treated wood posts, and junction boxes which have been installed and accepted.

Such price and payment will be considered full compensation for furnishing and installing the treated wood post, circuit breaker and enclosure, conduits and junction box.

Payment will be made under:

_____ Equipment Disconnect.....Each

8.00 POWER TRANSFORMER

8.10 DESCRIPTION

The work covered in this section involves installing a small, wall mounted power transformer in the mechanical room. This transformer is used to provide appropriate power to the proposed DMS sign located near the north-east corner of the weigh station building.

8.20 MATERIALS

Provide a power transformer in a NEMA 3R encapsulated enclosure designed to be mounted on a wall indoors. The transformer shall be rated for 15 kilovolt-amps (KVA) and have a line voltage of 208 VAC and a load voltage of 120/240 VAC, single-phase.

Install RGS conduit from the main distribution panel (MDP) to the power transformer.

8.30 CONSTRUCTION METHODS

Install the power transformer on the wall near the MDP in the mechanical room of the scale building. See sheet E3 of the Facilities Design plans for location.

Install 1-½" RGS conduit from the MDP to the power transformer. Include three #2 AWG THHN conductors in the conduit. Install 2" PVC conduit from the transformer to the junction box labeled "ITS/POWER" on sheet E3 of the Facilities Design plans. The 2" PVC conduit shall include two #2 USE power conductors and one #4 grounded conductor as shown on plan sheet LE13.

See plan sheet LE13 for phase connections.

8.40 MEASUREMENT AND PAYMENT

The quantity of power transformers to be paid for will be the actual number of power transformers installed and mounted with conduits and conductors as described above which have been installed and accepted.

Such price and payment will be considered full compensation for furnishing and installing the power transformer, conduits, conductors and any ancillary items required to connect the conductors to the breakers in the MDP and/or transformer housing.

Payment will be made under:

15KVA Power Transformer.....Each

9.00 HIGH MOUNT FOUNDATIONS

9.10 DESCRIPTION

High mount foundations for high mount standards consist of drilled piers or footings with pedestals, conduit and anchor rod assemblies. Construct high mount foundations in accordance with the contract and either Standard Drawing No. 1402.01 of the *2012 Roadway Standard Drawings* or the accepted submittals. Define "high mount standard foundation" as a drilled pier including the conduit and anchor rod assembly that meets Standard Drawing No. 1402.01.

9.20 MATERIALS

Use high mount foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision found in the Roadway Project Special Provisions.

9.30 HIGH MOUNT STANDARD FOUNDATIONS

Construct high mount standard foundations for the wind zone and high mount heights shown in the plans unless the following assumed site conditions are not applicable to high mount locations:

A. Soil with unit weight (γ) $\geq$ 120 lb/cf and friction angle (Φ) $\geq 30^{o}$,
B. Groundwater at least 7 ft below finished grade and
C. Slope of finished grade 6:1 (H:V) or flatter.

A subsurface investigation and high mount foundation design are required if the Engineer determines these assumed site conditions do not apply to a high mount location and the high mount cannot be moved. Subsurface conditions requiring a high mount foundation design include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations or high mount foundation designs.

9.40 SUBSUFACE INVESTIGATIONS

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each high mount location requiring a subsurface investigation. Rough grade high mount locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

9.50 HIGH MOUNT FOUNDATION DESIGNS

Design high mount foundations for the wind zone and high mount heights shown in the plans and the slope of finished grade and subsurface conditions at each high mount location. Design drilled piers, footings and pedestals in accordance with the 6th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges*. Use the computer software LPILE version 6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 0.5" at top of piers.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Submit boring logs, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for high mount foundation design submittals. Have high mount foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

9.60 CONSTRUCTION METHODS

Grade a 3 ft diameter level work area around high mount locations with cut and fill slopes as shown on Standard Drawing No. 1402.01. Construct drilled piers, footings and pedestals and install anchor rod assemblies for high mount foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

9.70 MEASUREMENT AND PAYMENT

High Mount Foundations will be measured and paid in cubic yards. High mount standard foundations will be measured as the cubic yards of concrete shown on Standard Drawing No. 1402.01 for the high mount height and wind zone shown in the plans. All other high mount foundations will be measured as the cubic yards of foundation concrete for drilled piers, footings and pedestals shown on the accepted submittals. The contract unit price for *High Mount Foundations* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct high mount foundations. Subsurface investigations and high mount foundation designs required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

High Mount Foundations.....Cubic Yard

10.00 HIGH MOUNT STANDARD

10.10 DESCRIPTION

Same as Section 1401-1, except include a PC30 junction box.

10.20 MATERIALS

Same as Section 1401-2, except add the following text:

(F) Junction Box
Include a PC30 junction box designed to meet Section 6.00 above.

10.30 CONSTRUCTION METHODS

Same as Section 1401-3, except add the following:

Install PC30 junction box within 10' of the high mast foundation. This junction box shall be the final splice point for the conductor into the high mast standard. Install a ground rod for the high mast in the junction box as show in detail drawing 1401D01 as shown on sheet LE6 of the plans.

10.40 MEASUREMENT AND PAYMENT

Same as Section 1401-4, except a PC30 junction box will be included as part of the _____*High Mount Standards* pay item.

11.00 LIGHT CONTROL SYSTEM

11.10 DESCRIPTION

The work covered by this section includes the furnishing and installing of all materials necessary to provide a wall mounted lighting control system in the mechanical room of the weigh station scale building as shown on the plans. This section also includes running conduit from the mechanical room to the junction box labeled "Site Lighting" as shown on sheet E3 of the Facilities Design Power Plan

11.20 MATERIALS

Provide a 5/8" thick Exterior Grade AD plywood back panel slightly larger than the layout of the control system components.

Provide a 6" x 6" wire trough. The wire trough shall be long enough to accommodate all components and connections. The trough shall be constructed of formed and welded steel that is painted or galvanized, with one removable side plate that is secured in place with corrosion resistant screws, and has only the holes necessary for the conduits shown in the plans. Wire trough with knockouts is not acceptable.

Provide a lighting panel consisting of a surface mount load center, with copper bus, factory installed main breaker, 22,000 Amps short circuit current rating sized as shown in the plans, a minimum of 22 single-pole branch breaker spaces and an equipment ground bar. Use three-pole branch breakers with 10,000 Amps short circuit current rating sized as shown in the plans.

Provide electrically operated, mechanically held contactors with coil clearing contacts. Ensure latching without the use of hooks or semi-permanent magnets. Use contactors rated 208 VAC, 30 amps, with 120 VAC coils and 4 poles each.

Provide a control relay rated 600 VAC, with one normally open contact, one normally closed contact, and "continuous load" rating and "inductive make and break" rating greater than that required by the mechanically held contactors. Install control relay in a NEMA 1 enclosure.

Use a control selector switch for each circuit rated standard duty, with three positions, and maintained contacts, in a surface mount NEMA 1 enclosure. Provide contacts with an inductive rating of 5 amps continuous, 3600 VA make, and 3600 VA break. Provide a legend plate that indicates "On-Off-Auto" for each selector switch.

Use a "dual voltage" photocontrol with surge protection and single pole, single throw, contact with a minimum contact rating of 1000 watts. Provide a normally closed contact that is "daylight energized," with a turn on range of approximately 3 footcandles. Mount the photocontrol in a three-prong locking type receptacle, conforming to NEMA Standard C136.10.

Use number 8 AWG type THHN stranded copper conductors on the line side of the mechanically held contactors, and number 12 AWG stranded copper conductors for the control circuit, conforming to the requirements of Article 1400-2C of the Standard Specifications titled "Wire". Size all other conductors as shown in the plans.

Use rigid galvanized steel conduit in accordance with Article 1400-2B of the Standard Specifications titled "Conduit".

11.30 CONSTRUCTION METHODS

Use the plywood panel for mounting components on all walls other than masonry. Arrange the components as shown on the equipment layout detail in the plans.

Install conductors and conduit in accordance with Articles 1400-4F of the Standard Specifications titled "Wiring Methods" and 1400-4E "Conduit Installation". Clearly identify the phase, neutral, and contact conductors for the photocontrol in the wire trough.

Install flashing around the conduit extended through the roof to the photo control.

Securely fasten each component to the wall or panel with corrosion resistant bolts and inserts. Utilize all mounting holes in each component. Install a galvanized washer between the component and masonry walls to assure a minimum of ¼" air space.

Paint the plywood panel the same color as the wall. After the control system components are installed, clean, prime, and paint all exposed surfaces of enclosures and conduit with a premium quality paint that best matches the color of the adjacent walls. Mask all legend plates, nameplates, etc. while painting.

11.40 MEASUREMENT AND PAYMENT

The quantity of light control systems to be paid for will be the actual number of light control systems that have been installed and accepted.

The quantity of light control systems, measured as provided above, will be paid for at the contract unit price each for "Light Control Equipment _____ " of the appropriate type. Such price and payment will be full compensation for all work of furnishing and installing an entire control system, including mounting panel, control circuit, photocontrol, contactors, breakers, and selector switch.

Payment will be made under:

Light Control Equipment, Type WS, 120/208V..... Each

12.00 REINFORCED CONCRETE SLABS, PITS, AND PLATFORMS

12.10 DESCRIPTION

The work covered by this section consists of the construction of reinforced concrete static scale pits, decks, approach slabs, and weigh-in-motion (WIM) slabs in accordance with these specifications and the details shown on the plans.

12.20 MATERIALS

All materials shall meet the requirements of Division 10 of the *Standard Specifications for Roads and Structures* dated January, 2012 shown below:

Portland cement concrete	Section 1000
Curing agents	Section 1026
Reinforcing steel	Section 1070
Stone, No. 78M	Section 1005

Class AA concrete shall be used for all reinforced concrete.

Fabricated metal stay in place should be in accordance with the Standard Specification, articles 420-3 and 1074-12.

12.30 CONSTRUCTION METHODS

The subgrade shall be constructed in accordance with Section 500.

Reinforcement shall be fabricated and placed in accordance with Section 425.

The provisions of Section 420 shall be applicable to all concrete work except as otherwise provided herein.

The reinforced concrete slabs and decks shall be placed, screeded and finished in accordance with the requirements of this provision and shall be cured in accordance with the requirements of Article 420-15 that are applicable to bridge floors, except that curing with membrane curing compound will be permitted.

Dowels shall be provided in accordance with Section 1070-6 of the Standard Specifications between the reinforced concrete slabs and the roadway concrete. Installation shall be in conformance with details shown in the plans and NC DOT Roadway Standard Drawing No. 700.05.

12.31 Reinforced Concrete WIM Slabs

Immediately following the screed and while the concrete WIM slab is still workable, the Contractor shall test the slab surface for irregularities with a 10 foot straightedge. The testing shall be performed by holding the straightedge in successive positions parallel to the centerline of slab and in contact with the slab surface. The surface shall be tested five (5) feet from the slab edge (centerline of scale frames) and approximately 24 inches each side of these lines for a total of six lines 250 feet length each. Advancement along the slab shall be in stages of not more than 1/2 the length of straightedge. The surface shall also be tested transversely at the ends, quarter points and just either side of center of the slab.

Areas showing depressions or high spots of more than 1/10 inch in 10 feet shall be immediately corrected by filling depressions with fresh concrete or by striking off high spots. Corrections may be made by use of hand tools or a combination of hand tools and rescreeding. The straightedge shall not be used as a finishing tool.

Tests and corrections as described above do not relieve the Contractor of the requirement to pass the flatness test as specified in ASTM E 1318.

After the concrete has been cured in accordance with Article 420-15, the finished surface shall be tested as described in ASTM E 1318 Section 6.1.5 in lieu of the rolling straightedge method specified in the Standard Specifications. All high areas in the hardened surface, as indicated by testing, shall be removed by means of an approved grinding or cutting machine. Where variations are such that the corrections will extend below the limits of the top layer of grout, the Engineer may require the corrected surface to be sealed with an approved sealing agent. If approved by the Engineer, low areas shall be corrected in an acceptable manner. The corrected areas shall have a rough, uniform texture and shall present neat patterns. In all cases, a minimum of 4 inches of concrete cover over reinforcement shall be maintained.

The reinforced WIM slab surface shall be grooved. Direction of grooves shall be perpendicular to the centerline of roadway. Grooving shall not be started until final straightedge testing and when necessary, corrective measures acceptable to the

Engineer have been completed. The slab surface within 6 inches of the slab edge and 2 inches of scale frames and slab end shall not be grooved. The areas between the scale frames shall not be grooved.

12.32 WIM Slab Working Drawings

When sufficient information on the proposed weigh-in-motion system is provided the Engineer and approval is given for a system, the Engineer will prepare revised details of the contract plans, if necessary, to accommodate installation of the frames. Revisions shall include necessary changes in dimensions, reinforcing steel and concrete blockouts of contract plans. No adjustment will be made in the contract price for any bid item due to revisions necessary to accommodate the frames, but the entire cost of same shall be absorbed in the lump sum paid for furnishing and installing the system. The Contractor shall provide in advance of the scheduled installation time for the weigh-in-motion system, all complete drawings, specifications and necessary data for the preparation of revised contract plans and no claim for delays will be permitted due to his failure to provide complete detailed drawings specifications and necessary data promptly.

12.33 Reinforced Concrete Static Scale Decks

Scale decks shall be constructed in accordance with details shown in the plans, these special provisions and approved scale manufacturers drawings.

All structural steel including the check rods, holders, and stands shall be painted in accordance with Section 442 of the Standard Specifications, except payment will be considered incidental to the overall contract bid items.

The load cell holder/stands and all exposed metal surfaces in the pit (girders, stay in place forms, etc.) shall undergo either hot dipped galvanizing or covering in a corrosion resistant epoxy paint. Galvanizing or painting of all exposed metal surface shall be done in accordance with Section 442 of the Standard Specifications.

Anchor bolts, nuts and washers shall be hot dipped galvanized

Each deck shall be supported by a weighbridge and shall be installed in a common pit with each deck separated as shown in the plans. The decks shall be 12' x 54', 12' x 14' and 12' x 12' each with an 8" reinforced steel concrete deck enclosed in steel channels for protection of the deck edges.

The 12' x 14' and 12' x 12' deck and weighbridge units shall have a 30 ton minimum gross capacity with two sections and shall be rated for 100% end loading. The 12' x 54' deck and weighbridge shall have a 75 ton gross capacity with three sections rated not less than 37.5 tons each. Each deck and weighbridge shall have a longitudinal and lateral check system at each corner to prevent horizontal motion detrimental to the weighing operation.

Manholes with ladders shall be provided in the decks for access to the pits as indicated in the plans. The steel ladders shall be bolted to supports from the deck and shall extend downward to within 18" of the floor.

Plans for the concrete static scale decks are detailed for the use of metal stay-in-place forms; however, the Contractor shall have the option of constructing a cast-in-place deck using removable forms. Either one of the forming systems shall be used for all of the same type spans within the same scale deck.

All forms shall be installed in accordance with detailed fabrication plans submitted to the Engineer for approval. The fabrication plans shall clearly indicate locations where the forms are supported by steel beam flanges subject to tensile stresses. Within these locations, no welding to the flanges will be allowed.

Form sheets shall not be permitted to rest directly on the top of the beam or girder. Sheets shall be securely fastened to form supports and shall have a minimum bearing length of 1 inch at each end. Sheets shall be centered between the form supports. Form supports shall be placed in direct contact with the flange of girder or beam. All attachments shall be made by permissible welds, bolts, clips or other approved means. However, welding of form supports to flanges of steels not considered weldable and to those portions of a flange subject to tensile stresses shall not be permitted. All welding shall be in accordance with the Standard Specification, Article 1072-18, except 1/8" fillet welds will be permitted.

In the areas where the form sheets lap, the form sheets shall be securely fastened to one another by screws at a maximum spacing of 18 inches. The ends of the form sheets shall be securely attached to the support angles with screws at a maximum spacing of 18 inches.

Any exposed form metal where the galvanized coating has been damaged shall be thoroughly cleaned, wire brushed, then painted with two (2) coats of zinc oxide zinc dust primer, Federal Specification TT-P-64ld, Type II, no color added, to the satisfaction of the Engineer. Minor heat discoloration in areas of welds need not be touched up.

All cuts shall be made by a saw. No flame cutting will be permitted.

The Contractor's method of construction shall be carefully observed by the Engineer during all phases of the construction of the scale decks. These phases include installation of the forms; location and fastening of the reinforcement; composition of concrete items; mixing procedures, concrete placement and vibrations; and finishing of the scale deck.

Until such time as the Engineer is satisfied that the Contractor's concrete mix and procedures are obtaining the desired results, the Contractor may be required to

remove one form in every scale deck. This shall be done at a time selected by the Engineer and as soon after placing the concrete as practicable. When the Engineer is satisfied that the desired results are being consistently obtained, he may at his discretion reduce the amount of form to be removed for inspection.

After the deck concrete has been in place for a minimum period of two days, the concrete shall be tested for soundness and bonding of the forms by sounding with a hammer as directed by the Engineer. A minimum of one quarter of the individual form panels, selected at random by the Engineer, shall be hammer tested over at least one half of their area. If areas of doubtful soundness are disclosed by this procedure, the Contractor will be required to remove the forms from such areas for visual inspection after the pour has attained a minimum compressive strength of 3000 psi. This removal of the stay-in-place forms shall be at no additional cost to the Department of Transportation.

At locations where sections of the forms are removed, the Contractor will not be required to replace the forms, but the adjacent metal forms and supports shall be repaired to present a neat appearance and assure their satisfactory retention. As soon as the forms are removed, the concrete surfaces will be examined for cavities, honeycombing and other defects. If irregularities are found, and in the opinion of the Engineer these irregularities do not justify rejection of the work, the concrete shall be repaired as the Engineer may direct. If the concrete where the forms are removed is unsatisfactory, additional forms, as necessary, shall be removed to inspect and repair the slab, and the Contractor's methods of construction shall be modified as required to obtain satisfactory concrete in the slabs. All unsatisfactory concrete shall be removed or repaired as directed by the Engineer.

The Contractor shall provide all facilities as are reasonably required for the safe and convenient conduct of the Engineer's inspection procedures.

12.34 Static Scale Platform Drawings

The Contractor shall provide static scale deck and weigh-bridge "Certified for Construction" shop drawings for the Engineer's approval. The drawings shall be in agreement with the details shown in the plans and should conform to applicable portions of Section 440 of the Standard Specifications except for compensation. The shop drawings shall be "Certified for Construction" by the scale manufacturer. The scale manufacturer shall be responsible for the adequate design and function of the scale decks, weigh-bridges, check rods, load cells, and anchorage. The scale decks and weigh-bridge structural steel will be considered proprietary items and shall be the scale manufacturer's responsibility for acceptable design and function.

12.35 Static Scale Pit

The pit shall be in accordance with the details shown in the plans and shall meet the requirements of AASHTO "Standard Specifications for Bridges". The pit design

may include a subbase if subsurface investigation indicates that such is warranted due to the type or condition of soil upon which the pit will be constructed.

Electrical conduit, lights, receptacles and sleeves shall be provided in the pit as detailed in other sections of these Special Provisions.

12.36 Static Scale Pit Drawings

The Contractor shall provide pit "Certified for Construction" drawings for the Engineer's approval. The drawings shall be in agreement with the details shown in the plans. The pit drawings shall be "Certified for Construction" by the scale manufacturer. The Engineer's approval of the drawings shall not relieve the Contractor of the responsibility for the adequate design and function of the scale pits.

12.37 Scale Pit Approach Slabs

The approach slabs shall be in accordance with details shown in the plans and applicable portions of Section 422 of the Standard Specifications except for compensation.

12.40 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

A. General:

The quantity of concrete to be paid for will be the number of cubic yards of concrete which has been incorporated into the completed and accepted concrete WIM slabs, static scale pits, and approach slabs except as indicated below. The number of cubic yards of concrete will be computed from dimensions shown on the plans or from revised dimensions authorized by the Engineer. The quantity of concrete, measured as provided above will be paid for at the contract unit price per cubic yard for "Class AA Concrete".

The quantity of reinforcing steel and epoxy coated reinforcing steel in the WIM slabs, static scale pits, and approach slabs to be paid for shall be in accordance with Section 425-6 of the Standard Specifications. The quantity of reinforcing steel and epoxy coated reinforcing steel determined as provided above will be paid for at the contract unit price per pound for "Reinforcing Steel" and "Epoxy Coated Reinforcing Steel" in accordance with Section 425-6 of the Standard Specifications.

B. Grooving Reinforced Slab:

The quantity of grooving reinforced slab to be paid for will be the actual number of square feet of reinforced WIM slab, pit approach slab, and static scale deck which has been grooved and accepted. In measuring this quantity, measurement will be made along the surface of the reinforced slab and will be limited to that portion of the reinforced concrete surface which has been grooved in accordance with the plans and

specifications or as directed by the Engineer. The quantity of grooving slabs and decks, measured as provided above will be paid for at the contract unit price per square foot for "Grooving Concrete Slabs".

C. Pit Approach Slabs:

The work including concrete and reinforcing steel regarding pit approach slabs except for grooving will be paid for, as indicated in (A) above, at the contract price for "Class AA Concrete", "Reinforcing Steel", and "Epoxy Coated Reinforcing Steel". Such price and payment will be full compensation for work including but not limited to constructing the subgrade; furnishing and placing concrete, reinforcing steel, joint filler and sealer, and any other materials; finishing, tineing, and curing the concrete.

D. Static Scale Platforms

The work of furnishing and installing the reinforced concrete static scale decks and weigh-bridges when completed and accepted will be paid for at the contract lump sum price " _____ Static Scale Platforms" at the appropriate location. Such price and payment will be full compensation for all labor and materials including: concrete, forming, falsework, reinforcing steel, weigh-bridge structural steel mounted on load cell stands, anchor bolts, check rods, and painting. Load cells are to be paid for under section 2.00 of these Special Provisions.

12.41 Compensation

The above prices and payments will be full compensation for all work covered by this section including but not limited to constructing the subgrades, furnishing and placing concrete, curing agents, reinforcing steel, scale decks, weigh-bridge structural steel, setting anchor bolts, grooving concrete, erecting and removing falsework and forms; protecting concrete in wind, rain, low humidity, high temperatures, or other unfavorable weather; finishing and curing concrete.

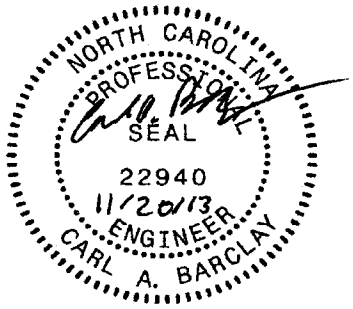
Payment will be made under:

Class AA Concrete (Weigh Bridge – Static Scale)	Cubic Yard
Reinforcing Steel (Weigh Bridge – Static Scale)	Pound
Epoxy Coated Reinforcing Steel (Weigh Bridge – Static Scale)	Pound
Grooving Concrete Slabs	Square Foot
_____ Static Scale Platforms	Lump Sum

PROJECT SPECIAL PROVISIONS
Utility Construction

NCDOT Utilities Unit
1555 MSC
Raleigh, NC 27699-1555

919-707-6690



Revise the 2012 Standard Specifications as follows:

Utility Owner's Contact Information:

Page 15-1, Sub-article 1500-2, Cooperation with the Utility Owner, paragraph 2: add the following sentences:

The utility is owned by Bessemer City and is maintained by Two Rivers Utilities. The contact person for Bessemer City is Mr. Jamie Ramsey at (704)-629-5398. The contact person for Two Rivers Utilities is Mr. Mike Bynum at (704)-866-6043.

Sanitary Sewer:

Page 15-11, Article 1520-3 (A) (2), Testing, line 5, replace the second paragraph with the following:

Test all 24" and smaller gravity sewer lines for leakage using infiltration, exfiltration or air test. Perform visual inspection on gravity sewer lines larger than 24". Perform line and grade testing and deflection testing on all gravity sewer lines.

Abandon or Remove Utilities:

Page 15-15, Article 1530-3 (A) Abandoning Pipe: add the following sentence:

The portion of the pipe located above grade, including within the culvert, shall be removed.

PROJECT SPECIAL PROVISIONS
Utilities by Others

General:

The following utility companies have facilities that will be in conflict with the construction of this project.

A) Duke Energy – Power Distribution
B) Williams Gas Pipeline Co. – Gas

The conflicting facilities of these concerns will be installed, adjusted prior to the date of availability, unless otherwise noted and are therefore listed in these special provisions for the benefit of the Contractor. All utility work listed herein will be done by the utility owner. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105-8 of the January 2012 Standard Specifications.

Utilities Requiring Adjustment:

A) Duke Energy – Power Distribution
   1) Duke Energy will abandon, adjust, relocate or remove its facilities prior to the date of availability, as shown on the Utilities by Others Plans.
   2) Contact person for Duke Energy is William Huffstetler at 704-866-5109.

B) Williams Gas Pipeline Co. – Gas
   1) Williams Gas Pipeline Co. will remove or relocate gas main location markers prior to the date of availability.
   2) Contact person for Williams Gas Pipeline Co. is Dave Dickerson at (434)-964-2122.

Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective August 3, 2011 issued by the North Carolina Department of Environment and Natural Resources Division of Water Quality. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING: (West)

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

Shoulder and Median Areas

August 1 - June 1		**May 1 - September 1**	
20#	Kentucky Bluegrass	20#	Kentucky Bluegrass
75#	Hard Fescue	75#	Hard Fescue
25#	Rye Grain	10#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 - June 1		**May 1 - September 1**	
100#	Tall Fescue	100#	Tall Fescue
15#	Kentucky Bluegrass	15#	Kentucky Bluegrass
30#	Hard Fescue	30#	Hard Fescue
25#	Rye Grain	10#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Tall Fescue Cultivars

2nd Millennium	Duster	Magellan	Rendition
Avenger	Endeavor	Masterpiece	Scorpion
Barlexas	Escalade	Matador	Shelby
Barlexas II	Falcon II, III, IV & V	Matador GT	Signia
Barrera	Fidelity	Millennium	Silverstar
Barrington	Finesse II	Montauk	Southern Choice II
Biltmore	Firebird	Mustang 3	Stetson
Bingo	Focus	Olympic Gold	Tarheel
Bravo	Grande II	Padre	Titan Ltd
Cayenne	Greenkeeper	Paraiso	Titanium
Chapel Hill	Greystone	Picasso	Tomahawk
Chesapeake	Inferno	Piedmont	Tacer
Constitution	Justice	Pure Gold	Trooper
Chipper	Jaguar 3	Prospect	Turbo
Coronado	Kalahari	Quest	Ultimate
Coyote	Kentucky 31	Rebel Exeda	Watchdog
Davinci	Kitty Hawk	Rebel Sentry	Wolfpack
Dynasty	Kitty Hawk 2000	Regiment II	
Dominion	Lexington	Rembrandt	

Approved Kentucky Bluegrass Cultivars:

Alpine	Bariris	Envicta	Rugby
Apollo	Bedazzled	Impact	Rugby II
Arcadia	Bordeaux	Kenblue	Showcase
Arrow	Champagne	Midnight	Sonoma
Award	Chicago II	Midnight II	

Approved Hard Fescue Cultivars:

Chariot	Nordic	Rhino	Warwick
Firefly	Oxford	Scaldis II	
Heron	Reliant II	Spartan II	
Minotaur	Reliant IV	Stonehenge	

On cut and fill slopes 2:1 or steeper add 20# Sericea Lespedeza January 1 - December 31.

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

Native Grass Seeding And Mulching **(West)**

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation and/or trout stream construction within a 50 foot zone on both sides of the stream or depression, measured from top of stream bank or center of depression. The stream bank of the stream relocation shall be seeded by a method that does not alter the typical cross section of the stream bank. Native Grass Seeding and Mulching shall also be performed in the permanent soil reinforcement mat section of preformed scour holes, and in other areas as directed.

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

August 1 - June 1		**May 1 – September 1**	
18#	Creeping Red Fescue	18#	Creeping Red Fescue
8#	Big Bluestem	8#	Big Bluestem
6#	Indiangrass	6#	Indiangrass
4#	Switchgrass	4#	Switchgrass
35#	Rye Grain	25#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Creeping Red Fescue Cultivars:

Aberdeen Boreal Epic Cindy Lou

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

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

Measurement and Payment

Native Grass *Seeding and Mulching* will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

TEMPORARY SEEDING:

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

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis and as directed.

SUPPLEMENTAL SEEDING:

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

MOWING:

The minimum mowing height on this project shall be six inches.

RESPONSE FOR EROSION CONTROL:

Description

Furnish the labor, materials, tools and equipment necessary to move personnel, equipment, and supplies to the project necessary for the pursuit of any or all of the following work as shown herein, by an approved subcontractor.

Section	Erosion Control Item	Unit
1605	Temporary Silt Fence	LF
1606	Special Sediment Control Fence	LF/TON
1615	Temporary Mulching	ACR
1620	Seed - Temporary Seeding	LB
1620	Fertilizer - Temporary Seeding	TN
1631	Matting for Erosion Control	SY
SP	Coir Fiber Mat	SY
1640	Coir Fiber Baffles	LF
SP	Permanent Soil Reinforcement Mat	SY
1660	Seeding and Mulching	ACR
1661	Seed - Repair Seeding	LB

1661	Fertilizer - Repair Seeding	TON
1662	Seed - Supplemental Seeding	LB
1665	Fertilizer Topdressing	TON
SP	Safety/Highly Visible Fencing	LF
SP	Response for Erosion Control	EA

Construction Methods

Provide an approved subcontractor who performs an erosion control action as described in the NPDES Inspection Form SPPP30. Each erosion control action may include one or more of the above work items.

Measurement and Payment

Response for Erosion Control will be measured and paid for by counting the actual number of times the subcontractor moves onto the project, including borrow and waste sites, and satisfactorily completes an erosion control action described in Form 1675. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

Payment will be made under:

Pay Item	Pay Unit
Response for Erosion Control	Each

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed.

STOCKPILE AREAS:

The Contractor shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed.

ACCESS AND HAUL ROADS:

At the end of each working day, the Contractor shall install or re-establish temporary diversions or earth berms across access/haul roads to direct runoff into sediment devices. Silt fence sections that are temporarily removed shall be reinstalled across access/haul roads at the end of each working day.

WASTE AND BORROW SOURCES:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

All offsite Staging Areas, Borrow and Waste sites shall be in accordance with "Borrow and Waste Site Reclamation Procedures for Contracted Projects" located at:

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

All forms and documents referenced in the "Borrow and Waste Site Reclamation Procedures for Contracted Projects" shall be included with the reclamation plans for offsite staging areas, and borrow and waste sites.

TEMPORARY DIVERSION:

This work consists of installation, maintenance, and cleanout of *Temporary Diversions* in accordance with Section 1630 of the *Standard Specifications*. The quantity of excavation for installation and cleanout will be measured and paid for as *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*.

SAFETY FENCE AND JURISDICTIONAL FLAGGING:

Description

Safety Fence shall consist of furnishing materials, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary, or other boundaries located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland, endangered vegetation, culturally sensitive areas or water. The fence shall be installed prior to any land disturbing activities.

Interior boundaries for jurisdictional areas noted above shall be delineated by stakes and highly visible flagging.

Jurisdictional boundaries at staging areas, waste sites, or borrow pits, whether considered outside or interior boundaries shall be delineated by stakes and highly visible flagging.

Materials

(A) Safety Fencing

Polyethylene or polypropylene fence shall be a highly visible preconstructed safety fence approved by the Engineer. The fence material shall have an ultraviolet coating.

Either wood posts or steel posts may be used. Wood posts shall be hardwood with a wedge or pencil tip at one end, and shall be at least 5 ft. in length with a minimum nominal 2" x 2" cross section. Steel posts shall be at least 5 ft. in length, and have a minimum weight of 0.85 lb/ft of length.

(B) Boundary Flagging

Wooden stakes shall be 4 feet in length with a minimum nominal 3/4" x 1-3/4" cross section. The flagging shall be at least 1" in width. The flagging material shall be vinyl and shall be orange in color and highly visible.

Construction Methods

No additional clearing and grubbing is anticipated for the installation of this fence. The fence shall be erected to conform to the general contour of the ground.

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence geotextile shall be attached to the wood posts with one 2" galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

Place construction stakes to establish the location of the safety fence in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for the staking of the safety fence. All stakeouts for safety fence shall be considered incidental to the work being paid for as "Construction Surveying", except that where there is no pay item for construction surveying, all safety fence stakeout will be performed by state forces.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

Boundary flagging delineation of interior boundaries will be placed in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications.* No direct pay will be made for delineation of the interior boundaries. This delineation will be considered incidental to the work being paid for as *Construction Surveying,* except that where there is no pay item or construction surveying the cost of boundary flagging delineation shall be included in the unit prices bid for the various items in the contract. Installation for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Additional flagging may be placed on overhanging vegetation to enhance visibility but does not substitute for installation of stakes.

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(3)(d) or Subarticle 802-2(F) of the *Standard Specifications.* No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

The Contractor shall be required to maintain alternative stakes and highly visible flagging in a satisfactory condition for the duration of the project as determined by the Engineer.

Measurement and Payment

Safety Fence will be measured and paid as the actual number of linear feet of polyethylene or polypropylene fence installed in place and accepted. Such payment will be full compensation including but not limited to furnishing and installing fence geotextile with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Safety Fence	Linear Foot

SKIMMER BASIN WITH BAFFLES:

Description

Provide a skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Skimmer Basin with Baffles Detail sheet provided in the erosion control plans. Work includes constructing sediment basin, installation of temporary slope drain pipe and coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing a geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drain, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056
Fertilizer for Temporary Seeding	1060-2
Seed for Temporary Seeding	1060-4
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
Coir Fiber Mat	1060-14
Temporary Slope Drain	1622-2
Coir Fiber Baffle	1640

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4" diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basin according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drain pipe and construct the primary spillway according to the Skimmer Basin with Baffles Detail sheet in the erosion control plans. Temporary slope drain pipe at inlet of basin may be replaced by geotextile as directed. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Line primary spillway with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for the primary spillway is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Skimmer Basin with Baffles detail. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans

and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

__" *Skimmer* will be measured in units of each. __" *Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of __" *Skimmer* is considered incidental to the measurement of the quantity of __" *Skimmer* and no separate payment will be made. No separate payment shall be made if __" *Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	Pay Unit
__" Skimmer	Each
Coir Fiber Mat	Square Yard

TIERED SKIMMER BASIN WITH BAFFLES:

Description

Provide a tiered skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Tiered Skimmer Basin Detail sheet provided in the erosion control plans. Tiered Skimmer Basins shall be installed in areas where topography creates a large elevation difference between the inlet and outlet of a single skimmer basin. Work includes constructing sediment basins, installation of coir fiber baffles, installation of temporary slope drains, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing geotextile spillway liners, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drains, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056
Fertilizer for Temporary Seeding	1060-2
Seed for Temporary Seeding	1060-4
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
Coir Fiber Mat	1060-14
Temporary Slope Drain	1622-2
Coir Fiber Baffle	1640

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe

diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4" diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basins according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drains and construct the primary spillways according to the Tiered Skimmer Basin Detail sheet in the erosion control plans. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*. Multiple upper basins, or Modified Silt Basins Type 'B' as labeled on the detail, may be required based on site conditions and as directed.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Install a minimum of 2 (two) temporary slope drains to dewater the upper basin to the lower basin. The slope drains shall be installed a minimum of 6 inches, or one radius width of the temporary slope drain pipe, below the base of the primary spillway section of the upper basin. The outlet of the slope drains shall be placed on the bottom elevation of the lower basin.

Line primary spillways with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for primary spillways is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Tiered Skimmer Basin with Baffles detail.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

__" *Skimmer* will be measured in units of each. __" *Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of __" *Skimmer* is considered incidental to the measurement of the quantity of __" *Skimmer* and no

separate payment will be made. No separate payment shall be made if __" *Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	**Pay Unit**
__" Skimmer	Each
Coir Fiber Mat	Square Yard

WATTLES WITH POLYACRYLAMIDE (PAM):

Description

Wattles are tubular products consisting of excelsior fibers encased in synthetic netting. Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of wattles, matting installation, PAM application, and removing wattles.

Materials

Wattle shall meet the following specifications:

100% Curled Wood (Excelsior) Fibers	
Minimum Diameter	12 in.
Minimum Density	2.5 lb/ft^3 +/- 10%
Net Material	Synthetic
Net Openings	1 in. x 1 in.
Net Configuration	Totally Encased
Minimum Weight	20 lb. +/- 10% per 10 ft. length

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound
Wattle	Linear Foot

TEMPORARY ROCK SILT CHECK TYPE A WITH EXCELSIOR MATTING AND POLYACRYLAMIDE (PAM):

Description

Temporary Rock Silt Checks Type A with Excelsior Matting and Polyacrylamide (PAM) are devices utilized in temporary and permanent ditches to reduce runoff velocity and incorporate PAM into the construction runoff to increase settling of sediment particles and reduce turbidity of runoff. Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of

Temporary Rock Silt Checks Type A, matting installation, PAM application, and removing Temporary Rock Silt Checks Type A with Excelsior Matting and PAM.

Materials

Structural stone shall be class B stone that meets the requirements of Section 1042 of the *Standard Specifications* for Stone for Erosion Control, Class B.

Sediment control stone shall be #5 or #57 stone, which meets the requirements of Section 1005 of the *Standard Specifications* for these stone sizes.

Matting shall meet the requirements of Excelsior Matting in Subarticle 1060-8(B) of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each Temporary Rock Silt Check Type A. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Temporary Rock Silt Checks Type A shall be installed in accordance with Subarticle 1633-3(A) of the *Standard Specifications*, Roadway Standard Drawing No. 1633.01 and the detail provided in the plans.

Installation of matting shall be in accordance with the detail provided in the plans, and anchored by placing Class B stone on top of the matting at the upper and lower ends.

Apply PAM at a rate of 4 ounces over the center portion of the Temporary Rock Silt Checks Type A and matting where the water is going to flow over. PAM applications shall be done during construction activities and after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM until the project is accepted or until the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are removed, and shall remove and dispose of silt accumulations at the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Temporary Rock Silt Checks Type A will be measured and paid for in accordance with Article 1633-5 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the Temporary Rock Silt Checks Type A. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound

IMPERVIOUS DIKE:

Description

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

Materials

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

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

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, and removal of the impervious dike.

Payment will be made under:

Pay Item	Pay Unit
Impervious Dike	Linear Foot

COIR FIBER MAT:

Description

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat with stakes, steel reinforcement bars or staples as directed.

Materials

Item	Section
Coir Fiber Mat	1060-14

Anchors: Stakes, reinforcement bars, or staples shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Place the coir fiber mat immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the mat with the soil. Unroll the mat and apply without stretching such that it will lie smoothly but loosely on the soil surface.

For stream relocation applications, take care to preserve the required line, grade, and cross section of the area covered. Bury the top slope end of each piece of mat in a narrow trench at least 6 in. deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. overlap. Construct check trenches at least 12 in. deep every 50 ft. longitudinally along the edges of the mat or as directed. Fold over and bury mat to the full depth of the trench, close and tamp firmly. Overlap mat at least 6 in. where 2 or more widths of mat are installed side by side.

Place anchors across the mat at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the mat 3 ft. apart.

Adjustments in the trenching or anchoring requirements to fit individual site conditions may be required.

Measurement and Payment

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

No measurement will be made for anchor items.

Payment will be made under:

Pay Item	**Pay Unit**
Coir Fiber Mat	Square Yard

ITS PROJECT SPECIAL PROVISIONS

I-85 NB WEIGH STATION

N.C. Project No. I-4928 (WBS # 41188.3. FS1)
F.A. Project No. IMS-85-1(106)3
Gaston County

Prepared for:

North Carolina Department of Transportation
ITS and Signals Unit

Prepared by:

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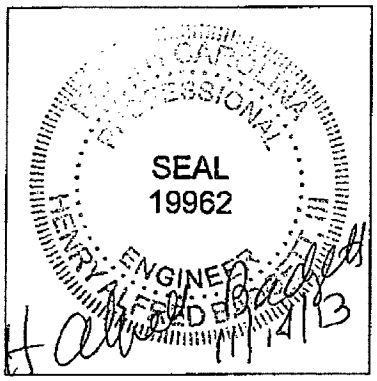
November 14, 2013



Project Special Provisions

Based On

NCDOT ITS and Signals Project Special Provisions

Version 12.2

Prepared by:

ATKINS

5200 Seventy Seven Center Drive, Suite 500
Charlotte, NC 28217 • NCBEES # F-0326

Contents

1. GENERAL REQUIREMENTS

1.1. DESCRIPTION

(A) General

Furnish, install, integrate, and test a Commercial Vehicle Information Systems and Networks (CVISN) compatible commercial vehicle weigh-in-motion system, advanced license plate reader (ALPR) system, ramp sorting system, closed circuit television (CCTV) cameras, lane control signals, DMS, and fiber-optic communications cable at locations shown in the Plans. The CVISN system must interface with the existing **NCPass** Transponder program. Integrate the components of this project into a fully operational system. When complete the weigh station will be operated by the State Highway Patrol (NCSHP).

(B) System Description

The CVISN compatible commercial vehicle weigh-in-motion system will be comprised of the following: Weigh-In-Motion (WIM) equipment, Automatic Vehicle Identification (AVI) equipment, vehicle classification equipment, over-height vehicle detection system, DMS, enforcement cameras, computers, servers, and control software. Furnish and install a fiber-optic communications network consisting of single-mode fiber optic cable. Furnish and install WIM electronics, and peripherals to integrate the new weigh station equipment. **Servers, computer workstations, and a printer called for in these Project Special Provisions will be furnished by NCSHP. If the Contractor's system requires additional servers, the Contractor shall notify Engineer so the Department can obtain the additional servers.** Provide an operational and integrated CVISN-compatible weigh station at the new I-85 northbound Weigh Station.

(C) Required System Operations

Provide a fully operational and integrated commercial vehicle processing system. All subsystems, including static scales (by others), lane control signals, ramp weigh-in-motion, classification equipment and communications networks must be compatible with each other and must be integrated into a working system. Configure the completed system in such a manner that failure of the proposed mainline WIM sensors do not interfere with the operation of the ramp WIM scales and vice versa. The CVISN must interface with the existing North Carolina **NCPass** Transponder program. Contact International Road Dynamics (IRD) at 336-261-5764 for further information.

The required operations of this system are based on processing transponder-equipped vehicles, meeting weight and credentials criteria, while the vehicles are traveling on the Interstate. Vehicles meeting the aforementioned criteria will be allowed to bypass the weigh station, thus ensuring greater efficiencies for both the commercial vehicles and the weigh station. Vehicles not meeting the criteria will be processed at the weigh station.

The CVISN equipment for the northbound I-85 Weigh Station can be described as a series of locations that process and communicate with commercial vehicles as the vehicles travel on northbound I-85. These locations include:

- Advance Location
- Notification Location
- Compliance Location

- Static Scale Location

(1) Advance Location

The Advance Location consists of two (2) automatic vehicle identification (AVI) readers and antennae, piezoelectric quartz sensors, piezo-electric axle sensors, inductive loops, and electronics, an over-height vehicle detector, ALPR with a freeze-frame CCTV camera, vehicle classification equipment, Ethernet edge switch, roadside operations controller, and other associated roadside electronics and communications equipment. The piezoelectric quartz sensors, piezo-electric axle sensors, inductive loops will be located on the entrance ramp from US 74 and the right two lanes of I-85 northbound. The vehicle classification equipment consists of inductive loops, piezo-electric axle sensors, and piezoelectric quartz sensors. Locate the Advance Location equipment as shown on the Plans.

(2) Notification Location

The Notification Location equipment consists of one (1) AVI antenna and reader, Ethernet edge switch, and associated roadside electronics and communications equipment.

(3) Compliance Location

The Compliance Location consists of an AVI reader and three antennae, inductive loops and piezoelectric quartz sensors, piezo-electric axle sensors, inductive loops, a freeze-frame CCTV camera and associated roadside electronics, roadside operations controller, and communications equipment. Locate the inductive loops, piezoelectric quartz sensors piezoelectric sensors in the two right mainline lanes and the ramp lane as shown on the Plans.

(4) CCTV Equipment

Furnish and install a video surveillance system at the US-74 interchange and within the weigh station as shown in the Plans. The video surveillance system shall consist of full-motion video, IP-based, closed-circuit television (CCTV) cameras installed at locations shown on the Plans. The video from this CCTV camera shall be transmitted to the scale house. Install a video workstation in the scale house. The cameras and workstations will all be integrated to allow control and viewing of all cameras from the scale house. The US-74 CCTV camera will be used by scale house operators to identify commercial vehicles that are attempting to bypass the weigh station via US-74.

Integrate with the central control equipment, roadside operations controllers, WIM server, workstations, communications equipment, and printing equipment to allow system operators to process commercial vehicles. The central control equipment shall allow operators to view, control and process commercial vehicles using the new equipment installed under this Contract.

(5) Ramp Sorting System

Furnish and install a ramp sorting system consisting of lane control signals WIM electronics, and roadside operations controller for electronic screening of vehicles. Install computer workstations and servers with all necessary database management software licensed appropriately for the anticipated usage.

(D) Processing of Commercial Vehicles

The following scenario describes how commercial vehicles will be processed:

1) All trucks approaching the weigh station will be directed into the right lane of I-85 by means of static signing located prior to the Advance Location.

2) As a truck first passes over the equipment at the Advance Location, the equipment in the right-most lane and entrance ramp from US 74 will collect axle weight and spacing, gross vehicle weight, vehicle speed, classification, vehicle length, over-height data and USDOT number. If the vehicle is equipped with an AVI transponder, the AVI transponder's unique identification number is read. All of the data is then sent to the roadside controller and server in the scale house for processing and database lookup. If the truck is in the lane immediately to the left of the WIM lane, the loops and piezoelectric sensors detect the truck and an alarm is activated in the station to alert operators that the truck was not weighed with the mainline WIM equipment, and was not read by the AVI system. System operators will define internal processes for handling these vehicles.

3) The freeze-frame CCTV camera located at the Advance Location captures images of each of truck as they travel past the location. Images of trucks that are not pre-cleared at the Notification Location are transmitted with the vehicle record (i.e. weight, vehicle length, over-height indication, AVI data, etc.) from the roadside controller for transmission to the scale house server.

4) At the Notification Location, vehicles equipped with AVI transponders are sent a message via the Notification Location's AVI system as to whether the vehicle has been pre-cleared, based on weight, credentials and other criteria, to bypass the weigh station. The pre-clearance criteria are identified in the section, "Central Control Software" of these Project Special Provisions. If a commercial vehicle is pre-cleared, a message is sent to the truck's transponder, which activates a green light on the transponder. If the weight or credentials need to be checked further, or the truck is selected for random inspection/weighing, a message is sent via the AVI system to activate a red light on the truck's transponder.

5) If the truck's transponder receives a green light, it proceeds along the Interstate passing under the Compliance Location's AVI antenna, which verifies that the truck was pre-cleared to bypass the station. The Compliance Location freeze-frame CCTV camera captures images of non-compliant trucks in the right-hand lane that were not pre-cleared. When non-compliant trucks are detected, an alarm message is sent to the workstations in the scale house. The image of the truck is transferred to the scale house workstations where operators can view the image.

6) If a truck is not pre-cleared, then it is required to report to the scale house. The WIM scale, loops, and sensors located on the station ramp detect that a truck has entered the weigh station and match the truck record to the Advance Location record. The AVI reader on the ramp will also be used for this matching. The scale house operator uses the information from the Advance Location, displayed on the workstation display, to identify why a truck was required to report to the station (i.e. no transponder, credentials check, weight check or random pull-in), and processes the truck accordingly. All AVI-equipped trucks that are not bypassed by the mainline CVISN equipment will automatically be directed to report to the scale house, where they are weighed on the static scales and inspected.

(E) Building Conduits and Conduits Entrances

Conduits within the scale house and inspection buildings and conduit entrances into the scale house and inspection buildings are being provided in the respective building plans. The building

plans include the conduit within and into the scale and inspection buildings. The pull boxes immediately outside each building is also shown in the respective plans for each group of conduits outside the building

1.2. MATERIALS

(A) General

Conform to these Project Special Provisions and the North Carolina Department of Transportation (NCDOT) *Standard Specifications for Roads and Structures*, dated January 2012, hereinafter referred to as the "*Standard Specifications*". Conform to the Codes and Regulations described in Section 1700 of the *Standard Specifications*.

Within these Project Special Provisions, the "Department" refers to the North Carolina Department of Transportation.

Conform to the requirements of the pay items included in these Project Special Provisions. All other pay items for items not described in these Project Special Provisions are included in the Standard Specifications and must be conformed to as described in those specifications unless modified herein.

Unless otherwise stated, furnish new equipment, materials, and hardware that meet the requirements of these Project Special Provisions. Permanently inscribe the manufacturer's name, model number, serial number, and any additional information needed for proper identification on each piece of equipment housed in a case or housing. Ensure all materials are compatible with the existing equipment as specified in these Project Special Provisions.

(F) Coordination of Plans, Specifications, and Special Provisions

The *Standard Specifications*, the Plans, and these Project Special Provisions are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are complementary and provide and describe the complete contract. In case of a discrepancy or conflict, the following will apply in ascending order:

- Calculated dimensions shall govern over scaled dimensions;
- Supplemental Specifications shall govern over *Standard Specifications*;
- Plans shall govern over Supplemental Specifications, *Standard Specifications* and *Roadway Standard Drawings*;
- Project Special Provisions shall govern over Standard Special Provisions, Plans, *Standard Specifications,* Supplemental Specifications, and *Roadway Standard Drawings*.

In the event of a contradiction within the Project Special Provisions as to the measurement and payment of any pay item, the text of the respective Measurement and Payment subsection for the pay item in question shall govern.

The Contractor shall not take advantage of any apparent error or omission in the contract. In the event such errors or omissions are discovered, the Engineer will make such corrections and interpretations as may be determined necessary for the fulfillment of the intent of the contract.

(B) Qualified Products

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

2012 ITS and Signals Qualified Products List (QPL) is available on the North Carolina Department of Transportation's website at the following address:

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

Signal and communications equipment, material, and hardware shall be pre-approved on the QPL by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project. Consult the QPL website to obtain pre-approval procedures.

(G) Submittal Requirements

Furnish a Type 3 material certification in accordance with Article 106-3 of the *Standard Specifications*. When requested by the Department, provide additional certifications from independent testing laboratories and sufficient data to verify item meets applicable specifications. Ensure additional certification states the testing laboratory is independent of the material manufacturer and neither the laboratory nor the manufacturer has a vested interest in the other.

Identify all proprietary parts in Contractor-furnished material. The Department reserves the right to reject material that uses proprietary components not commercially available through electronic or electrical supply houses.

For Contractor-furnished material listed on the QPL, furnish submittals in the format defined by the QPL.

For Contractor-furnished material not on the QPL, furnish three copies of the equipment list including three copies of catalog cuts. Identify proposed material on catalog cuts by a reproducible means (highlighter pen does not transfer to copies). Ensure material lists contain material description, brand name, manufacturer's address and telephone number, stock number, size, identifying trademark or symbol, and other appropriate ratings.

Do not fabricate or order material until receipt of the Engineer's approval.

Refer to the "Submittal Data and Documentation" section of these Project Special Provisions for additional submittal requirements.

(H) Observation Period

Prior to final acceptance, all Contractor-furnished equipment and software shall successfully complete a 60-day Observation Period.

The 60-day Observation Period is considered to be part of the work included in the total contract time and must be completed prior to final acceptance of the project.

Final acceptance will occur following the successful completion of the 60-day Observation Period and after all documentation requirements have been fully satisfied.

Refer to the "Testing and Acceptance" section of these Project Special Provisions for additional requirements.

(I) Warranties

Unless otherwise required herein, provide manufacturer's warranties on Contractor-furnished equipment for material and workmanship that are customarily issued by the equipment manufacturer or that are at least one year in length, whichever is greater, from the date of final

acceptance of the project by the Department. Include unconditional coverage for all parts and labor necessary or incidental to repair of defective equipment or workmanship and malfunctions that arise during warranty period.

For light emitting diode (LED) signal modules, provide a written warranty against defects in materials and workmanship for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide replacement modules within 45 days of receipt of modules that have failed at no cost to the Department.

Ensure all Contractor-furnished equipment, including pieces and components of equipment, hardware, firmware, software, middleware, internal components, and subroutines which perform any date or time data recognition function, calculation, or sequencing will support a four digit year format for a period of at least 50 years and will support user-definable parameters for setting the start and end dates for daylight savings time.

Upon receipt of the Department's written final acceptance of project, transfer manufacturer's warranties with proper validation by the manufacturer to the Department and the City. Provide warranties in the names of both the North Carolina Department of Transportation.

(J) Firmware Licensing, Source Code Escrow Requirements and Upgrades

Provide the Department with backups of the WIM and roadside operations software and operating system, application programs, data files and any other element necessary to restore any of the roadside operations controller servers and workstations to normal operation after repair or replacement. Provide this material on compact disk or other approved media. Include instructions for restoring the software and data.

Provide the Department with an unlimited license to duplicate all central programs and remote site programs to facilitate the addition of future sites throughout North Carolina. Provide three (3) copies of all software packages on CD-ROM.

Ensure software performance upgrades that occur during the contract period up through final acceptance of the project are available to the Department at no additional cost.

Software upgrades that are developed to correct operating characteristics shall be available to the Department at no additional cost until the warranty period expires.

Provide licensed copies of all software/firmware to the Department for any programmable devices furnished by the Contractor and installed in this project for which licensed software has not already been provided by the Department. The Department shall have the right to install any software/firmware for maintenance and support on all hardware provided under this contract. Provide software/firmware for maintenance and support of system support software, utility software, roadside operations controllers, and CCTV systems, and all other programmable devices provided by the Contractor.

(K) Wire and Cable

Furnish wire and cable on reels. When requested by the Department, furnish samples of wire and cable to the Department at no additional cost.

(L) Performance of Warranty Repair and Maintenance

Provide authorization to the Traffic Electronics Center of NCDOT to perform all warranty repairs after project acceptance. The decision to perform warranty work at the Traffic Electronics

Center by NCDOT electronics technicians or to have warranty work performed by the vendor shall be at the discretion of the Department. Provide any training required by the manufacturer to authorize the Traffic Electronics Center to perform warranty work and ensure manufacturer will furnish parts to the Traffic Electronics Center for all warranty repairs at no cost to the Department. In addition, ensure the manufacturer agrees to provide prompt technical support to the NCDOT electronics technicians for a period of one year after the end of the warranty period at no cost to the Department. Defective parts replaced under warranty by the Traffic Electronics Center will be returned to the vendor at the vendor's request. Provide schematics, part lists, and other documentation to perform bench repair to the Traffic Electronics Center within 2 weeks upon request. The Department agrees not to divulge any proprietary information in the schematics, part lists and other documentation upon request from the vendor. After project acceptance and at the request of the Department, the manufacturer shall perform warranty repairs to equipment, which fails during the warranty period at no cost to the Department including freight costs to ship repaired equipment back to the Traffic Electronics Center. Ensure all equipment is repaired and returned to the Traffic Electronics Center within 21 calendar days of receipt by the manufacturer.

1.3. CONSTRUCTION METHODS

(A) General

Unless otherwise stated in these Project Special Provisions, perform work that meets the requirements of the *Standard Specifications* and these Project Special Provisions. In the event of a conflict between these Project Special Provisions and the *Standard Specifications*, these Project Special Provisions shall govern.

Locate all underground utilities before beginning drilling, digging, and trenching operations.

Immediately cease work and notify the Engineer and affected owners if damage to existing utilities, cables, or equipment occurs. Make all required repairs and replacements at no additional cost to the Department.

(M) Regulations and Codes

Furnish material and workmanship conforming to the *National Electric Code* (NEC), *National Electric Safety Code* (NESC), Underwriters Laboratories (UL), or other listing agencies approved by the North Carolina Department of Insurance, and all local safety codes in effect on the date of advertisement. Comply with Article 4, Chapter 87 of the *North Carolina General Statutes* (Licensing of Electrical Contractors). Comply with the Plans, all previously referenced specifications, and all applicable local ordinances and regulations before and during all stages of the electrical work.

When required by the local ordinances and governmental agencies, upon completion of the work, have all systems inspected and approved in writing by the authorized governmental electrical inspector for the area. Furnish written certification of the authorized inspector's approval to the Engineer. Inspection by the authorized governmental electrical inspector must neither eliminate nor take the place of the inspections by the Engineer. Upon the Engineer's receipt of written certification and the Contractor's written request for a final inspection of the installations, the Engineer will perform a final inspection.

Where required, conform to ITE, AASHTO, and ASTM standards in effect on the date of advertisement.

Notify the Engineer, local traffic enforcement agency, and local utility companies seven business days before operational shutdowns to coordinate connection or disconnection to an existing utility or system, unless otherwise instructed herein.

Install meter bases and service disconnects as required by the NESC, NEC, local utility companies, and local ordinances. Install standoffs only when required and approved by the local utility companies. Where a standoff must be used, obtain the local utility company's approval prior to installing the standoff.

(N) Utility Services

Coordinate all work to ensure electrical power of proper voltage, phase, frequency, and ampacity is available to complete the work for the ITS devices beyond the immediate weigh station site as shown in the Plans. Use electrical service cables with THWN insulation.

When electrical, telephone, and telecommunication service is not furnished by the Department and is required, contact the utility company and make application to ensure all work can be completed. Obtain authorization for service in the Department's name.

The Department will be responsible for direct payment of monthly utility company usage charges. The Contractor will be responsible for all expenses associated with utility installation costs, hookups, etc.

Coordinate all work involving electrical service with the appropriate electric utility company. Coordinate with the utility company to ascertain the feasibility of installing electrical service at each location before performing any work. Obtain all required local permits before beginning work.

(O) Maintenance and Repair of Material

Furnish the Engineer with the name, office telephone number, cellular (mobile) telephone number, and pager number of the supervisory employee who will be responsible for maintenance and repair of equipment during all hours.

Maintain and repair all Contractor-furnished and installed communications related equipment within the project construction limits until completion of the Observation Period and receipt of written notification of final acceptance of the project. This requirement for maintaining and repairing said equipment shall remain in effect in the event of severe weather (see NOAA National Severe Storms Laboratory website http://www.nssl.noaa.gov/primer/) or a natural disaster, including but not limited to floods, winter weather, lightning, damaging winds, hail, tornado, tropical storm or hurricane.

Furnish the Engineer with the name, office telephone number, cellular (mobile) telephone number, and pager number of the supervisory employee who will be responsible for maintenance and repair of equipment during all hours.

Remove and replace all equipment that fails. The Department will furnish the Contractor replacement equipment for Department-furnished equipment that fails.

(P) Wire and Cable

For installation in a conduit system, lubricate cable and wires before installing in conduit. Use lubricant that will not physically or chemically harm cable jacket, wire insulation, and conduit.

Only splice lead-in cables in junction boxes using UL®-approved, underground splice connectors or inside condulets in a riser using gel-filled splice connectors. Splice all other electrical wire and cable inside equipment cabinets, and cabinet base extenders/adapters at nickel-plated brass, recessed-screw, barrier-type terminal blocks or using gel-filled splice connectors. Unless specifically allowed, connect no more than two conductors to the same terminal screw. Do not splice any electrical wire or cable other than lead-in cables in junction boxes or condulets.

Maintain color-coding of wires through splices.

Protect ends of wire and cable from water and moisture.

Place permanent labels on all wires and cables to clearly identify each one. Use an indelible black ink marker or approved labeling devices to write on the permanent labels when required.

Install all wire and cable with necessary hardware including, but not limited to shoulder eyebolts, washers, nuts, thimbleyelets, three-bolt clamps, J-hooks, split bolt connectors, grounding clamps, and lashing material.

(Q) Electrical Services and Grounding

Provide a grounding electrode system at all new electrical services. In addition to NEC requirements, test grounding electrode resistance for a maximum of 20 ohms. Furnish and install additional ground rods to grounding electrode system as necessary to meet test requirements.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than 1 ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method.

Submit a completed Inductive Loop & Grounding Test Form available on the Department's website. The form is located on the Department's website at:

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

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

(R) Electrical Bonding

Using an approved termination means, connect a number 14 AWG minimum 19-strand copper conductor (Type THWN) with green insulation to serve as an equipment grounding conductor to metal poles and other metallic components which are not otherwise bonded, through means approved by the Engineer.

1.4. MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this section. Payment at the contract unit prices for the various items in the contract will be full compensation for all work covered by this section. Include the incidental costs for furnishing and/or installing materials and equipment expressly required under the contract for successful completion of the contract, but whose measurement and payment is not specifically stated under any of the contract pay items, into the unit cost(s) for the various items in the contract.

2. UNDERGROUND CONDUIT

2.1. DESCRIPTION

Furnish and install conduit for underground installation with tracer wire, miscellaneous fittings, all necessary hardware, marker tape, backfill, graded stone, paving materials, and seeding and mulching.

2.2. MATERIALS

(A) General

Except for HDPE conduit, furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Refer to the following articles of the *Standard Specifications*:

Backfill 1018-2

Graded Stone 545-2 and 545-3

(B) Conduit Bodies, Boxes and Fittings

Use conduit bodies, boxes, and fittings that meet UL Standard 514A or 514B for electrical and communications installations.

(C) Conduit Types

(1) Rigid Metallic Conduit

Provide rigid hot dipped galvanized steel conduit that meets UL Standard 6 with rigid full weight sherardized or galvanized threaded fittings.

(2) PVC Conduit

Provide non-metallic conduit and duct including associated couplings, approved for below ground use with or without concrete encasement in accordance with UL Standard 651A. Provide Schedule 40 conduit unless otherwise specified.

(3) Solid Wall HDPE Conduit

Use HDPE conduit that conforms to UL Standard 651B. Provide conduit meeting the requirements of the table below with minimum wall thickness ratios corresponding to EPEC-40 (Schedule 40), EPEC-80 (Schedule 80) or EPEC-B (SDR 13.5) as listed in UL Standard 651B, Table 5.1, 5.2 and 5.3.

Provide HDPE conduit with an outer diameter to minimum wall thickness ratio that complies with ASTM D 3035, Standard Dimension Ratio (SDR) 13.5.

HDPE CONDUIT SIZE	
Conduit Trade Size	**Furnish**
1"	EPEC-40
1-1/4"	EPEC-40
1-1/2"	EPEC-B (SDR 13.5)
2"	EPEC-B (SDR 13.5)
2-1/2"	EPEC-B (SDR 13.5)
3"	EPEC-B (SDR 13.5)
4"	EPEC-B (SDR 13.5)
5"	EPEC-80
6"	EPEC-80

Ensure the PE resin compounds used in manufacturing the conduit meet or exceed the cell classification PE 334420C (black with 2% minimum carbon black) or PE 334420E (colored conduit with UV inhibitors) in ASTM D3350 and the table below.

RESIN PROPERTIES		
Property	**Requirement**	**Test Method**
Density	0.940 - 0.947g/cm3	ASTM D1505 ASTM D792 ASTM D4883
Melt Index (condition 190/2.16 is acceptable)	< 0.4 grams/10 minutes	ASTM D1238
Flexural Modulus	80,000 psi, min.	ASTM D790
Tensile Strength	Tensile Strength 3,000 psi, min.	ASTM D638
Elongation	Elongation 400%, min.	ASTM D638
Slow Crack Growth Resistance	An ESCR as per condition B, 10% IGEPAL requirement of F50>24 hrs is allowable	ASTM D1693
Hydrostatic Design Basis	"0" for Non-Pressure Rated Pipe	ASTM D2837
UV Resistance (Outdoor Conduit Only)	Stabilize with at least 2% by weight carbon black or colored with UV Inhibitor	ASTM D4218

Furnish conduits in the colors for the applications shown in the table below. For conduits manufactured with stripes, ensure the stripes are uniformly located around the conduit with 120 degrees of separation. Do not use "Solid Yellow" or "Black with Yellow Stripes" conduit.

CONDUIT COLORS		
Conduit Contents	**Preferred Solid Color**	**Alternate**
Signal Cable	Black	None
Loop Lead-in Cable	White	Black with White Stripes
Communications Cable (Copper, Fiber Optic, Coaxial)	Orange	Black with Orange Stripes
Electrical Power Cable	Red	Black with Red Stripes

Ensure the HDPE conduit is resistant to benzene, calcium 1 chloride, ethyl alcohol, fuel oil, gasoline, lubricating oil, potassium chloride, sodium chloride, sodium nitrate and transformer oil and is protected against degradation due to oxidation and general corrosion.

Furnish factory lubricated, low friction, conduit with a coefficient of friction of 0.10 or less in accordance with Telcordia GR-356. Ensure the supplied conduit is identified and certified as meeting, UL Standard 651B. Ensure the conduit is marked at least with the following information on 10 ft or less intervals:

1) Material: HDPE
2) Trade Size: i.e., 2"
3) Conduit Type: SDR 13.5 or EPEC-B
4) Manufacturer's name or trademark
5) Manufacturer's identity code to identify manufacturing date, facility, etc.
6) UL symbol or UL listing number

Furnish coilable conduit that is supplied on reels in continuous lengths for transportation and storage outside. Ensure that the process of installing the coilable conduit on the reel does not alter the properties or performance of the conduit for its intended purpose.

(D) Conduit Plugs, Pull Line, and Tracer Wire

Furnish conduit plugs that provide a watertight barrier when installed in conduit. Furnish conduit plugs sized in accordance with conduit. Ensure conduit plug provides a means to secure a pull line to the end of the plug. Provide removable and reusable duct plugs. Conduit plugs are not required to be listed electrical devices.

For all spare conduits, furnish 3/4", pre-lubricated, woven polyester tape, pull line with minimum rated tensile strength of 2,500 lb. Pull lines are not required to be listed electrical devices.

Provide green insulated number 14 AWG, THWN, stranded copper wire to serve as tracer wire.

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

(E) Mechanical Couplings for HDPE Conduit

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

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

(F) Duct and Conduit Sealer

Use duct and conduit sealer or mastic which is a putty-like compound and:

- Is permanently non-hardening, non-oxidizing, and non-corrosive to metals, rubber, plastic, lacquer and paints;
- Is readily workable for thumbing into openings and forming into seals around wires inside conduits and openings around conduits;
- Has a service temperature range of minus 30°F to 200°F;
- Is clean, non-poisonous and non-injurious to human skin;
- Seals against water, dust and air and shall adhere to wood, glass, plastics, metal, rubber and painted surfaces; and
- Is non-conductive.

2.3. CONSTRUCTION METHODS

(A) General

Except where the Plans call for a specific installation method or where the Engineer directs otherwise, underground conduit may be installed by either trenching, directional drilling or plowing at the option of the Contractor but will be measured and paid for as "underground conduit," regardless of installation method (see "Measurement and Payment" subsection).

Ensure conduit is free of moisture and debris before pulling cables.

Where cable is not immediately installed or conduit is for future use (spare), seal the ends of the conduit with a conduit plug immediately following installation of the conduit. Secure a pull line to the conduit plug in such a manner that it will not interfere with installation of the conduit plug and provides a watertight seal.

Extend ends of conduit 2" to 4" above concrete surfaces and 4" above crushed stone bases. For metallic conduit, install metallic bushings and bond conduits.

All conduits installed in a common trench or bore must be the same size and all conduits in a continuous longitudinal run must be the same size. Do not intermix different size conduits in the same run.

Install junction boxes in underground conduit runs as shown on the Plans. Do not exceed 150 feet between junction boxes in any underground conduit route that conveys electrical service or equipment signal or lead-in cable and 1,500 feet between junction boxes in any underground conduit route that conveys communications cable without the prior approval the Engineer.

(1) Conduit Entering Junction Boxes

Terminate conduits installed for communications cables (fiber-optic, Ethernet and coaxial) in oversized or special-sized junction boxes as shown on the Plans. Do not install other conduits in these junction boxes unless otherwise specified.

Terminate conduits installed for loop lead-in cable in standard size junction boxes unless otherwise specified.

For all conduits entering junction boxes, seal spare conduits with approved conduit plugs. Seal all conduits containing cable with duct and conduit sealer.

(2) Tracer Wire

Install tracer wire in all conduits containing fiber-optic cable, unless otherwise indicated on the Plans or the Engineer directs otherwise. Pull tracer wire simultaneously in continuous length with the fiber-optic cable. Where multiple pulls of fiber-optic cable are required and conduit is placed in the same trench, only one tracer wire is required. Where multiple pulls of fiber-optic cable are required and conduits may separate into individual trenches, install a tracer wire in each conduit run. Splice tracer wire only in cabinets and junction boxes using waterproof butt splice connectors. Coil and store 10 feet of spare tracer wire in junction boxes. Label all tracer wires entering an equipment cabinet. For a given tracer wire run between two cabinets, bond the tracer wire to the equipment ground inside the cabinet at one end of run only; do not bond both ends of the tracer wire in a continuous run to cabinet grounds at each end of the run. Establish a consistent convention for which end the tracer wire will be bonded. For example, bond the end of the tracer wire on the north side of the wire run.

(3) Ground Surface Restoration

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

(4) Plan of Record Drawings

Upon completion of the conduit system for communications, furnish the Engineer with a plan of record drawing detailing both the horizontal and vertical (i.e. depth) locations of the conduit system.

(G) Trenching

(1) General

Install PVC, HDPE, or rigid metallic conduit for all underground runs as specified in the Plans. Bond all metallic conduits.

If more than one conduit is required between the same points, install conduit in one common trench.

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

Install longitudinal runs of conduit a minimum of 1 foot from back of curb or 6 feet from edge of pavement in the absence of curb. If ditches are present, install conduit a minimum of 4 feet from the bottom of the ditch line.

Maintain a minimum trench depth of 30" (or 12" in areas blocked by rock or impenetrable obstructions) below finished grade or 6" below roadway sub-base, whichever is deeper. Upon completion, restore surface to like-original condition within five consecutive calendar days of occurrence of damage. Remove all rock and debris from backfill material. Remove excess material from site and compact area according to Article 300-7 of the *Standard Specifications*. Backfill with excavated material and compact to 95% of original density.

Backfill trench at locations along the trench path where non-movable objects, such as rocks and boulders, cannot be avoided. The purpose of the backfill is to provide a gradual change in elevation of the trench, so that excessive bending and stress will not be transferred to conduits once underground conduit system is installed.

After installation of conduits and upon completion of tamping and backfilling, perform a mandrel test on each conduit to ensure no conduit has been damaged. Furnish a non-metallic mandrel having a diameter of approximately 50% of the inside diameter of the conduit in which it is to be pulled through. If damage has occurred, replace the entire length of conduit. Ensure pull line is re-installed.

Use HDPE conduit in trenched areas unless otherwise specified in the Plans. Use 2-inch PVC or rigid galvanized conduit between junction boxes adjacent to the cabinet and the 2-inch conduit stub-outs from the cabinet foundation.

Comply with the *NCDOT Policies and Procedures for Accommodating Utilities on Highway Rights-of-Way* in effect on the date of advertisement.

(5) Unpaved Trenching

Install conduit in unpaved areas. Rake smooth the top 1-1/2 inches and seed with same type of grass as surrounding area. Finish unpaved areas flush with the surrounding natural ground. Restore damaged grassed areas. Seed and mulch, using methods and material approved by the Engineer, within five consecutive calendar days following initial damage to grassed areas, unless the Engineer approves otherwise due to weather and soil conditions. Adapt operations to

variations in weather and soil conditions as necessary for the successful establishment and growth of the grasses. When the Engineer determines that weather and soil conditions are unfavorable, including but not limited to extremely wet or frozen soil, do not distribute any limestone or fertilizer and do not sow any seed. During seasons of the year when temperatures are not conducive to germination and growth of the type of grass seed to be planted, seed and mulch the disturbed areas with temporary seeding that will germinate and grow under the prevailing temperatures until such time that permanent seeding can be established, as approved and directed by the Engineer.

As directed by the Engineer, apply additional seed or completely reseed areas which have been previously seeded and mulched but which have been damaged, have failed to successfully establish a stand of vegetation or have an unsatisfactory cover of vegetation. Perform supplemental and repair seeding promptly at all locations and times as directed by the Engineer.

On concrete surfaces, replace the entire joint of concrete and match the original concrete as to color and finish unless otherwise specified. On all other surfaces, neatly cut and replace the width of trench with like material.

Finish paved areas with materials matching damaged areas. For conduit installed under roadways, cut neatly and replace the width of paved area damaged by trenching. For conduit installed under sidewalks and walkways, remove entire section of slab from joint to joint and replace. Place graded stone material to maintain traffic temporarily where repairs cannot be performed immediately. Comply with Article 545-4 of the *Standard Specifications*.

(H) Plowing (HDPE Conduit Only)

Direct plow HDPE ducts simultaneously using chute plow method. Direct plow ducts at a minimum depth so the top of the highest duct is 30 inches deep unless otherwise approved.

Provide sufficient personnel to feed chute, operate prime mover and equipment carrying reels (if separate equipment is used), observe chute feeding, observe plowing, and observe reel payout. Use chute with adequate dimensions to allow for passage of duct without damage. During plow operation, continuously check chute opening and path to be sure there are no obstructions and monitor payout reels to be sure reels are turning at a steady rate.

(I) Directional Drilling

(1) Pre-Approvals and Minimum Depth Requirements

Obtain approval before beginning drilling operations.

At all points where HDPE conduit will traverse under roadways, driveways, sidewalks, or Controlled Access Areas including entrance/exit ramps, maintain a minimum depth of 4 feet or 8 times the back reamer's diameter, whichever is deeper. For an installation that runs parallel to a controlled access area or entrance/exit ramps maintain a minimum depth of 30 inches below finished grade. Maintain a minimum clearance of 30 inches below finished grade when crossing ditch lines.

For the following structures, the minimum clearance requirements are:

MINIMUM CLEARANCE REQUIREMENTS FOR STRUCTURES	
Man-made Structure	**Minimum Clearance Requirement**
Bridge foundation	5' horizontal & 4' vertical (clearances greater than minimum horizontal should continue to use the 4V:5H ratio, i.e., 10' horizontal should be no deeper than 8')
Drainage pipes 60" or less	1' above or below [while maintaining a minimum depth of 30" below grade]
Drainage pipes greater than 60"	1' above or 4' below [while maintaining a minimum depth of 30" below grade]
Box Culverts	1' above or 4' below [while maintaining a minimum depth of 30" below grade]
Slope protection	2' below
Slope protection foundation footing	5' below

Guarantee the drill rig operator and digital walkover locating system operator are factory-trained to operate the make and model of equipment provided and have a minimum of one-year experience operating the make and model of drill rig. Submit documentation of the operators' training and experience for review at least two weeks before start of directional drilling operations.

Provide a means of collecting and containing drilling fluid/slurry that returns to the surface such as a slurry pit. Provide measures to prevent drilling fluids from entering drainage ditches and storm sewer systems. Prevent drilling fluid/slurry from accumulating on or flowing onto pedestrian walkways, driveways, and streets. Disposal on public or railroad right-of-way or railroad drainage ditches/facilities is prohibited. Immediately remove all drilling fluids/slurry that are accidentally spilled.

Directional Drill Operations

Provide grounding for the drill rig in accordance with the manufacturer's recommendations. Place excavated material near the top of the working pit and dispose of properly. Backfill pits and trenches to facilitate drilling operations immediately after drilling is completed.

No geotechnical investigations have been performed at the sites of proposed directional drill operations for this project. Prior to performing the directional drilling operation, field investigate the site of the proposed directional drill conduit, including but not limited to walking the bore path and talking to adjacent property owners, to ascertain the soil conditions that may be encountered and to review the site's topography. Ensure that the equipment, tooling, personnel expertise, and techniques used at each site are sufficient to complete the directional drill operation successfully, regardless of soil conditions encountered. At all times, have alternate drill heads available in case the soil conditions do not match expected conditions.

Use drill head suitable for type of material being drilled and sized no more than 2 inches larger than the outer diameter of the conduit. Direct drill to obtain proper depth and desired destination. Pressure grout with an approved bentonite/polymer slurry mixture to fill all voids. Do not jet alone or wet bore with water.

During drilling operation, locate drill head every 10 feet along drill path and before traversing underground utilities or structures. Within railroad right-of-ways, mark the location and depth 10 foot intervals and when traversing underground utilities and structures. Use digital walkover locating system to track drill head during directional drilling operation. Ensure locating system is capable of determining pitch, roll, heading, depth, and horizontal position of the drill head at any point.

Once drill head has reached final location, remove head, and install back reamer of appropriate size (no more than 2 inches larger than outer diameter of conduits) to simultaneously facilitate back reaming of drill hole and installation of conduit. Use back reamer that is sized larger than actual conduits to ensure conduits are not adversely subjected to deviations caused by the original drill operation and are as straight as practical in their final position.

The intent of these Project Special Provisions is to limit the diameter of the actual drill shaft/hole so that it is no more than 2 inches larger than the conduit outer diameter. This enlarged diameter may be accomplished either during the original bore or during the back reaming/conduit installation process.

Once installation of conduit has started, continue installation without interruption to prevent conduit from becoming firmly set. Apply bentonite/polymer slurry mixture during conduit installation.

Upon completion of conduit installation, perform a mandrel test on conduit system to ensure conduit has not been damaged. Furnish non-metallic mandrel with a diameter of approximately 50% of the inside diameter of the conduit in which it is to be pulled through. If damage has occurred, replace the entire length of conduit and ensure that pull line is re-installed.

Drilling Fluids

Use lubrication for subsequent removal of material and immediate installation of the conduit. The use of water and other fluids in connection with directional drilling operations will be permitted only to the extent necessary to lubricate cuttings. Do not jet alone or wet bore with water. Use drilling fluid/slurry consisting of at least 10% high-grade bentonite/polymer slurry to consolidate excavated material and seal drill hole walls.

Transport waste drilling fluid/slurry from site and dispose of in a method that complies with local, state and federal laws and regulations. Disposal on public right-of-ways or within public drainage ditches/facilities is prohibited.

(J) Maximum Length of Directional Drill

The length of a directional drill shall not exceed 1,500 feet measured horizontally along the route of the directionally drilled conduit(s), unless otherwise approved by the Engineer. For routes longer than 1,500 feet, begin a successive directional drill where the first directional drill reaches 1,500 feet and install an oversized heavy-duty junction box where the two directional drilled conduit runs meet. The spacing of junction boxes in a directionally drilled route shall not exceed 1,500 feet.

(K) Splicing and Coupling of HDPE Conduit

Install a continuous HDPE conduit free from splices or couplings between junction boxes whenever possible. However, splicing or coupling of HDPE conduit may be permitted, subject to

the prior approval of the Engineer, to complete an underground HDPE conduit run when the end of an HDPE reel is reached. Splicing in the middle of a directional drill operation is prohibited.

Join the HDPE conduit ends by installing mechanical couplings in accordance with the manufacturer's instructions or by splicing the conduits using either a butt-fusion welder or an electro-fusion welder. Submit the proposed method of coupling or splicing the conduits to the Engineer for review and approval prior to joining any HDPE conduits.

Otherwise, install an oversized junction box where the ends of the HDPE conduits meet in lieu of joining the ends through splicing and coupling. Install an oversized junction box where the number of conduits in the underground run changes and where a directionally drilled conduit meets a trenched conduit. For example, install an oversized junction box where two directionally drilled conduits meet a single run of trenched conduit.

2.4. MEASUREMENT AND PAYMENT

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

Underground conduit (qty)(size) will be measured in horizontal linear feet of underground conduit installation of each type furnished, installed, and accepted, without regard to the installation method. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

No measurement will be made of 1" underground conduit that conveys electrical service wire between a service riser and a disconnect/meter and between a disconnect and an equipment cabinet as such work will be considered incidental to furnishing and installing a new electrical service, furnishing and installing and equipment cabinet disconnect or modifying an existing electrical service. (See "Electrical Service" section of these Project Special Provisions).

Directional drill (qty)(size) will be measured horizontal linear feet of directional drill for underground conduit installation furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be made in linear feet. When directional drilling is used where the Plans call for "Underground Conduit", directional drilling will be measured and paid for as Underground Conduit. There will be no additional compensation for field-investigating site conditions nor for providing any specialized equipment, tooling, personnel, or techniques necessary to complete the installation of the underground conduit through directional drilling for the soil conditions encountered, including, but not limited to rock.

No measurement will be made of vertical segments, non-metallic conduit, metallic conduit, conduit sealing material, pull lines, duct plugs, marker tape, and miscellaneous fittings, as these will be considered incidental to conduit installation.

No measurement will be made of restoration of paved roadways/driveways and unpaved ground surfaces with like materials, including but not limited to backfill, graded stone, paved materials, seeding and mulching, as this work will be considered incidental to conduit installation. The Department will make no payment for a given underground conduit run until all repairs to paved and unpaved surfaces damaged/disturbed during the installation of the underground conduit have been completed and accepted.

No measurement will be made of horizontal segments between the base of a riser and an adjacent junction box or base-mounted cabinet foundation that are 10 feet or less in length measured from the center of the riser to the center of the junction box or from the center of the riser to the center of the vertical sweep through the cabinet foundation as these will be considered incidental to riser installation.

No measurement will be made of conduit segments between adjacent junction boxes that are 10 feet or less in length measured from center of junction box to center of junction box as these will be considered incidental to furnishing and installing the junction boxes.

Conduit will be paid for per linear foot based on quantity and size of conduits. As examples, an installation of a single 2" HDPE conduit would be paid as:

Directional Drill (1)(2") Linear Foot

No measurement or payment will be made for furnishing and installing and subsequently removing graded stone material for temporary maintenance of traffic where a portion of existing pavement has been removed as such work will be considered incidental to furnishing and installing underground conduit.

Payment will be made under:

Pay Item	**Pay Unit**
Tracer Wire	Linear Foot
Underground Conduit (1)(2")	Linear Foot
Underground Conduit (2)(2")	Linear Foot
Underground Conduit (3)(2")	Linear Foot
Underground Conduit (4)(2")	Linear Foot
Directional Drill (1)(2")	Linear Foot
Directional Drill (2)(2")	Linear Foot
Directional Drill (4)(2")	Linear Foot

3. JUNCTION BOXES

3.1. DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, washed stone, grounding systems, and all necessary hardware.

3.2. MATERIALS

(A) General

Provide electrical junction boxes with covers of the type and size indicated by the contract or the Plans for the termination of conduits, for splicing loop wires to loop lead-in cables and for splicing and storing fiber-optic communications cable.

Except for special-sized junction boxes, material, equipment, and hardware furnished under this section shall be pre-approved on the ITS and Signals QPL.

Provide #67 washed stone aggregates in conformance with Sections 545 and 1005 of the *Standard Specifications.*

(B) Polymer Concrete (PC) Junction Boxes

Provide polymer concrete (PC) boxes which are stackable, have bolted covers and have open bottoms. Ensure vertical extensions of 6" to 12" are available from the junction box manufacturer.

Use polymer concrete material made of an aggregate consisting of sand and gravel bound together with a polymer and reinforced with glass strands to fabricate box and cover components which are exposed to sunlight. Other thermosetting glass-reinforced materials may be used for components, which are not normally exposed to sunlight.

Provide certification that the polymer concrete boxes and covers meet Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

Provide junction box covers with the required logos on the cover as follows:

- For standard size junction boxes, provide covers with the standard *Traffic Signal* logo.
- For oversized and special-sized junction boxes that house fiber-optic communications cable for the communications system, provide covers with the following log/imprint: *NCDOT FIBER* (line 1), *(XXX) XXX-XXXX* (line 2).

Provide at least two size 3/8" diameter hex head stainless steel cover bolts to match inserts in the box. Provide pull slot(s) with stainless steel pin(s). Polymer concrete junction boxes are not required to be listed electrical devices.

(C) Junction Box Sizes

Provide junction boxes and covers of the following sizes as called for in the Plans:

Junction Box Size	Minimum Inside Dimensions
Standard Size	28"(l) x 15"(w) x 22"(d)
Oversized	30"(l) x 15"(w) x 24"(d)
Special-Sized	36"(l) x 24"(w) x 24"(d)

3.3. CONSTRUCTION METHODS

(A) General

Install junction boxes flush with finished grade. Backfill beneath and around the junction box using #67 washed stone as shown in NCDOT Roadway Standard Drawing No. 1716.01. Do not install sealant compound between junction boxes and covers.

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

Install standard size junction boxes as shown in the Plans and where underground splicing of electrical cables is necessary. Install standard size junction boxes within 3 feet of pole or pole foundation where transitioning from below ground to a riser assembly. Install standard size junction boxes within 5 ft of each end of each lateral run of conduit for electrical cables. When lateral runs for electrical cables are greater than 150 feet, install additional junction boxes to ensure distances between junction boxes does not exceed 150 feet.

Install oversized junction boxes as shown in the Plans in underground fiber-optic communications cable runs where the conduit run transitions from directionally drilled conduit to trenched conduit and where transitioning from below ground to a riser assembly. Install oversized junction boxes in underground fiber-optic communications cable runs at maximum intervals of 1,500 feet, or where shown in the Plans, whichever is less.

Install special-sized junction boxes at all underground splice enclosure locations in underground fiber-optic communications cable runs as shown in the Plans.

(B) GPS Coordinates

Provide real world coordinates for all junction boxes and equipment cabinets installed or utilized under this project. Provide the coordinates in feet units using the North Carolina State Plane coordinate system (1983 North American Datum also known as NAD '83). Furnish coordinates that do not deviate more than 1.7 feet in the horizontal plane and 3.3 feet in the vertical plane. Global positioning system (GPS) equipment able to obtain the coordinate data

within these tolerances may be used. Submit cut sheets on the GPS unit proposed to collect the data for approval by the Engineer.

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

NCDOT Inv #	Name	Location	Latitude	Longitude	Manufacturer	Model #
12-0134	Equipment Cabinet	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

3.4. MEASUREMENT AND PAYMENT

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

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

No measurement will be made of restoration of paved roadways/driveways and unpaved ground surfaces with like materials, including but not limited to backfill, washed stone, paved materials, seeding and mulching, as this work will be considered incidental to junction box installation. The Department will make no payment for a given junction box until all repairs to paved and unpaved surfaces damaged/disturbed during the installation of the junction box have been completed and accepted.

No measurement will be made of collecting and recording GPS coordinates for junction boxes and compiling this data in the prescribed Microsoft Excel spreadsheet as such work will be considered incidental to furnishing and installing junction boxes.

Payment will be made under:

Pay Item	Pay Unit
Junction Box (Standard Size)	Each
Junction Box (Oversized)	Each
Junction Box (Special-Sized)	Each

4. RISER ASSEMBLIES

4.1. DESCRIPTION

Furnish and install riser assemblies with clamp-on, aluminum weatherheads, heat shrink tubing, conduit sealing bushing, galvanized pole attachment fittings, stainless steel banding hardware, grounding and all necessary hardware.

4.2. MATERIALS

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

Provide conduit for risers that is rigid hot dipped galvanized steel conduit that meets UL Standard 6 with rigid full weight sherardized or galvanized threaded fittings.

Refer to the following sections of the *Standard Specifications:*

- 1091-6, "Grounding Electrodes"
- 1091-2, "Wire and Cable"

Provide Schedule 40 PVC female adapter to connect an underground run of PVC conduit to the threaded end of a rigid metallic elbow/sweep at the base of a rigid metallic riser. Provide PVC adapters that have the same nominal diameter as the riser to join underground conduit of the same diameter to the riser. The interior surface of one end of the PVC female adapter shall be compatibly threaded to connect it to the threaded end of the rigid metallic riser without the aid of additional fittings, hardware or adhesives. The opposite end of the adapter shall be non-threaded to permit a slip fit, glued connection to the underground PVC conduit.

Furnish appropriately sized clamp-on aluminum weatherheads for electrical control and power cables.

Furnish heat shrink tubing for the installation of fiber-optic or coaxial cable in a new riser. Ensure the heat shrink tubing is made of modified polyolefin and includes a hot-melt adhesive. Provide tubing that has a length of at least 5" before heating. Ensure the heat shrink tubing will provide a watertight fit around individual cables and outer wall of the riser after heat is applied in accordance with the manufacturer's instructions.

Submit catalog cuts/manufacturer's literature for the conduit sealing bushing to the Engineer for approval prior to use.

4.3. CONSTRUCTION METHODS

Install risers with required weatherheads on poles using pole attachment fittings.

Use separate 1¼" riser with weatherhead for electrical service.

Use a 2-inch riser with weatherhead for composite cable routed to a CCTV camera.

Transition from rigid galvanized steel risers to underground PVC conduits using an approved rigid galvanized steel sweeping elbow with PVC female adapter. Use PVC female adapters that have the same nominal diameter as the riser to join underground conduit of the same diameter to the riser. Apply Teflon thread tape to the threads of rigid galvanized steel sweeping elbow before screwing the PVC adapter onto the threaded end of the elbow. Connect the threaded female end of the PVC adapter to the threaded male end of the rigid galvanized steel sweeping elbow

without the use of additional fittings, hardware, or adhesives. Connect the opposite, non-threaded end of the adapter to the underground PVC conduit using a slip fit, glued connection.

Bond all risers, a minimum of 10 feet above grade, to the pole ground using a #6 AWG minimum solid bare copper wire and an approved pipe clamp, a split-bolt connector or parallel groove clamp. On pole-mounted cabinets where the risers are connected to the cabinet, bond risers in the cabinet using ground bushings with a #6 AWG minimum solid bare copper wire to cabinet ground bus.

4.4. MEASUREMENT AND PAYMENT

__" *Riser with* _____ will be measured and paid as the actual number of risers of each type and size furnished, installed, and accepted.

No measurement will be made of weatherheads, conduit sealing bushings, bushings, conduit outlet bodies such as condulets, elbows, conduit fittings, PVC female adapters, and pole attachment fittings as these will be considered incidental to furnishing and installing risers.

No measurement will be made for horizontal sections of underground conduit that connect the riser to stub-outs in an adjacent cabinet foundation or to an adjacent junction box and that measure 10 feet or less in horizontal length from the center of the riser to the center of junction box or from the center of the riser to the center of the vertical sweep through the equipment cabinet foundation. Such conduit will be considered incidental to furnishing and installing the riser assembly.

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

No measurement will be made of 1¼" risers with weatherheads furnished and installed as part of new electrical service, as they will be considered incidental to furnishing and installing new electrical services (see "Electrical Service" section of these Project Special Provisions).

Payment will be made under:

Pay Item	**Pay Unit**
2" Riser with Weatherhead	Each

5. WOOD POLES

5.1. DESCRIPTION

Furnish and install wood poles with grounding systems and all necessary hardware.

5.2. MATERIALS

(A) General

Material, equipment, and hardware furnished under this section shall be pre-approved on the ITS and Signals QPL.

Furnish treated timber poles that meet the requirements of ANSI O5.1, except the timber shall be treated Southern Pine or treated Douglas Fir.

Treat all poles in accordance with AWPA Standard U1, except require retention of preservative as below.

Give all poles a preservative treatment of either pentachlorophenol, or chromated copper arsenate. The same type of preservative shall be used throughout the entire length of the project.

Minimum retention for poles treated with pentachlorophenol will be 0.45 lb. by assay of dry chemical per cubic foot of wood. Minimum retention for poles treated with chromated copper arsenate will be 0.6 lb. by assay of dry chemical per cubic foot of wood.

Refer to the following sections of the *Standard Specifications:*

- 1091-6, "Grounding Electrodes"
- 1082, "Inspection Requirements"
- 1091-2, "Wire and Cable"
- 1082, "Structural Timber and Lumber"

(B) CCTV Wood Poles

Furnish Class 3 or better wood poles to mount CCTV cameras and cabinets that are of sufficient length to permit the CCTV camera to be mounted at the mounting height specified in the Plans. To provide for mounting heights of up to 35 feet above the ground at the base of the pole, furnish CCTV wood poles that are at least 50 feet in length. The Contractor is encouraged to visit the site of the proposed CCTV poles to confirm the length of pole required to attain the specified mounting prior to ordering the CCTV poles.

(C) Wood Poles

Furnish Class 4 or better 35' wood poles to mount overhead electric service as shown the Plans.

(D) Wood Pedestal Poles

Furnish 6" x 6" treated wood pedestal poles to mount electrical service disconnects that are of sufficient length to mount the disconnect four feet above the ground.

5.3. CONSTRUCTION METHODS

Install poles at locations shown on the Plans. If the Plans do not specify an exact locations, locate the pole as far as practical from the edge of the roadway, using the setback distances in the following table as a guide:

Speed Limit	Desirable Minimum Setback Distance	
	from face of curb in curb & gutter section	from edge of travel way in shoulder section (no curb)
≤ 25 mph	8 feet	10 feet
30-35 mph	10 feet	12 feet
40 mph	12 feet	16 feet
45 mph	16 feet	18 feet
50 mph	20 feet	22 feet
55 mph	22 feet	24 feet
≥ 60 mph	n/a	30 feet

Measure the setback distance from the face of curb or edge of travel lane to the face of the pole.

Field conditions and site-specific constraints may require the pole to be located at setback distances less than those listed above, subject to the approval of the Engineer.

Mark final pole locations and receive approval from the Engineer before installing poles.

Drill or auger a hole for placement of pole and to allow for compacting. Set CCTV wood poles at a minimum depth of 10 feet. Ensure the pole is within 2 degrees of vertical when fully loaded.

Backfill hole with pole installed and tamp backfill in 6 inch lifts with a mechanical tamp until compacted density is at least 95% of original density.

On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is exothermically welded to a single ground rod installed at the base of the pole or to the electrical service grounding electrode system located within 10 feet of the pole. Install ground wire so as to minimize damage from vandalism and environmental exposures. Install ground wire up pole to a point adjacent to the uppermost span. Use hot-dipped galvanized 1.5" wire staples to secure ground wire to pole, spacing the staples along the ground as follows:

- 4 inches apart from ground level to 8 feet above ground level;
- 24 inches apart from 8 feet above ground level to point adjacent to uppermost span.

(A) Pole Grounding System

On Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is exothermically welded to a single ground rod installed at the pole base or to the electrical service grounding electrode system located within 10 feet of the pole. Install #6 AWG solid bare copper ground wire up the pole to a point adjacent to the uppermost span. Staple the ground wire to the pole using hot dipped galvanized 1.5" staples. Staple the ground wire to the pole 4 inches apart from the ground level to 8 feet above the ground, and then 24 inches apart from 8 feet above ground level to a point adjacent to the span.

5.4. MEASUREMENT AND PAYMENT

CCTV wood pole will be measured and paid for as the actual number of CCTV wood poles furnished, installed, and accepted regardless of length.

Wood pole will be measured and paid for as the actual number of 35' wood poles furnished, installed, and accepted.

No measurement will be made for installing wood pedestal pole as these will be considered incidental to furnishing and installing electrical service disconnects.

No measurement will be made for installing pole-grounding systems, as these will be considered incidental to furnishing and installing wood poles.

Payment will be made under:

Pay Item	Pay Unit
CCTV Wood Pole	Each
Wood Pole	Each

6. FIBER-OPTIC CABLE

6.1. DESCRIPTION

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

6.2. MATERIALS

(A) General

Refer to the "Pole Line Hardware" subsection of the "Messenger Cable" section of these Project Special Provisions for lashing wire, wrapping tape and hardware used for installation of aerial fiber-optic cable.

(B) SMFO Communications Cable

Furnish single-mode fiber-optic communications cable that is pre-approved on the ITS and Signals QPL.

Furnish single-mode fiber-optic cable manufactured into a loose buffer tube design installed around a central strength member where the cable complies with RUS CFR 1755.900and ICEA 640 requirements. Ensure the manufacturer is ISO 9001 and TL9000 registered and that the manufacturer's cable is RUS listed. The operating temperature range of the cable shall be -40°F to +158°F.

Furnish individual fibers manufactured from silica and dopant materials with each fiber having a color coated finish that is compatible with local injection detection (LID) devices. Distinguish each fiber from others by color-coding that meets EIA/TIA-598. Furnish single mode fiber that does not exceed attenuation ratings of 0.25 dB/km at 1550 nm and 0.35 dB/km at 1310 nm and complies with ITU G.652D and IEC 60793-2-50 Type B.1.3 industry standards for low water peak, single mode fiber. Provide fibers that are useable and with a surface, sufficiently free of imperfections and inclusions to meet optical, mechanical and environmental requirements.

Ensure the core central strength member is a dielectric glass reinforced rod and that the completed cable assembly has a maximum pulling rating of 600 lbf during installation (short term) and 180 lbf long term installed.

Construct buffer tubes (nominal size of 2.5 mm) manufactured from a polypropylene copolymer material to provide good kink resistance and allows the buffer tube to maintain flexibility in cold temperature over the expected lifetime of the cable. Except for 6-fiber drop cables, provide exactly 12 fibers per buffer tube in all cables regardless of the total number of fibers the cables contain. Do not provide cables with any other fiber count per buffer tube. Ensure that that all buffer tubes are filled with a water-blocking gel or water swellable material. Construct the cable such that the buffer tubes are stranded around the central strength member in a reverse oscillating arrangement to allow for mid-span entry. Distinguish each buffer tube from others by color coding that meets EIA/TIA-598. Use filler tubes to maintain a circular cross-section of the cable. Ensure the filler tubes are the same nominal size as the buffer tubes. Apply binders (water swellable yarn, aramid fiber, etc.) with sufficient tension to secure buffer tubes and filler tubes to the central member without crushing the buffer tubes. Ensure that binding material is non-hygroscopic, non-wicking, and dielectric with low shrinkage. Ensure the binders are of a high tensile strength that is helically stranded evenly around cable core.

Ensure the cable core is protected from the ingress of moisture by a water swellable material or that is filled with a water-blocking compound that is non-conductive. Ensure the water swellable material (when activated) or the water blocking compound is free from dirt and foreign matter and is removable with conventional nontoxic solvents. Furnish at least one ripcord to aid in the process of removing the outer jacket. Furnish the outer jacket constructed of a medium-density polyethylene material to provide reduced friction and enhanced durability. Ensure the polyethylene material contains carbon black to provide UV protection and does not promote the growth of fungus. Ensure the cable jacket is free of slits, holes, or blisters and the nominal outer jacket thickness is > 0.050".

Ensure the completed cable assembly contains identifications markings printed along the outside cover of the jacket every 2 feet. Ensure the character height of the markings is approximately 0.10". Provide length markings in sequential feet and within one percent of actual cable length.

Mark each cable with the following:

(1) Sequential length marks in feet as specified
(2) The name of the manufacturer
(3) "OPTICAL CABLE"
(4) Month/year of manufacture
(5) Number(s) of and type(s) of fibers
(6) Cable ID Number for product traceability

(C) Drop Cable

Provide drop cable meeting the material requirements list in "SMFO Communications Cable" subsection above with the exceptions herein to provide communications links between splice enclosures and the Ethernet edge switches through interconnect centers mounted in equipment cabinets and in CCTV cabinets. Furnish drop cables containing a minimum of six individual fibers.

On one end of the cable, furnish LC connectors for termination of all drop cable fibers on connector panel mounted inside an equipment cabinet. Provide either factory preassembled drop cables with SMFO pigtails and LC connectors already attached or field install the pigtails and connectors. For field installed connectors, provide cabinet-mounted interconnect centers that are pre-equipped with factory-preassembled connector panels, SMFO pigtails with LC connectors and splice trays; then fusion splice all drop cable fibers to the SMFO pigtails.

Ensure attenuation of drop cable at 1310 nm does not exceed 0.4 dB/km and the attenuation at 1550 nm does not exceed 0.3 dB/km. Ensure attenuation loss for complete drop cable does not exceed a mean value of 1.5 dB.

(D) Communications Cable Identification Markers

Furnish communications cable identification markers that are resistant to fading when exposed to UV sources and changes in weather. Use markers designed to coil around fiber-optic cable that do not slide or move along the surface of the cable once installed. Ensure exposure to UV light and weather does not affect the markers natural coiling effect or deteriorate performance. Provide communications cable wraps that permit writing with an indelible marking pen.

Furnish cable identification markers with the following text for communications cables:

WARNING
N.C.D.O.T. FIBER-OPTIC
CALL: (704) 480-5423
WARNING
N.C.D.O.T. FIBER-OPTIC

Overall Marker Dimensions: 7(l) x 4 (w) inches
Lettering Height: 3/8 inch for "WARNING"; 1/4" for all other lettering
Colors: Black text on yellow background

6.3. CONSTRUCTION METHODS

(A) General

Provide cable manufacturer's attenuation and Optical Time Domain Reflectometer (OTDR) testing data for each reel of cable.

Install SMFO communications cable and all necessary hardware.

Comply with manufacturer's recommendations. Install communications cable in conduits as required to bring the fiber-optic cable into and, if necessary, out of each splice enclosure.

Take all precautions necessary to ensure cable is not damaged during storage, handling, and installation. Do not violate minimum bending radius of 20 times the radius of cable diameter or manufacturer's recommendation, whichever is greater. Do not step on cable nor run over cable with vehicles or equipment. Do not pull cable over or around obstructions, or along the ground.

Determine lengths of cable necessary to reach from termination-point to termination-point. Install cable in continuous lengths between approved splicing facilities. Additionally, provide a sufficient amount of slack cable to allow for an additional 20 feet of cable to be present after removal of outer sheath for termination. Store the 20 feet of spare cable inside the equipment cabinet. Measure slack cable by extending the cable straight out of the equipment cabinet door.

Keep cable ends sealed at all times during installation to effectively prevent the ingress of moisture. Use approved heat shrink cable end cap. Do not use tape to seal cable ends.

Before installing cable, provide three copies of cable manufacturer's recommended and maximum pulling tension. Do not exceed manufacturer's recommended pulling tension. Use pulling grips containing a breakaway rotating swivel. Coil cable in a figure-8 configuration whenever cable is unreeled for subsequent pulling.

Install fiber-optic cable in separate conduits. Do not share conduits containing fiber-optic cable with other non-fiber-optic cable unless the Plans specify otherwise or the Engineer directs or approves otherwise.

Seal all conduits containing fiber-optic communications cable in junction boxes and cabinet bases with duct and conduit sealer. Comply with the requirements for duct and conduit sealer in the "Underground Conduit" section of these Project Special Provisions.

(B) Underground Installation

Install fiber-optic cable underground in conduit using cable pulling lubricants recommended by the fiber-optic cable manufacturer.

Obtain approval of cable pulling lubricant and method of pulling before installing underground fiber-optic cable.

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

Keep tension on cable reel and pulling line at start of each pull. Do not release tension if pulling operation is halted. Restart pulling operation by gradually increasing tension until cable is in motion.

For pulling cable through junction boxes, feed cable by manually rotating the reel. Do not pull cable through intermediate junction boxes, handholds, or openings in conduit unless otherwise approved.

Inside all junction boxes, install communications cable identification markers on each communications cable entering the junction box.

In a junction box where no splice enclosure is required, store 50 feet of each fiber-optic cable on all cable runs as shown in the Plans.

(C) Indoor Installation

Install the fiber-optic cable in risers and conduit between the building entrance and the enclosed communications racks being installed inside the scale house using cable-pulling lubricants recommended by the fiber-optic cable manufacturer. Obtain approval of cable pulling lubricant and method of pulling before installing the fiber-optic cable.

Use a breakaway swivel so as not to exceed 80% of the maximum allowable pulling tension specified by the cable's manufacturer if cable is pulled by mechanical means. Keep tension on cable reel and pulling line at start of each pull. Do not release tension if pulling operation is halted. Restart pulling operation by gradually increasing tension until cable is in motion.

For pulling cable through junction boxes and cabinets, feed cable by manually rotating the reel. Do not pull cable through cabinets, junction boxes, handholds, or openings in conduit unless otherwise approved. Inside all junction boxes and cabinets, install communications cable identification markers on each communications cable entering the junction box.

Store 30 feet of each fiber-optic cable inside the enclosed communications racks inside the scale house after terminating the cables in the rack-mounted splice centers housed therein.

(D) Installation of Drop Cable

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

At aerial splice enclosures, install the aerial splice enclosure and corresponding cable storage guide 50 feet apart and store between the splice enclosure and corresponding cable storage guide 50 feet of slack cable for each cable entering and exiting the splice enclosure.

At below ground splice enclosures, coil 50 feet of slack cable for each cable entering and exiting the splice enclosure in the manhole or junction box where enclosure is located. Coil and

store any drop cable in excess of what is needed for storage in the manhole or junction box in the base of the equipment cabinet. Where fiber-optic cables are installed but not immediately spliced, store 50 feet of drop cable and 50 feet of fiber-optic trunk cable inside the manhole or junction box to facilitate subsequent splicing in the splice enclosure. Cap and seal ends of cables that have yet to be spliced or terminated with a waterproof heat-shrink cap/seal as approved by the Engineer.

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

Using an OTDR, test the end-to-end connectivity of the drop cable from patch panel installed inside the signal or CCTV cabinet to the adjacent managed Ethernet switches. Comply with the OTDR testing and reporting requirements of the "Testing and Acceptance" section of these Project Special Provisions when testing drop cable.

6.4. MEASUREMENT AND PAYMENT

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

Drop cable will be measured and paid as the actual linear feet of fiber-optic drop cable comprise of a minimum of 6 fibers that are furnished, installed, and accepted.

No measurement will be made for terminating, splicing, and testing fiber-optic cable, SMFO jumpers and pigtails, mechanical sealing devices and conduit seals/sealing putty, as these will be considered incidental to the installation of fiber-optic cable and drop cables.

Payment will be made under:

Pay Item	Pay Unit
Communications Cable (36-Fiber)	Linear Foot
Drop Cable (6-Fiber)	Linear Foot

7. FIBER-OPTIC SPLICE CENTERS

7.1. DESCRIPTION

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

7.2. MATERIALS

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

(A) Interconnect Center

Furnish compact, modular interconnect centers designed to mount inside equipment cabinets. Design and size interconnect centers to accommodate all fibers entering cabinets. Provide interconnect centers for equipment cabinets and CCTV cabinets that are no more than three rack unit (RU) high.

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

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

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

(B) Splice Center

Furnish a separate rack-mounted fiber-optic splice housing for the fiber-optic communications cable entering and terminated inside the scale house and at CCTV 1 and 5. Provide a splice center sized to accommodate fusion splicing of all fibers in the designated cable to pigtails in splice trays housed inside the splice center and terminating those pigtails on the splice center's connector panels (i.e., patch panels) as shown in the Plans. Equip the splice center with LC-compatible connector panels with 12 connectors on each panel (arranged in either a simplex or duplex arrangement) to terminate fibers from each buffer tube in the incoming cable on a unique connector panel (i.e., one connector panel per buffer tube).

Provide a splice housing that is either a one-piece unit designed to house the connector panels as well as the splice trays or a two-part unit comprised of a rack-mountable connector housing (i.e., distribution panel) and a matching splice housing. For a two-part unit, furnish a connector housing and splice housing made by the same manufacturer and designed by the manufacturer to work together as a unit. Provide a splice center designed to house a separate splice tray for each buffer tube in the cable and to store buffer tubes following splicing. The splice center, whether a single unit or a two-piece unit, shall occupy no more than four rack

units. Provide splice centers that have connector panels on the front of the unit that are protected by a transparent door or shield constructed of rigid, durable plastic or acrylic material.

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

Furnish SMFO pigtails for the splice center. Provide pigtails are a maximum of 6 feet in length with factory-assembled LC connectors. Ensure SMFO pigtails meet the operating characteristics of the SMFO cable with which it is to be coupled. Factory pre-terminated and pre-assembled pigtailed connector panels may be furnished in lieu pigtails pre-assembled with LC connectors, subject to the Engineer's approval.

Provide all hardware needed to install the splice center in a rack inside the scale house.

(C) Splice Enclosure

Furnish splice enclosures that are re-enterable using a mechanical dome-to-base seal with a flash test valve, and are impervious to the entry of foreign material (water, dust, etc.). Ensure enclosures are manufactured in such a manner to be suitable for junction box installation.

Provide enclosures with a minimum of one oversized oval port that will accept two cables and with a minimum of four round ports (for single cables) that will accommodate all cables entering enclosure. Provide heat shrink cable shields with enclosure to ensure weather-tight seal where each cable enters enclosure.

Within enclosures, provide enough hinged mountable splice trays to store the number of splices required, plus the capacity to house six additional splices. Provide a fiber containment basket for storage of loose buffer tubes expressed (i.e., uncut and unspliced) through the enclosure. Ensure enclosures allow sufficient space to prevent microbending of buffer tubes when coiled.

Provide splice trays that hold, protect, organize optical fibers, and secure fibers inside splice tray. Provide splice trays that are dielectric.

7.3. CONSTRUCTION METHODS

(A) General (Workmanship Identification Information)

Include on the cover of each splice tray in a legible format the following workmanship identification information:

- Splice location reference # or identification information (e.g., 12-xxxx tray 1 of 3, 12-xxxx tray 2 of 3, etc.);
- Date the splice was made;
- Name of company that performed the splicing;
- Name of person who performed the splicing.

(B) Workmanship

Upon cutting the cable and removing the outer jacketing material down to the individual buffer tubes, secure the central strength member to the enclosure so that no tensile force is applied to the fibers. Secure the individual buffer tubes to the splice trays by a method recommended by the manufacturer. Determine the length of each buffer tube needed to ensure that the buffer tube can be looped a minimum of two times around the inside of the splice tray. Upon determining the length of buffer tube needed, remove the buffer tube to expose the

individual fibers for fusion splicing. Adjust individual fiber lengths as necessary to ensure that once the fusion splicing process in completed the finished splices will align with the "splice block organizer" supplied within the splice tray. Ensure the splice block organizer has individual fusion splice space holders for each fiber splice.

While prepping the individual fibers for splicing, install the heat shrink protective tube over the fiber and then perform the splicing operations, following the manufacturer's instructions. Verify that the newly formed splice does not exceed 0.05 dB of attenuation. If the attenuation is more than 0.05 dB, then remake the splice until it meets the 0.05 dB or less requirement. Finish the splicing operation by sliding the heat shrink tube over the splice and applying heat to active the heat shrink tubing. Secure the finished splice in the splice block organizer. Ensure each splice is properly secured in a space holder in the splice block organizer. Multiple splices secured to the same space holder are unacceptable.

Ensure all buffer tubes are contained within splice trays so that no bare fibers are outside of the tray. Do not damage the fibers or violate the minimum bend radius of the fiber.

Prior to installing the cover over the splice tray and placing it in its final resting location, take a MANDATORY digital photograph of the splice tray that shows the final workmanship. Ensure that the photograph shows the "Workmanship Identification Information" as well as the workmanship associated with installing and terminating the fiber. Include digital copies of each photograph on a compact disc as part of the OTDR Test results submittal.

(C) Termination and Splicing within Interconnect Centers & Splice Centers

Terminate and fusion splice all fibers as shown in the Plans.

Label all fiber-optic connectors, whether on jumpers, connector panels, or other equipment, to prevent improper connection. Obtain approval of fiber-optic connector labeling method.

For all fibers designated for termination to a connector panel within an interconnect center, fusion splice the fibers to pigtails.

For all fibers designated to pass through interconnect center, neatly coil, and express the fibers without cutting. For all buffer tubes designated to pass through interconnect center, neatly coil excess tubing inside interconnect center.

(D) Interconnect Centers in Equipment and CCTV Cabinets

Install interconnect centers with connector panels, splice trays, storage for slack cable or fibers, mounting and strain relief hardware, and all necessary hardware. Mount the interconnect center in the rack inside the equipment cabinet or CCTV cabinet at the location indicated in the Plans. Install SMFO jumpers between the appropriate connectors on the interconnect center and the edge switch.

(E) Splice Center

Install a splice center with connector panels, splice trays, storage for slack cable or fibers, mounting and strain relief hardware, and all necessary hardware inside the scale house at CCTV 1 and 5.

Install SMFO jumpers between the appropriate connectors on the connector panels of the splice center and the respective Ethernet switch.

(F) Termination and Splicing within Splice Enclosure

Install splice enclosures with splice trays, basket containment assemblies, racking for slack cable or fibers, mounting and strain relief hardware, and all other necessary hardware.

Fusion splice all fibers including fibers designated to be coupled with fibers from a drop cable. For all fibers designated to pass through splice enclosure, coil and express the fibers without cutting.

For all buffer tubes designated to pass through splice enclosure, neatly coil excess tubing inside basket provided with enclosure.

Label all fiber-optic splices. Obtain approval of fiber-optic connector labeling method.

Install heat shrink cable shields using methods recommended by the manufacturer of the enclosure. Perform a pressurization flash test on enclosure in accordance with manufacturer's recommended procedures at the conclusion of splicing procedure and before final placement of enclosure.

For underground junction box facility installations, place the enclosure along with required spare cables in the facility in a neat and workmanship like manner. Install underground splice enclosures only in special-sized junction boxes unless the Plans indicate otherwise or the Engineer approves otherwise.

(G) Testing

Provide written notification to the Engineer a minimum of 10 working days before beginning the OTDR tests.

After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused fibers. Install a 1,000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested and a 1,000-foot pre-tested destination cable on the end of the fiber-optic cable to be tested. Ensure each launch cable has been tested and is compatible with the fiber-optic cable being installed. Provide the Engineer with test results of the launch cable before use. Re-test or replace launch cable at the Engineer's request.

Ensure fusion splice losses do not exceed 0.05 dB and connectors have a loss of 0.5 dB or less. If any fiber exceeds maximum allowable attenuation or if fiber-optic properties of the cable have been impaired, take appropriate actions up to and including replacement of the fiber-optic cable. Corrective action will be at no additional cost to the Department.

Clearly label each OTDR trace identifying a starting and ending point for all fibers being tested. Record the attenuation level of each fiber and clearly indicate OTDR trace results in report format. Furnish two hard copies of each of the OTDR trace results and electronic copies of all trace results along with digital photographs showing workmanship for each splice on a compact disc. Furnish the manufacturer's make, model number, and software version of the OTDR used for testing.

Provide the Engineer with two copies of the software needed to view the OTDR traces electronically.

7.4. MEASUREMENT AND PAYMENT

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

Splice center (36-fiber) will be measured and paid as the actual number of fiber-optic splice centers of each fiber count furnished, installed in the scale house, and accepted.

Splice enclosure will be measured and paid as the actual number of fiber-optic splice enclosures that are furnished, installed, and accepted.

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

No measurement will be made for removal of existing interconnect centers as such work will be considered incidental to furnishing and installing fiber-optic interconnect centers.

Payment will be made under:

Pay Item	Pay Unit
Interconnect Center	Each
Splice Center (36-Fiber)	Each
Splice Enclosure	Each

8. CABLE MARKERS

8.1. DESCRIPTION

Furnish and install delineator markers (tubular marker posts), equipment cabinet decals, and curb/sidewalk markers/medallions with all necessary hardware and adhesives to warn of buried fiber-optic communications cable.

8.2. MATERIALS

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

Furnish delineator markers, also referred to as tubular marker posts that are approximately 6 feet long and constructed of Type III, high-density polyethylene (HDPE) material. Provide delineator assemblies that are ultraviolet stabilized to help prevent components from color fading, warping, absorbing water, and deterioration with prolonged exposure to the elements. Provide delineators designed to self-erect after being knocked down or pushed over. Provide orange delineator posts.

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

8.3. CONSTRUCTION METHODS

Submit sample of proposed delineator markers for approval before installation.

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

Install delineator markers at locations specified on the plans. Do not install delineator markers at locations other than those specified in the Plans without the prior approval of the Engineer.

8.4. MEASUREMENT AND PAYMENT

Delineator marker will be measured and paid for as the actual number of delineator markers (tubular marker posts) furnished, installed, and accepted.

No measurement will be made for cabinet decals, as they will be considered incidental to furnishing and installing underground conduit.

Payment will be made under:

Pay Item	Pay Unit
Delineator Marker	Each

9. ELECTRICAL SERVICE

9.1. DESCRIPTION

At locations called out in the Plans, install a new electrical service including an external disconnect and meter base.

Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the *Standard Specifications*, these Project Special Provisions, and all local ordinances. Coordinate all work involving electrical service with the appropriate utility company and the Engineer.

9.2. MATERIALS

(A) Electrical Service

Provide material, equipment and hardware under this section that is pre-approved on the 2012 ITS and Signals QPL by the date of equipment installation.

Provide all materials necessary to form a complete electrical service assembly as shown in the Plans. Furnish new external electrical service disconnects, meter bases, and required grounding.

Fabricate the enclosure from galvanized steel and electrostatically apply dry powder finish, light grey in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel.

Provide external electrical service disconnects at all new cabinet locations unless otherwise specified in the Plans.

Provide all electrical service disconnects with a space/expansion slots, covered by a knockout or removable blank cover, designed to allow the future installation of at least one additional circuit breaker.

Provide inverse time circuit breaker with at least 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure.

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

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

(1) CCTV-01 Overhead Electric Service

Provide the following equipment for the CCTV camera cabinet:

- Overhead electric service with combo meter/disconnect panel
- 1 double-pole 100A main breaker
- 1 single-pole 20A breaker
- 1 spare slot/space (minimum)

(2) Crowders Mtn. Rd. Underground Electric Service

Provide the following equipment:

- Underground electric service with combo meter/disconnect panel on 6" x 6" wood pedestal
- 1 double-pole 200A main breaker
- 3 double pole 25 amp secondary breakers
- 1 spare slot/space (minimum)

(3) Feeder Conductors

Provide THWN rated conductors with black, red, white, and green insulation that are intended for power circuits at 600 V or less and comply with the following:

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

As indicated below, provide the following:

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

(4) Meterbase and Disconnect

Ensure service disconnects are listed as meeting UL Standard UL-489 and marked as being suitable for use as service equipment. Fabricate enclosure from galvanized steel. Provide ground bus and neutral bus with a minimum of four terminals with minimum wire capacity range of number 8 through number 1/0 AWG.

Furnish NEMA Type 3R meter base rated 100A minimum for overhead service and 100A minimum for underground service and that meets the requirements of the local utility. Provide meter base with ampere rating of meter sockets based on sockets being wired with insulated wire rated at least 167°. With each meter base, provide a blank meter socket cover made from UV stabilized polycarbonate or metal and that is either clear or gray in color to prevent access to interior of meter base until meter is installed by the local power company.

Furnish four terminal, 600 volt, single phase, 4-wire meter base that complies with the following:

- Line, Load, and Neutral terminals accept #8 to 2/0 AWG copper/aluminum wire;
- Ringed or ringless type, with or without bypass;
- Made of galvanized steel;
- Listed as meeting UL Standard UL-414; and
- Overhead or underground service entrance as specified.

Provide electrical service disconnects, meter bases, combination panel enclosures and pedestals with electrostatically applied dry powder paint finish with minimum thickness of 2.4 mils and that is light gray in color. All exterior surfaces must be powder coated steel.

Furnish 1¼" watertight hub (i.e., meter socket hub) for threaded rigid galvanized conduit with meter base.

If meter base and electrical service disconnect are supplied in the same enclosure (i.e., combination panel), ensure assembly is marked as being suitable for use as service equipment. Ensure combination meter and disconnect mounted in a pedestal for underground service is listed as meeting UL Standard UL-231. Otherwise, ensure combination meter and disconnect is listed as meeting UL Standard UL-67.

Provide a grounding electrode system at all new electrical services. Provide underground marker tape above ground grounding electrodes and buried ground wire. Provide all grounding electrodes and ground wire necessary to ensure that grounding system, whether existing or new, complies with all grounding requirements of these Project Special Provisions.

(B) Grounding Electrodes (Ground Rods)

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

9.3. CONSTRUCTION METHODS

(A) General

All work involving electrical service shall be coordinated with the appropriate electric utility company. Coordinate with the utility company to ascertain the feasibility of installing electrical service at each location before performing any work. Obtain all required local permits before beginning work.

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

Use rigid galvanized conduit for all underground conduit runs 10 feet or less in length. For underground runs greater than 10 feet in length, the Contractor may transition from 2" rigid galvanized conduit to 2" PVC conduit for the remainder of the run beyond the initial 10 feet using an approved PVC female adapter. Apply thread seal tape to the threads of the rigid galvanized conduit before screwing the PVC adapter onto the threaded male end of the conduit. Connect the threaded female end of the PVC adapter to the threaded end of the rigid galvanized conduit, then connect the not threaded end of the adapter to the PVC conduit using a slip fit, glued connection.

Upon completion of electrical service installation and backfilling of all excavations, restore the disturbed ground to its original condition as determined and approved by the Engineer. For paved areas, replace removed or damaged pavement with in kind materials, matching the elevation, color, texture/finish and general appearance of the surrounding pavement. Refer to Section 1 of these Project Special Provisions for additional requirements concerning sidewalks and curbs in historic districts. For unpaved areas, backfill excavations with removed material, tamp the backfilled material and rake smooth the top 1½ inches. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with same type

of grass as surrounding area and mulch the newly seeded area. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

Install meter socket covers on new meter bases to block access to the wiring inside until the meter is attached to the meter base by the power company. Use only approved meter socket covers approved by the Engineer; do not use cardboard, paper, plywood, sheet plastic, tape, etc. to cover the meter socket opening. Do not leave a meter socket uncovered.

Provide all necessary stainless steel banding hardware and clamps for securely attaching service disconnects, meter bases, combination panels and service conduits and risers to metal poles. Submit catalog cuts/manufacturer's literature for banding hardware and clamps to the Engineer for approval.

(B) New Underground Electrical Service for Device Cabinets

At locations identified in the Plans, install a single new 4-wire 240-volt underground electrical service to serve the advance WIM, notification location, and the open/close sign. Comply with *Roadway Standard Drawing* Nos. 1700.01 and 1700.02.

Install a new electrical service comprised of an external service disconnect as well as a meter base with meter socket cover on the existing utility pole. After installation of the meter base with meter socket cover, the local power company will remove the meter socket cover, install a new meter, and make any necessary connections to the power lines.

(C) New Overhead Electrical Service for CCTV

As in the Plans, install a new 4-wire 240-volt new overhead electrical service for a CCTV cabinet in accordance with the details shown in the Plans. Install a new electrical service comprised of an external service disconnect and a meter base with meter socket cover housed in a combination panel on a new wood pole. Mount the combination panel on the wood pole. After installation of the meter base with meter socket cover, the local power company will remove the socket cover and transfer the existing meter or install a new meter and make any necessary connections to the power lines.

(D) Device Cabinet Service Disconnects

At the following locations, provide a device cabinet disconnect:

1) CCTV-1: Mounted on 6" x 6" treated wood pole
2) Advance WIM: mounted on 6" x 6" treated wood pole
3) Open/close sign: mounted on 6" x 6" treated wood pole
4) Notification Site: mounted on 6" x 6" treated wood pole

In the disconnect, terminate the four wire copper service conductors from the metered service. Install No. 10 conductors from the disconnect into the respective device cabinet.

(E) Grounding of Electrical Services

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

Grounding electrode resistance test must be verified or witnessed by the Engineer or the Engineer's designated representative. Furnish and install additional ground rods to grounding electrode system as necessary to meet the requirements of these Project Special Provisions and test requirements.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than 1 ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method.

Submit a completed Inductive Loop & Grounding Test Form available on the Department's website. The form is located on the Department's website at:

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

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

9.4. MEASUREMENT AND PAYMENT

New electrical service (type) will be measured and paid for as the actual number of complete, functional electrical service locations furnished, installed, and tested.

No measurement will be made of risers with weatherheads for electrical service, as they will be considered incidental to furnishing and installing a new electrical service.

No measurement will be made of short risers (i.e., from disconnect to underground conduit and from underground conduit to bottom of cabinet), meter bases, meter socket covers, service disconnects, additional circuit breakers in new service disconnects where required, underground conduit between service risers and disconnects/meters, conduit for feeder conductors between the service disconnect and the equipment cabinet, PVC female adapters, acquisition of service fees, service entrance conductors, feeder conductors, ground wire, and any remaining hardware and conduit to connect the electrical service to the cabinet as they will be considered incidental to furnishing and installing new electrical service.

5/8" X 10' grounding electrode (ground rod) will be measured and paid as the actual number of 5/8" copper clad steel ground rods furnished, installed and accepted as part of grounding systems for new and modified electrical services and equipment cabinet disconnects. No separate payment will be made for #4 AWG solid bare copper grounding conductors or exothermic welding kits as they will be considered incidental to furnishing and installing the ground rod. No measurement and payment for grounding electrodes furnished and installed for purposes other than electrical service grounding systems.

Service disconnect will be measured and paid for as the actual number of complete, functional pedestal-mounted electrical service disconnects furnished, installed and tested. Furnish and install a 6" x 6" treated wood pedestal to support the service disconnect at locations described in these Project Special Provisions. No measurement and payment for 6" x 6" treated wood pedestal for the disconnect furnished and installed as this work will be considered incidental to installation of a new service disconnect. No measurement and payment for No. 10 service conductors from the disconnect to the device cabinet furnished and installed as this work will be considered incidental to installation of a new service disconnect.

No measurement will be made of short risers (i.e., from disconnect to underground conduit and from underground conduit to bottom of cabinet), service disconnects, additional circuit breakers in new service disconnects where required, underground conduit between service risers and disconnects/meters, conduit for feeder conductors between the service disconnect and the equipment cabinet, PVC female adapters, feeder conductors, ground wire, and any remaining hardware and conduit to connect the service disconnect to the cabinet as they will be considered incidental to furnishing and installing new service disconnect.

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

No measurement will be made of restoration of paved roadways/driveways and unpaved ground surfaces with like materials, including but not limited to backfill, graded stone, paved materials, seeding and mulching, as this work will be considered incidental to installation of a new electrical service.

The Department will make no payment for a given new electrical service until all repairs to paved and unpaved surfaces damaged/disturbed during the installation the electrical service have been completed and accepted.

Payment will be made under:

Pay Item	**Pay Unit**
New Electrical Service (Overhead)	Each
New Electrical Service (Underground)	Each
5/8" x 10' Grounding Electrode	Each
Service Disconnect	Each
Four-Wire Copper Feeder Conductors	Linear Feet

10. INDUCTIVE DETECTION LOOPS

10.1. DESCRIPTION

Furnish and install inductive detection loops with loop slot sealant, loop wire, conduit with fittings, and all necessary hardware.

10.2. MATERIALS

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

(A) Loop Sealant

Provide the Engineer with a Type 3 material certifications and material safety data sheets (MSDS) for the sealant in accordance with Article 106-3 of the *Standard Specifications*.

Provide loop slot sealant that completely encapsulates loop wire when installed according to manufacturer's instructions. Provide loop sealant that does not generate temperatures greater than 220° F. Ensure sealant bonds with asphalt and concrete pavement saw slots so sealant and encapsulated loop wire do not come out of slot. Ensure sealant is self-leveling, but with sufficient viscosity to prevent exit from saw slot when installed along a 10% grade.

Provide sealant that protects loop wire by preventing the entrance of dirt, water, rocks, sticks, and other debris into saw slot, and is resistant to traffic, water, gasoline, chemical and chemical fumes, mild alkalis, oils, and mild acids. Ensure sealant will not be affected by water and sealant does not chemically interact with pavement and loop wire insulation.

Ensure loop sealant has sufficient flexibility to permit expected pavement expansion and contraction due to weather and to permit pavement movement due to traffic without cracking for a temperature range of -40 to 160° F.

Provide sealant with a usable life of at least ten minutes once mixed, when the ambient temperature is 75° F. Ensure sealant dries to tack-free state in less than 2 hours, and does not flow within or out of saw slot after exposed surface has become tack free. Tack free time will be determined by testing with a cotton ball until no sealant adheres to cotton ball and no cotton adheres to sealant.

Ensure two-part sealant cures within 48 hours to attain 95% of published properties for the cured material.

Ensure one part sealant cures within 30 days to attain 95% of published properties for the cured material.

(B) Loop Wire

Provide loop wire composed of 19-strand conductor insulated by a cross-linked polyethylene compound. Ensure insulated conductors are completely encased in tubes of low density polyethylene compound. Print manufacturer's name, manufacture year, and any applicable part number on encasing tube at intervals of 2 feet or less.

Provide #14 AWG copper conductors fabricated from 19 strands that comply with ASTM B3 before insulating. Ensure stranded conductors use either concentric or bunch stranding, and comply with circular mil area and physical requirements of ASTM B8 or ASTM B174 for bunch stranding.

Provide insulating compound that is cross-linked thermosetting black polyethylene in accordance with ASTM D 2655. Ensure insulation is applied concentrically about conductor. Provide insulation thickness not less than 0.026" at any point and minimum average thickness of 0.030" as measured by UL Standard 62.

Ensure insulation of finished conductor will withstand application of a 60 Hertz or 3,000 Hertz, 7,500 volt (RMS) essentially sinusoidal spark test potential as specified in UL Standard 83.

Provide insulated conductors that are factory-installed in protective encasing tube that complies with the following:

- Encasing tube fabricated of polyethylene compound conforming to ASTM D1248 for Type I, Class C, Grade E5.
- Minimum inside diameter of 0.150"
- Wall thickness of 0.040" ± 0.010"
- Outside diameter of 0.240" ± 0.010" Conduit

(C) Conduit

Comply with the "Underground Conduit" section of these Project Special Provisions for PVC conduit.

10.3. CONSTRUCTION METHODS

All work performed in this section shall be done in the presence of the Engineer.

Notify Engineer one week before installing inductive detection loops.

Coordinate sawcutting and loop placement with pavement markings. For new construction or for resurfacing, install inductive detection loops before placing final layer of surface course. On unmarked pavement, pre-mark locations of stop lines and lane lines before locating inductive detection loops.

Before sawcutting, pre-mark inductive detection loop locations and receive approval. Sawcut pavement at approved pre-marked locations. Do not allow vehicles to travel over unsealed loop slots.

Install conduit with bushings from edge of pavement to junction box. Do not sawcut through curb.

Remove all loose material and wash saw slots with a high-pressure method using an air and water mixture. Dry saw slots with compressed air. Clear saw slots of jagged edges and protrusions. Seat loop conductor at bottom of saw slot without damaging loop wire.

Before sealing loop conductors, test that impedance from the loop wire to ground is at least 100 megohms. For each location with inductive loops, submit a completed Inductive Detection Loop & Grounding Test Results form. Ensure all loops are included on form. The form is located on the Department's website at https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx .

Embed loop conductors in saw slot with loop sealant. Seal saw slot and dispose of excess sealant in an environmentally safe manner.

Between where loop conductor pairs leave the saw cut in pavement and enter a junction box, twist loop conductor pairs a minimum of 5 turns per foot. Permanently label each twisted pair in the junction box with nylon cable tie using indelible ink. Indicate loop number and loop polarity on the tie.

10.4. MEASUREMENT AND PAYMENT

Inductive loop sawcut will be measured and paid as the actual linear feet of inductive loop sawcut furnished, installed, and accepted.

No measurement will be made of loop slot sealant, loop wire, conduit, and conduit fittings as these will be considered incidental to furnishing and installing inductive detection loops.

Payment will be made under:

Pay Item	Pay Unit
Inductive Loop Sawcut	Linear Foot

11. LEAD-IN CABLE

11.1. DESCRIPTION

Furnish and install lead-in cable with all necessary hardware to be used in conjunction with inductive detection loops.

11.2. MATERIALS

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

Furnish lead-in cable with two conductors of #14 AWG fabricated from stranded tinned copper that complies with IMSA Specification 50-2 except as follows:

- Ensure conductor is twisted with a maximum lay of 2.0 inches, resulting in a minimum of 6 turns per foot.
- Provide a ripcord to allow cable jacket to be opened without using a cutter.

Provide length markings in a contrasting color showing sequential feet and within 1% of actual cable length. Ensure character height of the markings is approximately 0.10 inch.

11.3. CONSTRUCTION METHODS

For underground runs, install lead-in cable in 2-inch non-metallic conduit.

Splicing of lead-in cable will be allowed only for runs in excess of 750 feet. Splice lead-in cable in terminal splice boxes, junction boxes, condulets on poles or equipment cabinets.

Test each complete loop system from the equipment cabinet by using a megger to verify that impedance from the loop system to the ground is at least 50 megohms. After successful completion of megger test, test loop system resistance using an electronic ohmmeter to verify loop system resistance is less than 0.00885 ohms per foot.

11.4. MEASUREMENT AND PAYMENT

Lead-in cable will be measured and paid as the actual linear feet of lead-in cable furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Terminate all cables before determining length of cable run.

If markings are not visible, measurement will be point to point with no allowance for sag.

Payment will be made under:

Pay Item	Pay Unit
Lead-in Cable	Linear Foot

12. BASE MOUNTED EQUIPMENT CABINET

12.1. DESCRIPTION

Furnish and install base and pole mounted equipment cabinets and all necessary hardware in accordance with the Plans and Project Special Provisions.

12.2. MATERIALS

(A) Standards

Ensure that the equipment cabinets comply with the following standards:

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

(B) Functional

Furnish equipment cabinets meeting the following minimum requirements:

- Caltrans Type 332 for base mount and Caltrans Type 336 series for pole mount;
- D doors on both front and rear of cabinet;
- Fiber-optic splice centers (paid separately);
- Grounding bus bar;
- 19-inch rack system for mounting of all devices in the cabinet;
- Pull-out shelf for laptop and maintenance use;
- Maintenance access connections;
- Fluorescent lighting;
- Ventilation fans;
- 120VAC power supply;
- 120VAC ground fault circuit interrupter (GFCI)-protected duplex outlets for tools;
- 120VAC surge-protected duplex outlets for equipment;
- Lightning and surge protection on incoming and outgoing electrical lines (power and data);
- Managed Ethernet switch (paid separately);
- Power strip along vertical rail;
- UPS with sufficient capacity to hold hub's electrical load for 4 hours, (paid separately).

(C) Physical Features

(1) General

Provide cabinets that are completely weatherproof to prevent the entry of water. Provide cabinet and door exterior seams that are continuously welded and all exterior welds are smooth. Provide cabinets with two full-size doors with three hinges, or a full-length stainless steel piano hinge, with stainless steel pins spot-welded at the top. Provide hinges that utilize stainless steel hinge pins. Provide hinges that are mounted so that they cannot be removed from the door or

cabinet without first opening the door. Provide door and hinges braced to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. Ensure that there is no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide cabinet door fitted with a #2 Corbin lock. Provide two keys for each cabinet. Provide cabinet doors that are also pad lockable. Provide door openings that are double flanged on all four sides.

Provide cabinets constructed of unpainted sheet aluminum alloy H5052-H32 with a minimum thickness of 0.125 inch.

Provide doorstops at 90 and 180-degree positions. Ensure that both the door and the doorstop mechanism are of sufficient strength to withstand a simulated wind load of five pounds per square foot of door area applied to the both inside and outside surfaces without failure, permanent deformation, or compromising of door position and normal operation. Do not provide auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Ensure that the gasket material is closed-cell neoprene and maintains its resiliency after exposure to the outdoor environment. Ensure that the gasket shows no sign of rolling or sagging, and provide a uniform dust and weather-resistant seal around the entire door facing.

Provide rails to create a cage to mount hardware, wiring panels and miscellaneous mounting brackets. Provide rails constructed of .1345-inch steel or .105-inch stainless steel. Provide rails with a keyhole design with slots 2 inches on center with a top opening of 5/8 inch in diameter to allow the insertion of a .625-inch by 1-inch carriage bolt. Ensure that the rails are 1.5 to 2 inches wide by .5 inches deep. Drill and tap the rails for 10-32 screws or rack screws with EIA universal spacing.

Provide rack assemblies that have a removable, standard 19-inch EIA compliant rack. The rack shall have a clearance between the rails of 17.5 inches.

Equip each cabinet with an aluminum storage compartment mounted in the rack assembly with the following dimensions (±0.5 inch): 16 inches wide, 14 inches long, and 1.75 inches deep. Provide compartment with ball-bearing telescoping drawer guides to allow full extension from the rack assembly. Ensure that when extended, the storage compartment opens to provide storage space for cabinet documentation and other miscellaneous items. Ensure that the storage compartment is of adequate construction to support a weight of 20 pounds when extended without sagging. Provide a top to the storage compartment that is hinged aluminum. Provide two (2) removable metal shelves with each cabinet.

(2) Base Mount Cabinet

Provide cabinets that include predrilled holes of standard diameter and bolt pattern with four (4) anchor bolts with each cabinet unit as part of the unit price bid. Provide a panel with each cabinet that matches the rest of the cabinet; and is held in place by four bolts provided with the panel. Drill or punch the panel to accommodate the bolts; the drill holes shall match the bolt pattern of the base cabinet of the cabinet. Provide a panel designed to be fitted in the interior of the cabinet and fabricated of the same material and thickness as the cabinet bottom.

Furnish a cabinet base extender with each cabinet that complies with the requirements of the "Cabinet Base Extender" section of these Project Special Provisions.

(3) Pole Mount Cabinet

Provide Caltrans Type 336A or 336S pole mount cabinets with full height internal rack assemblies. Size the cabinet for the equipment to be housed in it.

(D) Lighting

Provide the field cabinet with one 20-watt fluorescent lamp and clear shatterproof shield assembly which are mounted on the inside front and rear top of the cabinet. Ensure that these lamps are unobstructed and able to cast light on the equipment. Equip the field cabinet with door-actuated switches so that the lamps automatically turn on when either cabinet door is opened and go off when the doors are closed.

(E) Electrical

Provide a service panel assembly to function as the entry point for AC power to the cabinet and the location for power filtering, transient suppression, and equipment grounding. Provide AC isolation within the cabinet. Configure cabinet to accept 120 VAC from the utility company.

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

Provide UL listed surge protection devices according to the UL 1449, 2nd edition standard that comply with the NEMA requirements as detailed in the NEMA LS 1 (1992) standard.

Provide branch circuits, surge protection devices, and grounding for the ITS device-connected load served by the cabinet, including ventilation fans, internal lights, electrical receptacles, etc., as shown on the Plans. Terminate field wiring on terminal blocks with the voltage and current rating of the terminal block is greater than the voltage and current rating of the wire fastened to it.

Furnish a power distribution assembly that fits in the EIA 19-inch rack and provides for protection and distribution of 120VAC power.

Ensure that ground bus bars are fabricated from a copper alloy material compatible with copper wire. Use ground bus bars that have at least two positions where a #6 AWG stranded copper wire can be attached.

Mount the ground bus bar on the side of the cabinet wall adjacent to the service panel assembly for the connection of AC neutral wires and chassis ground wires. If more than one ground bus bar is used in a cabinet, use a minimum of a #10 AWG copper wire to interconnect them.

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

Terminate conductors on terminal blocks using insulated terminal lugs large enough to accommodate the conductor to be terminated. When two or more conductors are terminated on field wiring terminal block screws, use a terminal ring lug for termination of those conductors.

Number all terminal block circuits and cover the blocks with a clear insulating material to prevent inadvertent contact.

(F) Ventilation

Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the Ethernet edge switches and other roadside equipment.

Include two cooling fans with 100 CFM, minimum capacity. Provide thermostats to be incorporated into the ventilation system. Mount fans in the top of the cabinet.

Provide the cabinets with vent openings in the lower portion of the door to allow convection cooling of electronic components. Cover them fully on the inside with a commercially available disposable three layer graded type filter. All air entering the cabinet must pass through the air filter.

(G) Environmental Requirements

Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the equipment.

12.3. CONSTRUCTION METHODS

(A) General

Install equipment cabinets at locations identified in the Plans. Install the cabinets on foundations as identified in the Plans and the Standard Specifications.

Ground all cabinets in accordance with the requirements of these Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

Ensure all cabinet wiring is tagged and identified by the use of insulated pre-printed sleeves and follows the project's cable identification scheme. Ensure that the wire markers identify usage in plain words with sufficient details without abbreviations or codes.

Use stranded copper for all conductors, including those in jacketed cables. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug, or connector. Do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks with permanent and waterproof tags. Provide strain relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include, but are not limited to, terminal blocks; bus bars, panel and socket mounted TVSS, circuit breakers, accessory and equipment outlets, and DC power supply chassis. Configure each cabinet mounted UPS unit for remote monitoring from the scale house

Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. Ensure that all fastener heads and nuts (when used) are fully accessible within a complete cabinet

assembly, and any component is removable without requiring removal of other components, panels or mounting rails. Do not use self-tapping or self-threading fasteners.

Furnish and install a 48" 120 VAC power strip vertically along one of the rear rails of the communications rack. Provide a power strip that has at least eight outlets along its length.

Provide a cabinet that is ISO 9001 certified at the time of bid letting.

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

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

Terminate power service wire, video, and data cabling on the appropriate terminal strips, surge protection devices or jacks in the cabinet with insulated terminal lugs or connectors. Use a calibrated ratchet-type crimping tool to install the insulated terminal lugs onto the field wires.

Label spare circuits of the data cables and connect them to the cabinet ground bus bar.

Neatly bundle and identify all field wiring cables in the cabinet with permanent waterproof tags.

(B) Base Mount Cabinet

Locate cabinets so as not to obstruct sight distance of vehicles turning on red.

Install base mounted cabinets as shown on the Plans and as approved by the Engineer. Refer to the "Equipment Cabinet Foundations" section of these Project Special Provisions for installation requirements for the cabinet foundations. Install only the required number of conduits as shown on the Plans plus one additional spare stub out conduit. Position the ends of conduits approximately 2 inches above the finished surface of the concrete base.

Mount the cabinets on cabinet base extenders in accordance with the "Cabinet Base Extender" section of these Project Special Provisions.

(C) Pole Mount Cabinet

Mount the cabinet to a steel pole with approved hardware and attachment brackets. Mount the cabinet 4 feet from the ground to the center of the cabinet. Do not mount cabinets where one of its doors opens into a street, driveway, or other area subject to vehicular traffic or where an existing physical feature such as a pole, sign post, down guy, shrub or tree prevents its doors from being opened at least 90 degrees.

Ground all cabinets in accordance with the requirements of these Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

12.4. MEASUREMENT AND PAYMENT

Base mounted equipment cabinet will be measured and paid as the actual number of base mounted equipment cabinets furnished, installed and accepted.

Pole mounted equipment cabinet will be measured and paid as the actual number of pole mounted equipment cabinets furnished, installed and accepted.

No measurement will be made for cabling, connectors, cabinet attachment assemblies, conduit, condulets, grounding equipment, surge protectors, or any other equipment or labor required to install the field equipment cabinet and integrate it with the CCTV equipment and / or wireless communications equipment as these will be considered incidental to furnishing and installing base mounted equipment cabinets.

Payment will be made under:

Pay Item	Pay Unit
Base Mounted Equipment Cabinet	Each
Pole Mounted Equipment Cabinet	Each

13. CABINET BASE EXTENDER

13.1. DESCRIPTION

Furnish and install cabinet base extenders with all necessary hardware.

13.2. MATERIALS

Fabricate base extenders from the same materials and with the same finish as cabinet housing. Fabricate base extender in the same manner as equipment cabinets, Provide base extenders that have a minimum height of 12".

13.3. CONSTRUCTION METHODS

Where the plans require a cabinet to be base mounted, install extender, as required. Use permanent, flexible waterproof sealing material to:

- Seal between cabinet base and cabinet base extender, and
- Seal space between cabinet base extender and foundation.

13.4. MEASUREMENT AND PAYMENT

Cabinet base extender will be measured and paid as the actual number of cabinet base extenders furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Cabinet Base Extender	Each

14. EQUIPMENT CABINET FOUNDATIONS

14.1. DESCRIPTION

Furnish and install foundations for base-mounted equipment cabinets and all necessary hardware.

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

14.2. MATERIALS

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

Provide preformed cabinet pad foundations with 7"(l) x 18"(w) minimum opening for the entrance of conduits. For precast equipment cabinet foundations, include steel reinforcement to ensure structural integrity during shipment and placing of item. Include four 3/4" coil thread inserts for lifting. Comply with Article 1077-16 of the *Standard Specifications.*

Furnish cabinet foundations with chamfered top edges. Provide minimum Class B concrete in accordance with Article 1000-4, "Portland Cement Concrete for Structures and Incidental Construction", of the *Standard Specifications.*

Provide standard cabinet foundations in unpaved areas with a minimum pad area that extends 24" from front and back of cabinet base extenders, and 3" from sides of cabinet base extenders and adapters.

14.3. CONSTRUCTION METHODS

Comply with Section 825, "Incidental Concrete Construction – General," of the *Standard Specifications.*

Obtain approval for final cabinet foundation locations before pouring concrete base or installing a preformed cabinet base. Maintain 12 inches minimum from service pole to closest point on foundation unless otherwise approved.

Do not install foundations over uncompacted fill or muck. When using poured concrete foundations, use procedures, equipment, and hardware as follows:

- Hand tamp soil before placing concrete or preformed cabinet base and ensure ground is level.
- Use a minimum of four 1/2-inch diameter expanding type anchor bolts to secure cabinet to foundation.
- In unpaved areas, install cabinet foundations a minimum 4 inches above and 4 inches below finished grade. In paved areas, install foundations 1 inch above the paved surface at its highest point and 4 inches below the paved surface at its lowest point.
- Locate external stubbed out conduit at cabinet foundation so conduit is in middle of cabinet. Provide service conduit as the rightmost conduit coming into cabinet. Provide two spare conduits stubbed out; one pointed toward service pole and the other toward direction of lead-in cable. Inscribe identification arrow in foundation indicating direction of spare conduits.
- Ensure that conduits extend 2" to 3" above finished cabinet foundation.

- Give cabinet foundation a broom finish. Seal space between cabinet base and foundation with permanent, flexible, waterproof sealing material.
- If using preformed cabinet pad, use loop sealant to seal the conduit stub-outs within the knock-out.

Restore the disturbed ground surrounding the new cabinet foundation to its original, preconstruction condition as determined and approved by the Engineer.

- For paved areas, replace removed or damaged pavement with in kind materials, matching the elevation, color, texture/finish, and general appearance of the surrounding pavement. Replace concrete sidewalk in whole slabs from joint to joint and comply with Article 848-3 of the *Standard Specifications*. Replace sidewalk pavers using pavers of the same color, texture, shape, dimensions and materials as the damaged or modified items. Place graded stone material temporarily to maintain pedestrian traffic where repairs cannot be performed immediately. Comply with Article 545-4 of the *Standard Specifications.*
- For unpaved areas, backfill excavations with removed material, tamp the backfilled material and rake smooth the top 1½ inches. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with same type of grass as surrounding area and mulch the newly seeded area. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

14.4. MEASUREMENT AND PAYMENT

Equipment cabinet foundation will be measured and paid as the actual number of equipment cabinet foundations furnished, installed, and accepted.

No measurement or payment will be made for restoration of the surrounding unpaved ground surfaces in accordance with these Project Special Provisions as such work will be considered incidental to furnishing and installing equipment cabinet foundations.

Payment will be made under:

Pay Item	Pay Unit
Equipment Cabinet Foundation	Each

15. ENCLOSED COMMUNICATIONS RACK

15.1. DESCRIPTION

Furnish and install freestanding enclosed communications rack in the scale house net rack room.

15.2. MATERIALS

Provide an enclosed communications rack meeting these minimum performance requirements:

- All equipment shall comply with ANSI/EIA RS-310D,
- Provide frame and external components with zinc coating per ASTM B633,
- Paint interior and exterior components per RAL 7035, and
- The thermostatically controlled fans shall provide up to 300 cubic feet per minute (cfm) of exhaust. Thermostats shall monitor both humidity and temperature.

Provide enclosed communications racks meeting the following minimum material requirements:

- Full size rack cabinet for scale house net rack room 42 rack units high (approx. 78 inches nominal height of less base and wheels),
- Nominal depth: 30 inches,
- 19-inch EIA single-bay,
- Nominal 4-inch-high ventilated base,
- All-metal components,
- Full-height locking window door on the front,
- Urethane gaskets for window sealing,
- ¼-inch-thick lightweight thermoplastic shatter-resistant acrylic glass,
- Solid metal removable side panels with bottom vents,
- Full-height solid metal door for the back of each cabinet, and
- Vented top with three integral, thermostatically controlled, prewired fans.
- Set of four (4) heavy-duty, locking casters on base.

Mechanical: Construct all rack frames from 12-gauge, cold-formed steel. Construct all side panels and door panels of 14-gauge steel. Construct the vented base from 16-gauge steel. Construct the 19-inch electrical rack angles from 12-gauge steel.

Doors: Equip all doors with grounding brackets and doorstop kits. Door hinges shall have a maximum opening range of 130-140 degrees. Hinge kits shall permit left or right side mounting. Furnish the racks with tamper-proof hinges and removable hinge pins.

Provide the rack with flush swing handles with tamper resistant locks on all doors. Key all locks to the same key with two sets of keys provided for each unit. Locks shall have a three-point latch mechanism.

Wall Panels: Provide removable solid side panels with hanger tabs for easy alignment and assembly. Provide vents on front and rear panels, along with wire entry access plates with dust-tight seals.

Finish: Furnish factory-applied paint or powder-coating that is black in color on the exterior and interior of all components.

Furnish and install one metal shelf kit per communications rack. Provide each shelf the full width and depth of the rack angles and attach directly to the rack angles. Furnish and install one metal keyboard slide out drawer per full-height communications rack.

15.3. CONSTRUCTION METHODS

Ground the rack to a building ground.

Furnish and install an outlet strip and 10-foot power cord along one rear vertical rack frame. Furnish and install strips that use 120 VAC 60 Hz power and shall contain at least 10 outlets over the 70 inches for full size racks. Furnish and install grounding bus bar system to ground the rack-mounted electrical equipment. Equip door with grounding studs.

Furnish and install cable management hardware for attachment vertically along the rack frame and horizontally between 19-inch rack angles. Cable management hardware shall run vertically up one rear rack frame and shall include six horizontal runs per rack. Provide hardware including cable organizers and clamps to provide strain relief and cable mounting.

Install a communications rack cabinets in the scale house net rack room as shown in the Plans.

Install a keyboard shelf at a height comfortable for operator use when sitting on a stool. Provide tamper-resistant but removable screws through hinges and exterior panels. Furnish any special tools required to remove tamper resistant screws.

15.4. MEASUREMENT AND PAYMENT

Enclosed communications rack will be measured and paid as the actual number of enclosed communications racks furnished, installed, and accepted.

No separate measurement and payment will be made for rack set-up and assembly, mounting of all accessories and equipment specified for installation within the rack, all brackets, fasteners, and hardware required for properly mounting equipment in the rack, as such materials and work will be considered incidental to furnishing and installing the communications racks.

Payment will be made under:

Pay Item	Pay Unit
Enclosed Communications Rack	Each

16. METAL POLE SUPPORTS

16.1. DESCRIPTION

Furnish and install metal poles with hinged mast arms, monotube gantry structures, grounding systems, and all necessary hardware. The work covered by this special provision includes requirements for the design, fabrication, and installation of custom/site specifically designed metal pole supports and associated foundations.

Provide metal pole support systems that contain no guy assemblies, struts, or stay braces. Provide designs of completed assemblies with hardware that equals or exceeds AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* 6th Edition, 2013 (hereafter called 6th Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi sided cross section with no less than six sides. The sides may be straight, convex, or concave.

Pole heights and dimensions of mast arms and gantry monotubes shown in the Plans are estimated from available data for bid purposes. Prior to submitting shop drawings for approval, use field measurements and adjusted cross-sections to determine the pole dimensions (i.e. pole height, arm attachment height) necessary to obtain required clearances and adjust the dimensions on the Plans accordingly as necessary.

Ensure that metal poles permit cables to be installed inside poles and any required mast arms. For holes in the poles and arms used to accommodate cables, provide full-circumference grommets. Arm flange plate wire access holes should be deburred, non grommeted, and oversized to fit around the 2" diameter shaft flange plate wire access hole.

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

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

Applicable Standard Drawings for Metal Poles are available that supplement these Project Special Provisions. These drawings are located on the Department's website:
https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx

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

Comply with article 1098-1A of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, metal pole inventory number(s) and a project number or work order number on the drawings.

Summary of information required for metal pole review submittal:

Item	Hardcopy Submittal	Electronic Submittal	Comments / Special Instructions
Sealed, Approved ITS Plan/Pole Loading Diagram	1	1	Submit field elevation data that support dimensions shown on pole loading diagrams. 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 inventory number(s) in or above the title block
Structure Calculations	1 set	1 set	Not required for Standard QPL Poles
Custom Foundation Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media.
Foundation Calculations	1	1	**Submit LPile calculations per "Metal Pole Foundations" section of these Project Special Provisions.** Not required for Standard QPL Poles
Soil Boring Logs and Report	1	1	Report should include a location plan and a soil classification report including soil capacity, water level, hammer efficiency, soil bearing pressure, soil density, etc. for each pole.

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

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

16.2. MATERIALS

(A) General

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

Use the submerged arc process or other NCDOT previously approved process suitable for pole shaft and arms to weld continuously pole shafts and arm shafts along their entire length. The longitudinal seam weld will be finished flush to the outside contour of the base metal. Ensure shafts have no circumferential welds except at the lower end joining the shaft to the pole base and arm base. Provide welding that conforms to Article 1072-18 of the *Standard Specifications*, except that no field welding on any part of the pole will be permitted unless approved by a qualified engineer.

Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details. Fabricate anchor bases from plate steel meeting, as a minimum, the requirements of ASTM A 36M or cast steel meeting the requirements of ASTM A 27M Grade 485-250, AASHTO M270 Gr 36 or an approved equivalent. Conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

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

Provide a minimum of four (4) 1-1/2" diameter high strength bolts for connection between arm plate and pole plate. Increase number of bolts to six (6) 1-1/2" diameter high-strength bolts when arm lengths are greater than 50'-0" long.

Unless otherwise required by the design, ensure each anchor rod is 2" diameter and 60" length. Provide 10" minimum thread projection at the top of the rod, and 8" minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision (SP09-R005) located at:

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

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

Provide a circular anchor bolt lock plate that will be secured to the anchor bolts at the embedded end with two washers and two nuts. Provide a base plate template that matches the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼" minimum thick steel with a minimum width of 4". Galvanizing is not required for both plates.

Provide four heavy hex nuts and four flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material.

(B) Metal Pole

Provide steel poles as indicated on the plans. Comply with the following for Steel Poles:

- Have shafts of the tapered tubular type and fabricated of steel conforming to ASTM A-595 Grade A or an approved equivalent.
- Have galvanization in accordance with AASHTO M 111 or an approved equivalent.
- Have shafts that are continuously welded for the entire length by the submerged arc process, and with exposed welds ground or rolled smooth and flush with the base metal. Provide welding that conforms to Article 1072-18 of the *Standard Specifications* except that no field welding on any part of the pole will be permitted.
- Have anchor bases for steel poles fabricated from plate steel meeting as a minimum the requirements of ASTM A 36M or cast steel meeting the requirements of ASTM A 27M Grade 485-250 or an approved equivalent.

Provide a grounding lug near the base of the pole near the hand hole. Lugs must accept #4 or #6 AWG solid bare copper wire grounding conductor. Refer to Metal Pole Standard Drawing Sheet M6 for metal pole grounding details.

Have poles permanently stamped above the hand holes with the identification tag details as shown on Metal Pole Standard Drawing Sheet M2.

Fabricate poles from a single piece of steel with single line seam weld with no transverse butt welds. Fabrication of two-ply pole shafts is unacceptable with the exception of fluted shafts. Provide tapers for all shafts that begin at base and that have diameters, which decrease uniformly at the rate of not more than 0.14 inch per foot (11.7 millimeters per meter) of length.

Ensure that allowable pole deflection does not exceed that allowed per 6th Edition AASHTO. For mast arm poles (with primarily moment loads), ensure that maximum angular rotation of the top of the pole does not exceed 1° 40'.

Provide four anchor nuts and four washers for each anchor bolt. Ensure that anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

Provide a terminal compartment with cover and screws in each pole that encompasses the hand hole and contains a 12-terminal barrier type terminal block. Provide two terminal screws with a removable shorting bar between them for each termination. Furnish terminal compartment covers attached to the pole by a sturdy chain or cable approved by the Engineer. Ensure that the chain or cable is long enough to permit the cover to hang clear of the compartment opening when the cover is removed, and is strong enough to prevent vandals from being able to disconnect the cover from the pole. Ensure that the chain or cable will not interfere with service to the cables in the pole base.

For each pole, provide a 1/2 inch minimum thread diameter, coarse thread stud, and nut for grounding which will accommodate #6 AWG ground wire. Ensure that the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

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

(C) Monotube Gantry Structures

Provide pole support assemblies. Comply with the previous Section – Metal Pole—except as noted herein.

Provide pole plates and associated gussets and fittings for attachment of required monotube gantries. As part of each monotube gantries attachment, provide a cable passage hole in the pole to allow passage of cables from the pole to the arm.

Ensure that allowable monotube gantry deflection does not exceed that allowed per 6th Edition AASHTO.

Furnish all monotube gantry plates and necessary attachment hardware, including bolts and brackets.

Provide two extra bolts for each arm.

Provide grommet holes on the arms to accommodate cables for the equipment.

Provide monotube gantries with weatherproof connections for attaching to the shaft of the pole.

Provide hardware that is galvanized steel, stainless steel, or corrosive-resistant aluminum.

Fabrication of two ply pole shafts and monotube gantries is unacceptable with the exception of fluted members.

After all fabricating, cutting, punching, and welding are completed, hot-dip galvanize the structure in accordance with the AASHTO M 111 or an approved equivalent

(D) Metal Pole with Hinged Mast Arm

Provide pole support assemblies. Comply with the previous section – Metal Pole – except as noted herein. Provide hinged mast arm assemblies.

Provide pole plates and associated gussets and fittings for attachment of required mast arms. As part of each mast arm attachment, provide a cable passage hole in the pole to allow passage of cables from the pole to the arm.

Ensure allowable mast arm deflection does not exceed that allowed by 6th Edition AASHTO. Also, when arm is fully loaded, tip of the arm shall not go below the arm attachment point with the pole for all load conditions per 6th Edition AASHTO.

Furnish all arm plates and necessary attachment hardware, including bolts and brackets.

Provide two extra bolts for each arm.

Provide grommet holes on the arms to accommodate cables for the equipment.

Provide arms with weatherproof connections for attaching to the shaft of the pole.

Provide hardware that is galvanized steel, stainless steel, or corrosive-resistant aluminum.

Provide a removable end cap with stainless steel attachment screws for the end of each mast arm. Ensure that the cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the arm with a sturdy chain or cable approved by the Engineer. Ensure that the chain or cable is long enough to permit the cap to hang clear of the arm end opening when the cap is removed.

Design and construct the metal poles with a hinge plate assembly as shown on the Plans. The hinge assembly shall allow maintenance crews to swing the mast arm horizontally away from the roadway for servicing of equipment attached to the mast arm from the shoulder. A metal pole with hinged mast arm of this type can be purchased from:

Union Metal Corporation
1432 Maple Ave., NE
PO Box 9920
Canton, OH 44705
(330) 456-7653

Atlantic Technical Sales
14522 – K Lee Road
Chantilly, VA 20151-1639
Tel: 703-631-6661

(E) Custom Design of Metal Pole Supports

(1) General:

Design metal pole supports with foundations consisting of metal poles with mast arms and monotube gantry structures.

The lengths of the metal poles shown on the plans are estimated from available data for bid purposes. Determine the actual length of each pole from field measurements and adjusted cross-sections. Furnish the pole heights to the Engineer. Use all other dimensional requirements shown on the Plans.

Ensure each pole includes an identification tag with information and location positions as defined on Metal Pole Standard Drawing Sheets M2, M3 and M4. All pole shaft tags must include the pole number shown on the ITS plan.

Design all metal pole support structures using the following 6th Edition AASHTO specifications:

- Design for a 50-year service life as recommended by Table 3-3.
- Use the wind pressure map developed from 3-second gust speeds, as provided in Article 3.8.
- Ensure support structures include natural wind gust loading and truck-induced gust loading in the fatigue design, as provided for in Articles 11.7.3 and 11.7.4, respectively. Designs need not consider periodic galloping forces.
- Assume the natural wind gust speed in North Carolina is 11.2 mph. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) computed for 11.2 mph wind velocity and not the basic wind speed velocity.
- Design for Category II fatigue, as provided for in Article 11.6, unless otherwise specified.
- Calculate all stresses using applicable equations from Section 5. The maximum allowable stress ratios for all support designs are 0.9.
- Conform to article 10.4.2 and 11.8 for all deflection requirements.

Ensure that the design permits cables to be installed inside poles, mast arms and gantry monotubes.

Unless otherwise specified by special loading criteria, compute ice load for all attachments to the mast arm in accordance with article 3.7 of AASHTO. Use projected areas and weights of loads defined in the Mast Arm Loading Schedule on the metal pole loading diagram shown on the Plans.

Ensure that designs provide a removable pole cap with stainless steel attachment screws for each pole top and mast arm end.

(2) Metal Poles:

Submit design drawings for approval. Show all the necessary details and calculations for the metal poles including the foundation and connections. Include pole inventory number on design drawings. Include as part of the design calculations the ASTM specification numbers for the materials to be used. Provide the types and sizes of welds on the design drawings. Include a Bill of Materials on design drawings. Ensure design drawings and calculations are signed, dated, and sealed by the responsible Professional Engineer licensed in the state of North Carolina.

Immediately bring to the attention of the Engineer any structural deficiency that becomes apparent in any assembly or member of any assembly because of the design requirements imposed by these specifications, the plans, or the typical drawings. Said Professional Engineer is wholly responsible for the design of all poles, arms, and monotubes. Review and acceptance of these designs by the Department does not relieve the said Professional Engineer of his responsibility. Do not fabricate the assemblies until receipt of the Department's approval of the design drawings.

For mast arm poles and monotube gantry structures, provide designs with provisions for pole plates and associated gussets and fittings for mast arm and monotube attachment. As part of each mast arm and monotube attachment, provide a grommeted 2" diameter hole on the shaft side of the connection to allow passage of cables from the pole to the arm/monotube.

Where ice is present, assume wind loads as shown in Figure 3-5 of the 6th Edition AASHTO Specification for Group III loading.

Design tapers for all pole shafts that begin at the base with diameters that decrease uniformly at the rate of 0.14 inch per foot of length.

Design a base plate on each pole. The minimum base plate thickness for all poles is determined by the following criteria:

Case 1: Circular or rectangular solid base plate with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/3 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

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

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

P = anchoring force of each anchor bolt

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

Locate the critical section at the face of the anchor bolt and perpendicular to the bolt circle radius. The overlapped part of two adjacent critical sections is considered ineffective.

Case 2: Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/3 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt is $M = P \times D_2$, where

P = anchoring force of each anchor bolt

D_2 = horizontal distance between the face of the upright and the face of the anchor bolt nut

Locate the critical section at the face of the anchor bolt top nut and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections is considered ineffective.

If the base plate thickness calculated for Case 2 is less than Case 1, use the thickness calculated for Case 1.

The following additional owner requirements apply concerning pole base plates.

- Ensure that whichever case governs as defined above, the anchor bolt diameter is set to match the base plate thickness. If the minimum diameter required for the anchor bolt exceeds the thickness required for the base plate, set the base plate thickness equal to the required bolt diameter.
- For metal poles supporting a mast arm or monotube that is 50' or greater length, use a minimum 8-bolt orientation with 2" diameter anchor bolts, and a 2" thick base plate.
- For all metal poles with mast arms and gantry monotubes, use a full penetration groove weld with a backing ring to connect the pole upright component to the base. Refer to Metal Pole Standard Drawing Sheet M4.

Ensure that designs have anchor bolt holes with a diameter 1/4 inch larger than the anchor bolt diameters in the base plate.

Ensure that the anchor bolts have the required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

Provide designs with a 6 x 12-inch hand hole with a reinforcing frame for each pole.

Provide designs with a terminal compartment with cover and screws in each pole that encompasses the hand hole and contains provisions for a 12-terminal barrier type terminal block.

For each pole, provide designs with provisions for a 1/2 inch minimum thread diameter, coarse thread stud and nut for grounding which will accommodate a #6 AWG ground wire. Ensure the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

(3) Mast Arms and Monotubes:

Design all arm plates and necessary attachment hardware, including bolts and brackets as required by the plans.

Design for grommeted holes on the arms and monotubes to accommodate the cables for the equipment mounted on the arms and monotubes.

Design arms and monotubes with weatherproof connections for attaching to the shaft of the pole.

Always use a full penetration groove weld with a backing ring to connect the mast arm or monotube to the pole. Refer to Metal Pole Standard Drawing Sheet M5.

Capacity of tapped flange plate must be sufficient to develop the full capacity of the connecting bolts. In all cases, the flange plate of both arm/monotube and shaft must be at least as thick as the arm connecting bolts are in diameter.

16.3. CONSTRUCTION METHODS

(A) General

Erect metal pole structure only after concrete has attained a minimum allowable compressive strength of 3000 psi. Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision (SP09-R005) located at:

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

For further construction methods, see construction methods for Metal Poles, Metal Pole with Mast Arm, and Monotube Gantry Structure subsections below.

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

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

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

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

Perform repair of damaged galvanizing that complies with the *Standard Specifications*, Article 1076-7 "Repair of Galvanizing".

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

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

(B) Metal Poles

Install metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Install metal poles so that when the pole is fully loaded it is within 2 degrees of vertical. Install poles with the manufacturer's recommended "rake". Use threaded leveling nuts to establish rake if required.

(C) Metal Pole With Hinged Mast Arm

Install horizontal-type arms with sufficient manufactured rise to keep arm from deflecting below the arm attachment height.

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

For mast arm poles, use full penetration welds with back-up ring at the pole base and at the arm base connection.

(D) Monotube Gantry Structure

Install monotube gantry with sufficient manufactured rise to keep arm from deflecting below the arm attachment height.

For monotube gantries, use full penetration welds with back-up ring at the pole base and at the arm base connection.

16.4. POLE NUMBERING SYSTEM

Attach an identification tag to each pole shaft, monotube gantry, and mast arm section as shown on Metal Pole Standard Drawing Sheet M2 "Typical Fabrication Details Common To All Metal Poles".

16.5. MEASUREMENT AND PAYMENT

Metal pole with hinged mast arm will be measured and paid as the actual number of metal poles with hinged mast arms furnished, installed, and accepted.

Metal poles with monotube gantry structure will be measured and paid as the actual number of metal poles with monotube gantry structures furnished, installed, and accepted.

Metal pole with hinged mast arm design will be measured and paid for as the actual number of designs for mast arms with metal poles furnished and accepted.

Metal pole with monotube gantry structure design will be measured and paid for as the actual number of designs for metal poles with monotube gantry structure furnished and accepted.

No measurement will be made for metal pole foundation designs as these will be considered incidental to furnishing and installing the metal pole foundations (see "Metal Pole Foundations" section of these Project Special Provisions).

Payment will be made under:

Pay Item	Pay Unit
Metal Pole with Hinged Mast Arm	Each
Metal Poles with Monotube Gantry Structure	Each
Metal Pole with Hinged Mast Arm Design	Each
Metal Poles with Monotube Gantry Structure Design	Each

17. METAL POLE FOUNDATIONS

17.1. DESCRIPTION

Furnish and install foundations for metal poles with mast arms and metal poles supporting monotube gantry structures with all necessary hardware in accordance with the Plans and specifications.

17.2. GENERAL REQUIREMENTS

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

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

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

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

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

Notify the Engineer if the proposed foundation is to be installed on a slope other than 8H: 1V or flatter.

Design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standards and Section 17.3 (D) (Non-Standard Foundation Design) below.

17.3. DRILLED PIER FOUNDATIONS FOR METAL POLES

(A) General

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

For non-standard site-specific poles, the contractor-selected pole fabricator will determine if the addition of wing walls is necessary for the supporting foundations to resist torsional rotation. If wing walls are found to be necessary, contact the Engineer.

(B) Soil Test

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

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

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

Describe each soil test location with the following information: "Intersection of *(Route or SR #), (Street Name)* and *(Route or SR #), (Street Name)*," or "Route *#, STA # or Mile #, travel direction (i.e., NB/SB/EB/WB, if divided roadway) offset distance and direction (left or right)* "_____ *County, Pole Inventory No.* _____". In lieu of intersection-based information, the Contractor may use device number from the Plans. Pole numbers should be made available to the Drill Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers. For each boring, submit a legible (handwritten or typed) boring log signed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at each depth, depth of the boring, hammer efficiency and a general description of the soil types encountered.

(C) Determination of Design N Value:

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

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

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

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

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

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

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

Or

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

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

Submit completed boring logs collected in accordance with Section (B) (Soil Test) above along with pole loading diagrams from the Plans to the contractor-selected pole fabricator to assist in the pole and foundation design.

If one of the following occurs, contact the Engineer.

- The Design N-value is less than 4.
- The drilled pier length, "L" is greater than the depth of the corresponding boring.

Foundation designs are based on level ground around the pole. If the slope around the edge of the drilled pier is steeper than 8:1 (H:V) or the proposed foundation will be less than 10 feet

from the top of an embankment slope, the Contractor is responsible for providing slope information to the foundation designer and to the Engineer so it can be considered in the design.

If assistance is needed, contact the Engineer.

(D) Non-Standard Foundation Design:

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

17.4. DRILLED PIER CONSTRUCTION

(A) General

Construct drilled pier foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision (SP09-R005). This provision is located at:

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

17.5. MEASURMENT AND PAYMENT

Soil test will be measured and paid as the actual number of soil tests with SPT borings drilled, furnished, and accepted.

Drilled pier foundation will be measured and paid as the actual volume of concrete poured in cubic yards of drilled pier foundation furnished, installed, and accepted.

No measurement will be made for structural design analysis as this will be considered incidental to the soil test and drilled pier foundation or foundation with wing walls.

Payment will be made under:

Pay Item	Pay Unit
Soil Test	Each
Drilled Pier Foundation	Cubic Yard

18. ETHERNET CABLE

18.1. DESCRIPTION

Furnish and install copper Ethernet cable, as shown in the Plans, for interconnecting various hardware in an Ethernet network located between the equipment cabinets, CCTV cabinets and the scale house.

18.2. MATERIALS

(A) Ethernet Cable

Provide Category 5 Enhanced (5e) Ethernet cable that complies with ANSI/TIA-568-A-5 standards for four-pair shielded twisted copper for Ethernet communications. The cable shall meet all of the mechanical requirements of ANSI/ICEA S-80-576 applicable to four-pair inside wiring cable for plenum or general cabling.

Furnish Ethernet cable meeting the following minimum performance requirements:

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

Furnish Ethernet cable meeting the following physical requirements:

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

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

(B) Connectors

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

(C) LAN Patch Panel

Furnish a 24-port LAN patch panel in the scale house net rack room. All ITS Ethernet cabling in the scale house and scale booth shall terminate in this LAN patch panel. The quantity of Ethernet ports may be provided in 12 increment size patch panels. The patch panels shall be designed for Category 5e cable and shall meet TIA/EIA-568-A-5 Category 5e and ISO 11801 Class D standards. The cables shall terminate on the patch panel with Type 110 insulation displacement connectors. All ports shall be RJ-45 eight-wire jacks.

Furnish patch panel with write-on areas for port and panel identification.

(D) Ethernet Patch Cords

Furnish Fast Ethernet patch cords meeting the following physical requirements:

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

Furnish Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-A-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5e Cabling.
- Frequency Range: 1-100 MHz.
- Near-End Crosstalk (NEXT): 30.1 dB.
- Power-sum NEXT: 27.1 dB.
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB.
- Power-sum ACR: 3.1 dB.
- Return Loss: 10 dB. and
- Propagation Delay: 548 nsec.

(E) Network Interface Boxes

Network interface boxes for the Ethernet Category5e cabling is included in the building plans as shown in the Plans. Provide faceplates and RJ-45 with dual jacks in each network interface box shown in the Plans. Faceplate colors shall match those of other electrical and network outlet boxes in the scale house. Label the boxes as ITS.

(F) Environmental Requirements

(1) Outdoor Cable

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

(2) Interior Cable

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

18.3. CONSTRUCTION METHODS

(A) General

Install Category 5e Ethernet cable for equipment cabinets, CCTV cabinets, and network devices in the scale house.

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

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

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

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

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

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

(B) Underground Installation

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

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

Use a clutch device (dynamometer) with breakaway swivel so as not to exceed the allowable pulling tension if the cable is pulled by mechanical means. Do not use a motorized vehicle to generate cable-pulling forces.

Keep tension on the cable reel and the pulling line at the start of each pull. Do not release the tension in the cable if the pulling operation is halted. Restart the pulling operation by gradually increasing the tension until the cable is in motion.

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

not pull the cable through intermediate junction boxes, pull boxes, handholes, or openings in conduit unless otherwise approved by the Engineer.

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

(C) LAN Patch Panel

Install the rack mounted patch panel in scale house net rack room. All ITS Ethernet cabling in the scale house and scale booth shall terminate in this LAN patch panel.

Terminate the cable from the ITS network interface boxes on the proposed patch panel.

Remove one inch of cable jacket. Fan out all four twisted pairs in the specified wiring sequence. Minimize removal of cable jacket. Follow manufacturer's installation instructions for cable termination and panel assembly. Punch down the conductors using a manufacturer's recommended tool. Terminate field wiring and secure with cable management hardware.

(D) Network Interface Boxes

For the ITS network interface boxes, install faceplates and RJ-45 with dual jacks in each network interface box shown in the Plans.

(E) Ethernet Patch Cords

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

18.4. MEASUREMENT AND PAYMENT

Ethernet cable will be measured and paid as the actual linear feet of Ethernet cable furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on network interface boxes outer jacket from start of run to end of run for each run. No measurement will be made for , RJ-45 jacks and faceplates and as such work is considered incidental to installing the Ethernet cable.

Patch panel (Ethernet) will be measured and paid as the actual number of Ethernet LAN patch panels furnished, installed, and accepted.

No measurement will be made of the following Ethernet patch cables, as they will be considered incidental to furnishing and installing the equipment that they connect:

- Ethernet patch cables that connect adjacent devices/equipment (e.g., between an edge switch and a network device housed in the same cabinet);
- Ethernet patch cables between equipment housed in the same or adjacent equipment racks in the scale house net rack room or in the under counter cabinet racks in the scale room;
- Ethernet patch cables between a computer or server and a network interface box; and
- Ethernet patch cables between equipment housed in the same room such in the scale house scale room.
- Ethernet patch cables between equipment housed in the scale booth.
- Ethernet patch cables between any two pieces of equipment in roadside cabinets.

Payment will be made under:

Pay Item	Pay Unit
Ethernet Cable	Linear Foot
Patch Panel (Ethernet)	Each

19. CCTV FIELD EQUIPMENT

19.1. DESCRIPTION

Furnish and install CCTV field equipment, cabinets, and local camera control software described in this Section.

Furnish dome cameras for locations identified on the Plans for mounting on wood poles. Furnish one dome camera for wall mounting in the inspection building. Furnish three cameras with barrel enclosure for mounting in the inspection pit in the inspection building

Furnish and install new electrical service for CCTV-01 as shown in the Plans.

Provide a system to protect field devices and electronic equipment from lightning and surge protection using UL listed surge protection devices.

19.2. MATERIALS

(A) General

Provide new CCTV camera assemblies with composite cable and CCTV cabinets as shown in the Plans.

Each CCTV camera assembly shall consist of the following:

- NEMA environmental dome enclosure,
- CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories,
- Control receiver/driver that complies with the NTCIP specifications listed below,
- Motorized pan, tilt, and zoom,
- Power supplies,
- Pole-mount camera attachment hardware,
- All necessary cable, connectors and incidental hardware to make a complete and operable system,
- NEMA Type 4, IP 66 enclosure constructed of aluminum with a clear acrylic dome or approved equal camera unit housing,
- 60-foot composite cable for power supply and video and data transmission, and
- Surge protection devices.

Each CCTV cabinet assembly, except where noted on the Plans, shall consist of the following:

- Type 336A pole-mounted cabinet.
- Local interface panel,
- Power supplies/transformers,
- Transient voltage surge suppressors, and
- All necessary cable, connectors, and incidental hardware to make a complete and operable system.

(B) Standards

- ANSI,
- ASTM,

- CE, Class B,
- EIA Standards 170, 232, 422, 250C and 485,
- FCC Rules Part 15, Sub-part J,
- FCC Class A,
- FCC, Class B,
- IEEE,
- ICEA,
- IMSA,
- ISO 9001,
- NEC,
- NEMA 4X, IP 66,
- NEMA Type 1,
- NTSC, and
- UL Listed.

Provide UL listed surge protection devices according to the UL 1449, 2nd edition standard that comply with the NEMA requirements as detailed in the NEMA LS 1 (1992) standard.

Provide a means to ground all equipment as called for in the Standard Specifications, these Project Special Provisions, and the Plans.

(C) Camera Assembly

(1) Cameras

General

Provide new charged-coupled device (CCD) color day/night cameras. Provide cameras with automatic gain control (AGC) for clear images in varying light levels. The camera must meet the following minimum requirements:

- Video signal format: NTSC composite color video output, 1 volt peak to peak,
- Min. horiz. resolution: 540 TV Lines,
- Min. image sensor resolution: 768 horizontal pixels by 752 vertical pixels,
- White balance: Automatic through the lens with manual override,
- Gain control: Automatic and manual,
- Sync system: Internal AC line lock, phase adjustable using remote control, V-sync,
- Overexposure protection: Built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun,
- Video output connection: 1-volt peak to peak, 75 ohms terminated, BNC connector,
- Primary voltage: 120 VAC, and
- Camera voltage: 24 VDC.

Dome Camera

Provide new ¼-inch CCD. The dome camera must meet the following minimum requirements:

- Image sensor resolution: 768 horizontal pixels by 752 vertical pixels,

- Automatic gain control (AGC): 0-20 dB, peak-average adjustable,
- Electronic-shutter: Dip-switch selectable NTSC electronic shutter with speed range from 1/2 of a second (off) to 1/30,000 of a second (NTSC),
- Sensitivity: 1.5 lux at 90% scene reflectance,
- Signal to noise ratio: Greater than 50 dB,
- Camera power: 73 VA with heater at 24 VAC or 3A at 24 VDC.

Barrel Camera

Provide new 1/3 CCD. The barrel cameras must meet the following minimum requirements:

- Automatic gain control (AGC): 0-20 dB, peak-average adjustable,
- Sensitivity: .25 lux at 90% scene reflectance,
- Electronic-shutter: Dip-switch selectable NTSC electronic shutter with speed range from 1/60 of a second (off) to 1/10,000 of a second (NTSC), and
- Signal to noise ratio: Greater than 48 dB.

(2) Lens

a) Dome Camera

Provide each dome camera with a motorized zoom lens with automatic iris control with manual override and neutral density spot filter. Provide lenses that meet the following optical specifications:

- Automatic focus: Automatic with manual override,
- Horizontal angle of view: 54 degrees at 3.6 mm wide zoom and 2.5 degrees at 82 mm telephoto zoom,
- Focal length: 3.6 mm to 124 mm, 35X optical zoom, 12X electronic zoom,
- Zoom Speed: 2.9, 4.2 and 5.8 seconds,
- Lens aperture: Minimum of f/1.6,
- Maximum Sensitivity at 35 IRE: .025 lux at ½ second color, .1 lux at 1/60 second black and white, .004 lux at ½ sec. black and white,
- Preset positioning: Minimum of 128 presets.

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

b) Barrel Camera

Provide each barrel camera with a fixed focus lens with automatic iris control with manual override and neutral density spot filter. Provide lenses that meet the following optical specifications:

- Automatic focus: Automatic with manual override,
- Angle of view: Horizontal 72 degrees, vertical 52 degrees,
- Focal length: 5.5 to 82 mm, and

- Zoom ratio: 15x
- Lens aperture: Minimum of f/1.8.

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

(3) Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit must be integral to dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The dome must have an auto flip dome rotation to rotate and reposition camera for viewing objects passing below camera. Provide electronic image stabilization. The pan and tilt units must meet or exceed the following specifications:

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

(4) Fixed Barrel Camera

Barrel cameras shall not have a pan-tilt unit but they shall be fixed and mounted in an indoor rated enclosure for wall mounting.

(5) Power Supplies

Provide all power supplies necessary for the camera and its pan tilt unit. Mount power supplies in the camera cabinet and utilize composite cable to supply power the camera and pan tilt unit.

(6) Control Receiver/Driver

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

- Zoom in/out,
- Automatic focus with manual override,
- Tilt up/down,
- Automatic iris with manual override,

- Pan right/left, and
- Minimum of 128 preset positions for pan, tilt, and zoom.

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

(7) Camera Housing

a) General

Provide surge protectors for all ungrounded conductors that will enter the CCTV enclosure as described below. House the surge protectors within the CCTV housing in a manner approved by the Engineer.

The enclosures shall have a NEMA 4X/IP-66 rating.

A dome-type environmental housing shall have a sustained ambient operating temperature of -50 degrees F to 122 degrees F, with 100 percent non-condensing relative humidity as defined within the NEMA TS-2 (1998) standard.

b) Dome Camera

Provide new dome style enclosure for assemblies with a high performance integrated dome system or approved equal. Provide the dome housing with a 1½" NPT threaded cable entry. Equip each camera housing with a mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a strip heater. Provide a sunshield fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The viewing area of the enclosure must be tempered glass.

c) Barrel Camera

Provide new die-cast aluminum, integrated barrel or bullet style enclosures. The enclosures shall be a rugged, vandal resistant design. Provide the housing with an adaptor plate for a 6" nominal size conduit box mounting.

(D) Composite Cable

Provide a composite cable for carrying the CCTV power, analog video and serial data between the camera and CCTV cabinet. The composite cable shall consist of:

- Outer jacket composed of UV resistant PVC,
- RG-59U coaxial cable
  - Maximum outer diameter .75 in.,
  - PVC jacket,
  - 75 ohm rating,
  - Nominal capacitance of 17.5 pF/ft.,
  - 22 AWG stranded copper center conductor,
  - Bare copper stranded shield.

- Data cable
  - 22 AWG stranded cable,
  - Two twisted pairs,
  - Nominal capacitance of 26 pF/ft.,
  - Nominal impedance of 55 ohms,
  - Common shield/drain wire.
- Power Cable,
  - 16 AWG,
  - Four wire, and
  - THWN stranded.

(E) Camera Mounting Bracket

a) Dome Camera

Provide attachment assemblies for the CCTV dome camera unit to mount on walls, wood poles, metal poles, and metal mast arms. The attachment assemblies shall use stainless steel banding around the pole approved by the Engineer.

Provide the CCTV attachment assembly that allows for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather-tight, seal that does not allow moisture to enter the enclosure.

Provide CCTV camera attachment assembly that is able to withstand wind loading at the maximum wind speed and gust factor called for in the interim revision of the 2013 ASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* and can support a minimum camera unit dead load of 45 pounds.

b) Barrel Camera

Provide an attachment assembly for the CCTV barrel camera unit to mount to the underside of the metal stair tread and connect to an electrical conduit box. The attachment assembly shall be approved by the Engineer.

Provide the CCTV attachment assembly that allows for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather-tight, seal that does not allow moisture to enter the enclosure.

(F) Camera Cabinet

(1) General

Provide cabinets to house CCTV related and communications equipment described herein. Provide the cabinets with a 19-inch communications rack for all equipment.

Provide Type 336A CCTV cabinets that provide for and meet the following minimum requirements:

- Ethernet edge switch (paid for separately),
- Digital video encoder (paid for separately),
- Termination of the composite cable to the camera,
- Local interface panel with maintenance access points for data and video connections to observe camera images and program/monitor camera status,
- Fiber-optic interconnect center (paid for separately),
- Grounding bus bar,

- 19-inch rack system for mounting of all devices in the cabinet,
- Pull-out shelf for laptop and maintenance use,
- Stationary shelf for shelf-mounting the digital video encoder and Ethernet edge switch,
- Fluorescent lighting,
- Ventilation fan,
- Thermostats,
- 120 VAC power supply,
- 120 VAC GFCI-protected duplex outlets for tools,
- 120 VAC surge protected duplex outlets for equipment,
- Surge protection on incoming and outgoing electrical lines (power and data),
- Transformers/power supplies, and
- Power strip along vertical rail.

Provide cabinets complete with a prefabricated cabinet shell, and all internal components and equipment, back and side panels, front and back doors, terminal strips, cabling and harnesses, surge protection for power and communication circuits, power distribution blocks or assemblies, shelves, connectors and all mounting hardware necessary for installation of equipment.

Provide the cabinets using unpainted sheet aluminum with a minimum thickness of 0.125 inch.

Provide the rack assembly with a removable, standard 19-inch EIA compliant rack. Equip each cabinet with an aluminum storage compartment mounted in the rack assembly with the following dimensions (±0.5 inch): 16 inches wide, 14 inches long, and 1.75 inches deep. Provide the compartment with a ball bearing telescoping drawer guides to allow full extension from the rack assembly. The storage compartment shall open to provide a full-depth storage space for cabinet documentation and other miscellaneous items. The storage compartment shall be of adequate construction to support a weight of 20 pounds without sagging when extended. The top of the storage compartment shall be hinged aluminum. Provide at least one removable metal a full-depth shelf with each cabinet.

Provide all cabinets and exterior door seams with continuously welded seams and with smooth exterior welds. Provide all cabinets with two (2) full-size doors (one front, one back). Provide the doors with three hinges, or a full-length stainless steel piano hinge, with stainless steel pins spot-welded at the top. The hinges shall utilize stainless steel hinge pins. Mount the hinges so that they cannot be removed from the door or cabinet without first opening the door. Brace the door and hinges to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. There shall be no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide the cabinet door with a #2 Corbin lock. Provide two keys for each cabinet. Provide the cabinet doors so they can be padlocked. Provide door openings with double flanges on all four sides.

Doorstops shall be included at 90° and 180° positions. Provide both the door and the doorstop mechanism of sufficient strength to withstand a simulated wind load of five pounds per square foot of door area applied to the both inside and outside surfaces without failure,

permanent deformation, or compromising of door position and normal operation. Provide the cabinets without auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Provide the gasket material with closed-cell neoprene and shall maintain its resiliency after exposure to the outdoor environment. The gasket shall show no sign of rolling or sagging, and shall ensure a uniform dust and weather-resistant seal around the entire door facing.

Provide pole-mounted versions of the 336A CCTV cabinet as required by the Plans.

(2) Ventilation

Provide a cooling fan in all cabinets with a minimum capacity of 100 CFM. Provide a thermostat to control the ventilation system.

Provide the cabinets with vent openings in the door to allow convection cooling of electronic components. Locate the vent opening on the lower portion of the cabinet door and cover fully on the inside with a commercially available disposable three layer graded type filter.

Provide cabinets with a serial number unique to the manufacturer. Engrave the entire identification code on a metallic plate that is epoxied to the cabinet on the upper right hand sidewall.

(3) Electrical

Provide a power distribution assembly that consists of power filters, transient voltage suppression, equipment grounding, main and branch circuit breakers for equipment, electrical outlets, lighting and ventilation.

Provide AC isolation within the cabinet. Configure all cabinets to accept 120 VAC from the utility company.

Provide UL listed circuit breakers with an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide power distributions blocks for use as power feed and junction points for two and three wire circuits. The line side of each shall be capable of handling up to 2/0 AWG conductors. Isolate the AC neutral and equipment ground wiring and terminal blocks from the line wiring by an insulation resistance of at least 10 MΩ when measured at the AC neutral.

For components that are furnished by the Contractor that are mounted on cabinet side panels, fasten with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include, but are not limited to, terminal blocks, bus bars, and DC power supply chassis.

Tag and identify all cabinet wiring installed by the Contractor by the use of insulated pre-printed sleeves. The wire markers shall identify in plain words with sufficient details without abbreviations or codes.

Neatly arrange all wiring in the cabinet, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug; or connector, do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks provided by the Contractor. Provide strain

relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

(4) Cable Terminations

Terminate all field cabling on the respective surge protection devices for composite coaxial video, 4-wire EIA 422 data communications, and 24 VAC power cable.

Provide an interface panel to permit a technician to connect a laptop and video monitor to the front side to control the camera locally and view live CCTV video without disconnecting the field wiring. All field wiring shall be routed through the surge protection units before the interface panel. Clearly label all connections on the interface panel.

Provide three adaptor cables to convert USB data to RS-422/RS-232.

Provide a video splitter on the video cable to simultaneous provide video to the video monitor port and to the encoder. Provide a switch for selecting and local camera PTZ control.

(5) Surge Suppression

Provide surge protection both ahead of and behind the ITS device electronics for the cameras. All surge protection devices shall have an ambient operating temperature of -40 degrees F to 165 degrees F with 95 percent non-condensing relative humidity. All surge protection devices shall comply with the following standards:

- UL 1449 version 3 for electrical power,
- UL 497B for paired data communications, and
- UL 497C for coaxial communications.

For those CCTV cabinets with Ethernet communications over twisted-pair copper cable, provide surge protection devices meeting UL 497A.

a) Grounding

Provide a cabinet grounding system as shown in the Plans. Incorporate a means to bond (i.e., connected) all metal components of the camera and cabinets to the grounding system with a grounding cable that uses a mechanical connection on the equipment side and an exothermic welded connection at the down cable.

b) Line Side CCTV Power

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

- Maximum AC line voltage: 140 VAC,
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20,000 Amperes,
- The protector must be provided with the following terminals:
  - Main line (AC line first stage terminal),
  - Main neutral (AC neutral input terminal),
  - Equipment line out (AC line second state output terminal, 19 amps),

- Equipment neutral out (neutral terminal to protected equipment),
- Ground (earth connection),

- The main AC line in and the equipment line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle the 10 Amp AC service,
- The first stage clamp must be between main line and ground terminals,
- The second stage clamp must be between equipment line out and equipment neutral,
- The protector for the first and second stage clamp must have an MOV or similar solid-state device rated at 20 KA and must be of a completely solid-state design (i.e., no gas discharge tubes allowed),
- The main neutral and equipment neutral out must be connected together internally and must have an MOV similar solid-state device or gas discharge tube rated at 20 KA between main neutral and ground terminals,
- Peak clamp voltage: 350 volts at 20 KA (voltage measured between equipment line out and equipment neutral out terminals. Current applied between main line and ground terminals with ground and main neutral terminals externally tied together),
- Voltage must never exceed 350 volts, and
- The protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The equipment line out must provide power to cabinet CCTV and communications equipment and to the 24V power supply.

c) Load Side CCTV Power

Load side protection is designed to restrict surge current transients from entering the power source from the CCTV device and/or site. The surge protection for the CCTV power source shall have an operating voltage of 120 volts single phase and a maximum continuous operating voltage of 150 volts single phase.

The device's surge protection shall be rated at a minimum of 90,000 amps per phase and have maximum clamping voltage ratings of 330 volts at 500 amps, 395 volts at 3,000 amps, and 533 volts at 10,000 amps. The surge protection shall also be UL listed for a minimum suppressed voltage of 330 volts per line to the neutral/ground. The suppression device shall be of the metal oxide varistor (MOV) type.

d) Load Side CCTV Data/Video

Provide specialized surge protection devices at the supply and load sides of all low voltage connections to the CCTV device and its operating subsystems. Provide specialized surge protection devices at the supply and load sides of all low voltage Ethernet data connections between a CCTV and traffic signal cabinet. These connections include, but are not limited to, coaxial video cables and low voltage control serial and Ethernet data cables that comply with EIA requirements as detailed in the EIA-232/422/485 standards.

The surge protection shall have an operating voltage to match the characteristics of the CCTV, such as 24 volts of direct current (VDC) or 24 volts of alternating current and less than 5 VDC for data and video functions. These specialized surge protection units shall be UL listed according to the UL 497B (paired-date cable) and UL 497C (coaxial cable) standards. The minimum surge current rating for the surge protection shall be 2,000 amps for data and telecommunications, 2,000 amps for twisted pair video, and 4,000 amps for binary network connectors (BNC).

(G) Grounding

Provide a minimum of four grounding electrodes with a minimum length of 10 feet each and listed according to UL requirements as detailed in the *UL 467J* standard. Provide copper clad or solid copper electrodes.

(H) Software

Provide Vendor-supplied GUI-based software to setup, configure, and operate the cameras in the field. This software shall include features to set communications addresses and protocols, define camera ID lens control, digital signal processing (DSP) settings, azimuth configuration, presets, tours, and privacy zones. The software shall allow the user to control all functions of the camera locally from the CCTV cabinet at the base of the pole with a serial or USB cable.

19.3. CONSTRUCTION METHODS

(A) Electrical and Mechanical Requirements

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

Install surge protectors on all ungrounded conductors entering the CCTV enclosure as described below. House the protectors in a small, ventilated weatherproof cabinet attached near the CCTV attachment point in a manner approved by the Engineer. The air terminal ground wire must not pass through this cabinet.

(B) CCTV Camera Assembly

Mount CCTV dome camera units on poles at a height sufficient to adequately see traffic in all direction and as approved by the Engineer. Mount dome cameras on poles at the attachment heights shown on Special Details in the Plans.

Mount CCTV camera on the side of pole that is nearest to the intended field of view, to avoid occlusion of the view by the pole or utility lines. Obtain approval of camera orientation from the Engineer. Comply with the "Wood Poles" section of these Project Special Provisions.

Mount CCTV dome camera unit on the wall at a height sufficient to adequately see a clear view of the interior of the inspection building and as approved by the Engineer.

Mount CCTV barrel camera unit on the underside of steel steps to adequately see traffic clearly in the in section pit and as approved by the Engineer.

(C) CCTV Camera Attachment to Pole

Have the Engineer approve the pole location prior to setting a new pole. At locations shown in the Plans, assemble the camera attachment hardware for the CCTV camera unit and attach to the pole using stainless steel banding approved by the Engineer. Submit shop drawings for review and approval by the Engineer prior to installation.

Install the camera attachment assembly to the pole in a manner that allows for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather-tight seal that does not allow moisture to enter the enclosure.

Install CCTV camera attachment assembly that is able to withstand wind loading at the maximum wind speed and gust factor called for in the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, 2013 Interim, and can support a minimum camera unit dead load of 45 pounds.

(D) CCTV Cabinet

Mount the CCTV cabinet on the pole supporting the CCTV camera it controls using approved hardware and attachment brackets. Mount the cabinet 4 feet from the ground to the center of the cabinet. Avoid mounting cabinets where they will overhang and encroach upon an adjacent sidewalk or pedestrian path. Where a minor overhang of the sidewalk or pedestrian path cannot be reasonably avoided, ensure that that a minimum of 4 feet of clear sidewalk width will remain once the cabinet is installed. Do not mount cabinets above pedestrian pushbuttons or where they will hinder access to pedestrian pushbuttons. Have the Engineer approve the proposed mounting position prior to attaching the CCTV cabinet to the pole.

Ground all cabinets in accordance with the requirements of these Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

Tag and identify all cabinet wiring installed by the Contractor by the use of insulated pre-printed sleeves. The wire markers shall identify in plain words with sufficient details without abbreviations or codes.

Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug, or connector, do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks installed by the Contractor. Provide strain relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

Fasten all components installed by the Contractor to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include, but are not limited to, terminal blocks, bus bars, and DC power supply chassis.

Connect the CCTV camera cabinet to the CCTV camera assembly using a composite cable carrying the video, serial data and power. Terminal strips shall be provided with the cabinets to support 4-wire EIA 422 communications and the 24 VAC power as will be required for power and data.

Mount the digital video encoder on a shelf in the 19" equipment rack inside the cabinet in accordance with the "Digital Video Encoder" section of these Project Special Provisions. Mount the fiber-optic interconnect center in accordance with the "Fiber-Optic Communications Cable" section of these Project Special Provisions.

Install the Ethernet edge switch inside the cabinet in accordance with the "Communications Hardware" section of these Project Special Provisions. Mount the edge switch on the same shelf in the CCTV cabinet as the video encoder. Connect the appropriate connectors on the interconnect center with those on the Ethernet edge switch using SMFO jumpers.

(E) Power Service

For CCTV-1 provide 120 VAC power from the existing sign electrical service as shown on the Plans. Comply with the "Electrical Service" section of these Project Special Provisions and the details shown in the Plans.

(F) Grounding

Ground the CCTV pole and subsystems in accordance with the special details (i.e., "SD" sheets) in the Plans.

(1) Device Line Side

Connect the surge protection devices on the CCTV power source on the line side. This device shall provide protection between line-to-neutral, line-to-ground, line-to-line, and neutral-to-ground.

(2) Device Load Side

Connect the surge protection devices in the power line side ahead of all CCTV electronic equipment. This installation technique is designed to restrict earth current transients induced within the ground or directly from the power source from entering the ITS device through the incoming 120/240-volt power circuit. This device shall provide protection between line-to-neutral, line-to-ground, line-to-line, and neutral to ground.

(3) Device Data/Video Supply

Connect the specialized surge protection devices at the supply and line sides of all low voltage connections to the CCTV device and its operating subsystems. These connections include, but are not limited to, Category 5E data cables, coaxial video cables, twisted pair video cables, and low voltage control cables that comply with EIA requirements as detailed in the EIA-232/422/485 standards.

(G) Software

If Vendor software is provided to program and operate the cameras, install the Vendor-supplied GUI-based software to setup, configure and operate the cameras on each laptop supplied with the project.

(H) GPS Coordinates

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

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

NCDOT Inv #	Name	Location	Latitude	Longitude	Manufacturer	Model #
05-0134	Equipment Cabinet	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

19.4. MEASUREMENT AND PAYMENT

CCTV camera assembly will be measured and paid as the actual number of CCTV camera assemblies (dome or barrel) furnished, installed, and accepted.

No separate measurement will be made for composite cabling, connectors, CCTV camera attachment assemblies (including luminaire mast arms), software, grounding equipment, surge protector devices, composite cable, other cabling, and conduit, or any other equipment or labor required to install the CCTV assembly and integrate it with the fiber-optic communications equipment as they are considered incidental to furnishing and installing the CCTV camera assembly and the CCTV cabinet.

CCTV cabinet will be measured and paid as the actual number of pole-mounted CCTV cabinets furnished, installed, and accepted.

No separate measurement and payment will be made for hardware, fasteners and brackets required to mount CCTV cabinets to a pole as shown in the Plans as such work with be considered incidental to furnishing and installing the CCTV cabinets.

Installation of Ethernet edge switches and digital video encoders will be measured and paid for in accordance with the "Communications Hardware" and "Digital Video Equipment" sections of these Project Special Provisions.

Payment will be made under:

Pay Item	Pay Unit
CCTV Camera Assembly	Each
CCTV Camera Assembly (Fixed Mount)	Each
CCTV Cabinet	Each

20. COMMUNICATIONS HARDWARE

20.1. DESCRIPTION

Furnish and install all equipment described below for a fully functional 100 megabit Ethernet network for communication to the weigh station system ITS devices and CCTV.

(A) Managed Ethernet Switch

Furnish and install managed Ethernet switch in the scale house. Ensure that the managed Ethernet switch provides wire-speed, Ethernet connectivity at transmission rates of 100 megabits per second to/from each device on the switch to the core switch.

(B) Ethernet Edge Switch

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for field devices. Ensure that the edge switch provides wire-speed, Ethernet connectivity at each ITS device location to the managed Ethernet switch.

(C) Network Management Software

For the communications network, utilize network management software (NMS) for configuration, troubleshooting, security, and system monitoring. The Contractor shall perform the initial system integration of all Ethernet switches installed on the project.

Install the network management software on all relevant communications hardware, including workstations and servers, as recommended by the manufacturer's instructions. Ensure that the network management software is compatible with all elements of the network, including all Ethernet switches, workstations, and servers. Ensure the system meets the minimum technical requirements and is capable of handling expansion within the network. Ensure that the software manages third party switches and hardware via Simple Network Management Protocol (SNMP) v1 or v3.

Provide system that has a graphical user interface (GUI) for the operator and shall graphically depict the equipment and maintenance/operational status using a graphical map of the system. Include setup and diagnostic utility software for both the server and client computers (licenses to be provided by the Contractor). Ensure that the system is interoperable with all end-to-end communications elements (video encoder, edge switch, and managed Ethernet switch), that connect each CCTV camera to digital video monitors.

(D) UPS

Furnish and install rack-mounted uninterruptible power supply (UPS) units as described in this Project Special Provision for the equipment cabinets, video monitors, managed Ethernet switches, and servers in the scale house and the managed Ethernet edge switch in the inspection building. The UPS shall also include any ancillary equipment or incidental items, such as required mounting hardware and cabling. Furnish and install monitoring software to provide email alerts.

Furnish all materials with the most recently developed and approved product versions that meet or exceed all applicable standards, specifications, and requirements before the system is considered for acceptance.

For the UPS located in the buildings, size the UPS units to provide at least 20 minutes of UPS power. For the ITS equipment cabinets, size the UPS units to provide at least four hours of

UPS power. Provide the UPS a 25% reserve of receptacles. Provide load calculations for each configuration of equipment connecting to a UPS.

20.2. MATERIALS

(A) General

Ensure that the edge switches are fully compatible and interoperable with the trunk Ethernet network interface and that the Ethernet switches support half and full duplex Ethernet communications.

Furnish edge switches that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switches have a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

Provide all SMFO jumpers required to connect the existing managed Ethernet switches and proposed edge switches with the connector panels of fiber-optic splice centers. Provide SMFO jumpers with factory-assembled LC connectors one end (i.e., the fiber-optic interconnect center/connector housing end) and, on the other end, factory-assembled connectors of the same type provided on the existing managed Ethernet switch and edge switches. Provide SMFO jumpers that are a minimum of 3 feet in length for edge switches inside equipment cabinets and CCTV cabinets. Ensure SMFO jumpers meet the operating characteristics of the SMFO cable with which it is to be coupled.

(B) Managed Ethernet Switch

(1) Standards

Ensure that the managed Ethernet switch comply with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D Spanning Tree Protocol (STP),
- IEEE 802.1P Quality of Service (QoS),
- IEEE 802.1Q Virtual Local Area Networks (VLAN Tagging),
- IEEE 802.1Q-2005 Multiple Spanning Tree Protocol (MSTP),
- IEEE 802.1X Port-Based Network Access Control,
- IEEE 802.1W Rapid Spanning Tree Protocol (RSTP),
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX,
- IEEE 802.3X Flow Control,
- IEEE 802.3ad Link Aggregation,
- RFC 821 – Simple Mail Transfer Protocol,
- RFC 854 – Telnet Protocol Specification,
- RFC 1112 – IGMP v1,
- RFC 2131 – Dynamic Host Configuration Protocol for IPv4,
- RFC 2236 – IGMP v2,
- RFC 3315 – Dynamic Host Configuration Protocol for IPv6 (DCHCPv6),
- RFC 3376 – IGMP v3,
- RFC 2362 – Protocol Independent Multicast Sparse Mode (PIM-SM),
- RFC 3973 – Protocol Independent Multicast Dense Mode (PIM-DM),

- RFC 2328 – Open Shortest Path First (OSPF) v2,
- RFC 2338 – Virtual Router Redundancy Protocol (VRRP),
- RFC 2570:2575 – SNMP v3,
- RFC 2030 – Simple Network Time Protocol (SNTP), and
- RFC 2267 – Denial of Service (DoS).

Ensure that the managed Ethernet switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

(1) Functional

Ensure that the managed Ethernet switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard,
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard,
- Support port-based VLAN and support VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and have a minimum 4-kilobit VLAN address table,
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second,
- A minimum 4-kilobit MAC address table,
- Support of Traffic Class Expediting and Dynamic Multicast Filtering,
- Support of, at a minimum, snooping of Version 2 of the Internet Group Management Protocol (IGMP),
- Support of remote and local setup and management via telnet, Secure Shell (SSHv2), or secure Web-based GUI and command line interfaces,
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP),
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network,
- Support of remote monitoring (RMON-I) of the Ethernet agent, and
- Support of the TFTP and SNTP. Ensure that the managed Ethernet switches support port mirroring for troubleshooting purposes when combined with a network analyzer.

(2) Physical Features

Mounting: Provide a 19" rack mount managed Ethernet switch that does not exceed a height of two RU.

Optical Ports: Ensure that all single mode fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide fully functional ports with Type LC connectors and the optics for the optical ports as specified in the Plans or by the Engineer. Do not use mechanical

transfer registered jack (MTRJ) or ST type connectors. Ensure that each optical port consists of a pair of fibers: one fiber will transmit (TX) data and the other fiber will receive (RX) data.

Provide fully functional single mode fiber-optic 10/100/1000 Mbps ports with optical transceivers installed in the proposed managed Ethernet switch. Each optical transceiver shall consist of fiber pairs; one fiber will transmit (TX) data and one fiber will receive (RX) data. Provide 18 single mode fiber-optic 100 Mbps ports in the proposed managed Ethernet switch.

Copper Ports: Provide 24 10/100/1000 Base TX ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/100 Base) and duplex (i.e., full or half). Ensure that all 10/100 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5e unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

Ensure that the managed Ethernet switch (10/100/1000 Mbps ports) supports jumbo frames and full Layer 3 routing. Ensure that the switch includes support for dynamic unicast routing protocols such as RIPv1/v2 and OSPF, and support for multicast routing protocols, including PIM-SM, PIM-DM, and DVMRP.

Port Security: Ensure that the managed Ethernet switch supports/complies with the following minimum requirements:

- Ability to configure static MAC addresses,
- Ability to disable automatic address learning per ports, known hereafter as Secure Port. Secure Ports only forward data for pre-defined / learned MAC addresses.
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to reset manually the port before communications are allowed.

Network Capabilities: Provide managed Ethernet switch that supports/complies with the following minimum requirements:

- Have a non-blocking architecture,
- Route and switch unicast and multicast traffic simultaneously at wire speed,
- Support port mirroring and monitoring to aid in troubleshooting,
- Support QoS queue management using weighted round robin (WRR) and strict priority (SP),
- Support 10/100 BaseTX ports (RJ-45),
- Provide support for the following RMON–I groups, at a minimum,
    - Part 1: Statistics
    - Part 2: History
    - Part 3: Alarm
    - Part 9: Event
- Capable of mirroring any port to any other port within the switch,
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports,
- Telnet/CLI,
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL), and
- Be managed through console (RS-232), telnet, and Web interface, and
- Supports download and upload of images and configurations via TFTP.
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

- Support port mirroring and monitoring to aid in troubleshooting,

Network Security: Provide managed Ethernet switches that support/comply with the following (remotely) minimum network security requirements:

- Multi-level user passwords,
- RADIUS centralized password management (IEEE 802.1X),
- SNMPv3 encrypted authentication and access security,
- Port security through controlling access by the users: ensure that the managed Ethernet switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network,
- Support of remote monitoring (RMON) of the Ethernet agent, and
- Support of the TFTP and SNTP. Ensure that the managed Ethernet switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

(3) Electrical Specifications

Ensure that the managed Ethernet switch has a redundant power supply and operates on power is supplied with 115 VAC. Ensure that the maximum power consumption does not exceed 350 watts.

Ensure that the managed Ethernet switch has diagnostic light emitting diodes (LEDs), including link, port activity, duplex mode, speed (for Category 5e ports only), and power LEDs.

(4) Management Capabilities

Ensure that the managed Ethernet switch includes management capabilities, as defined in the following:

- Incorporate an internal temperature sensor capable of sending system log and/or SNMP traps should the switch exceed a specified warning level,
- Support automatic powering off should the temperature exceed a specified level to prevent damage to the switch,
- Support port mirroring and monitoring to aid in troubleshooting,
- Be capable of utilizing the following standard protocols:
  - Support VLAN (IEEE 802.1Q),
  - Support Multiple Spanning Tree Protocol (IEEE 802.1Q-2005)
  - Support Rapid Spanning Tree Protocol (IEEE 802.1W),
  - Support IGMP Versions 1 and 2 (RFC 1112 and 2236),
  - Support RIP Versions 1 and 2 (RFC 1058 and 1723),
  - Support OSPF Version 2 (RFC 1583 and 2328),
  - Support PIM (SM & DM),
  - Support IGMP Version 1 and 2 (RFC 1112 and 2236),
  - Support DVMRP,
  - Support VRRP (RFC 2338),
  - Support ToS/DSCP mapping to priority queue,
  - Support QoS queue management using weighted round robin (WRR) and strict priority (SP),
  - Support 10/100 BaseTX ports (RJ-45),
  - Support Flow Control (IEEE 802.3x),

- Support Gigabit Ethernet (IEEE 802.3z),
- Support SNMP Version 1 and 3,
- Support 4 groups of RMON-I (Groups 1-3, 9),
- Be managed through console (RS-232), telnet, and Web interface, and
- Supports download and upload of images and configurations via TFTP.

Ensure that the managed Ethernet switch fully supports all Layer 2 and Layer 3 management features related to multicast data transmission and routing, including, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards.
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- A multicast forwarding database that supports a minimum of 2048 entries in hardware.
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, Version 2 of the Internet Group Management Protocol (IGMP).
- Support of remote and local setup and management via telnet, Secure Shell (SSHv2), or secure Web-based GUI and command line interfaces.
- Support of the SNMP protocol.
- Port security through controlling access by the users. Ensure that the Ethernet core switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of the TFTP-and the SNTP. Ensure that the Ethernet core switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

(5) Environmental Specifications

Provide managed Ethernet switches that adhere to the following environmental constraints if located within a climate-controlled environment:

- Operating temperature range: -40°F to 130°F,
- Storage temperature range: -40°F to 185°F, and
- Operating relative humidity range: 5% to 90%, non-condensing.

(C) Ethernet Edge Switch

(1) Standards

Ensure that the edge switches comply with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP),
- IEEE 802.1P standard for Quality of Service (QoS),
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs),
- IEEE 802.1Q-2005 standard for MAC bridges used with the Multiple Spanning Tree Protocol,

- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP),
- IEEE 802.1x standard for port based network access control, including RADIUS,
- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications,
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX,
- IEEE 802.3x standard regarding flow control with full duplex operation, and
- RFC 783 – TFTP
- RFC 854 – Telnet Protocol Specification,
- RFC 1112 – IGMP v1,
- RFC 1541 – Dynamic Host Configuration Protocol for IPv4,
- RFC 2030 – SNTP
- RFC 2068 – HTTP
- RFC 2236 – IGMP v2,
- RFC 2865 – RADIUS
- RFC 3414 – SNMPv3-USM
- RFC 3415 – SNMPv3-VACM.

Ensure that the edge switches have a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

(6) Functional

Ensure that the edge switches support all Layer 2 management features and certain Layer 3 features related to multicast data transmission. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard,
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard,
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous),
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second,
- A minimum 4-kilobit MAC address table,
- Support of Traffic Class Expediting and Dynamic Multicast Filtering,
- Support of, at a minimum, snooping of Version 2 of the Internet Group Management Protocol (IGMP),
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces,
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP),

- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network,
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

(7) Physical Features

Mounting: Provide shelf mount edge switches. Optionally, if cabinet space dictates provide mounting kit to attach the edge switch to a vertical rack rail or a DIN rail in the cabinet. If the Contractor elects to use DIN rail mounting supply the DIN rail with the edge switch.

Ports: Provide 10/100 Mbps auto-negotiating ports (RJ-45) copper Ethernet ports for all edge switches. Provide auto-negotiation circuitry that will automatically negotiate the highest possible data rate and duplex operation possible with attached devices supporting the IEEE 802.3 Clause 28 auto-negotiation standard.

Optical Ports: Ensure that all fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide fully-functional ports with Type LC connectors and the optics for the optical ports. Do not use mechanical transfer registered jack (MTRJ) or ST type connectors.

Provide edge switches having a minimum of two optical 100 Base FX ports capable of transmitting data at 100 megabits per second. Ensure that each optical port consists of a pair of fibers, one fiber will transmit (TX) data and one fiber will receive (RX) data.

Provide 10/100 Mbps optical ports that consist of fiber pairs, one fiber will transmit (TX) data and one fiber will receive (RX) data. Provide optical ports that meet the following minimum requirements:

- Optical receiver sensitivity: -32 dBm,
- Optical transmitter power: -15.5 dBm,
- Typical transmission distance: 20 km, and
- Operating wavelength: 1310 nm.

Copper Ports: Provide edge switches that include a minimum of six copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100 Base) and duplex (i.e., full or half). Ensure that all 10/100 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5e unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

Port Security: Ensure that the edge switches support/comply with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses,
- Ability to disable automatic address learning per ports, known hereafter as Secure Port. Secure Ports only forward, and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to reset manually the port before communications are allowed.

Network Capabilities: Provide edge switches that support/comply with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236),
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3,
- Capable of mirroring any port to any other port within the switch,
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs,
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports,
- Telnet/CLI,
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL), and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

Network Security: Provide edge switches that support/comply with the following (remotely) minimum network security requirements:

- Multi-level user passwords,
- RADIUS centralized password management (IEEE 802.1X),
- SNMPv3 encrypted authentication and access security,
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network,
- Support of remote monitoring (RMON) of the Ethernet agent, and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

(8) Electrical Specifications

Ensure that the edge switches operate and power is supplied with 115 current VAC. Ensure that the edge switches have a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switches have diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5e ports only), and power LEDs.

(9) Environmental Specifications

Provide Ethernet edge switches that adhere to the following environmental constraints as defined in the environmental requirements section of the NEMA TS 2 standard if located within a climate-controlled environment:

- Operating temperature range: -30°F to 165°F,
- Storage temperature range: 14°F to 158°F, and
- Operating relative humidity range: 10% to 90%, non-condensing.

Verify that the edge switch manufacturer certifies their device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Verify that vibration and shock resistance meet the requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switches shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations),
- IEC 6185003 (electric utility substations),
- IEEE 61800-3 (variable speed drive systems), and
- IEC 61000-6-2 (generic industrial).

(D) Network Management Software

Provide network management software that provides configuration, troubleshooting, security and system monitoring for the communications network. Ensure that the system includes the following features:

- Able to create and maintain system and user identification and passwords,
- GUI interface,
- Syslog and SNMP alarm manager,
- Distributed server support for scalable management,
- Physical and logical topology for viewing every element on the network and how it is connected,
- Fault management and alarm view to see the health and status of every element on the network,
- Configuration management for configuring multiple elements and images, perform multi-step upgrades and archive device configurations,
- HTML report generator for Web-based reports,
- Switch configuration and monitoring,
- Inventory tool for the managed devices,
- VLAN manager,
- IP/MAC Address finder,
- Administration tool,
- Abstract Type Library for adding support for future hardware and software in the field,
- Spanning Tree monitor,
- Monitoring of third-party devices,
- Support industry standard protocols such as SNMP, ANS.1, and XML,
- Handle commands from system clients via ASN.1 and/or XML-defined protocol over a standard TCP/IP connection,
- Command underlying nodes (devices such as decoders, encoders, and switches),
- Report status of system nodes and alarms,
- Monitor system node connections,
- Store recent alarms in an internal database,
- Cooperate with another server in redundant set (when working in redundant configuration),
- Receive SNMP traps generated by network infrastructure, translate SNMP traps as system alarms, and send alarms as SNMP traps,
- Support remote configuration and diagnostics, and
- Restore video and connections in case of system component restarts.

Interface: Ensure that the network management software interface meets the following requirements:

- Network interface: Any network/telecom adapter supporting MS Windows TCP/IP stack.
- Network: Microsoft TCP/IP service software must be installed and configured correctly in the project's network environment.

Furnish client-server based application that supports installed client application and browser based client.

(E) UPS

Provide UPS units that produce uninterruptible power and power conditioning for the WIM equipment, managed Ethernet switch, and video monitor(s) in the scale house.

Each UPS shall provide adequate capacity to run its respective workstation, roadside computer and associated equipment without commercial power for twenty minutes. Provide load calculations for each configuration of equipment connecting to a UPS.

(1) Standards

Ensure that the UPS units comply with the following standards:

- ANSI,
- ASTM,
- CSA, and
- UL.

(2) Functional

Each UPS shall provide adequate capacity to run its respective equipment without commercial power for 20 minutes. Size the UPS units for the proposed loads. Provide load calculations for each configuration of equipment connecting to a UPS assuming a run time of 20 minutes.

Ensure that the UPS and its remote monitoring software perform the following functions:

- Remote environmental monitoring of temperature and humidity,
- Data logging,
- Event logging,
- Fault notification,
- Hibernation,
- Radius authentication,
- Protocols: HTTP, HTTPS, IPv4, IPv6, SMTP (v1-v3), Telnet, SSH v2, SSL,
- Manage all network UPS units,
- Operating system shutdown,
- Load shedding to turn off selected devices or groups of devices,
- Outlet control to turn off, reboot, or shutdown outlets,
- Power event summary,
- Recommended actions,
- Risk assessment summary,
- Run command file, and

- System event log integration.

(3) Physical Features

Supply each UPS unit described above with 25 percent spare outlets. Ensure that the UPS meets the following material requirements:

- Rack-mounted and floor mounted as listed below in these Project Special Provisions.
- Sealed AGM type, maintenance free batteries,
- Minimum of nine NEMA 5-15R and two NEMA 5-20R outlets,
- NEMA L5-30P input plug,
- Ethernet network management card using 10/100 Base TX communications,
- USB interface port,
- Remote environmental monitoring of temperature and humidity with telnet management,
- Status lights: power on, power source and overload,
- Alarms: audible and remote notification,
- Manual power on/off switch, and
- Supply UPS unit with multi-pole noise filtering. Supply UPS with a terminal for connecting the UPS to a surge protection device.

(4) Environmental Specifications

Verify that the UPS meets all specifications and is capable of performing all of its functions during and after being subjected to:

- Operating temperature: 0° F to 104° F,
- Operating relative humidity: 95%,
- Storage temperature: 5° F to 113° F, and
- Storage relative humidity: 95%.

20.3. CONSTRUCTION METHODS

(A) General

Ensure that all communications hardware is UL listed.

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

Receive approval for the System Design Report described in these Project Special Provisions before submitting product submittal data, purchasing, installing and configuring the computer and communications hardware at each facility.

Ensure that all project IP addresses are assigned as defined in the System Design Report. Ensure the as-built documentation includes the identification of all IP addresses and VLANs, and associated hardware devices and device locations. Configure the Ethernet network so the WIM equipment and CCTV cameras are in separate VLANs.

The Engineer will designate who their network administrator is for the LAN. Upon project completion, ensure that the network administrator will be able to manage remotely the Ethernet switches for switch configuration, performance monitoring, and troubleshooting.

(B) Managed Ethernet Switches

(1) General

Ensure that the managed Ethernet switch includes Layer 2+ capability providing architecture standardization, open connectivity (i.e., interoperability), bandwidth management, rate limiting, security filtering, and general integration management of an advanced Ethernet switching architecture.

Ensure that all project IP addresses and VLAN IDs are assigned as defined in the System Design Report. Ensure that at a minimum, the switch configuration includes the following features: SNMP, SNTP, Port Security, all required VLANs, Unicast Routing protocols, and Multicast Routing protocols. Ensure unused switch ports are disabled.

Ensure that the managed Ethernet switch is fully accessible by technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that is connectorized on both ends, primarily used for interconnecting termination or patching facilities and/or equipment. Use fiber-optic jumpers that are factory assembled and connectorized and are certified by the fiber-optic jumpers' manufacturer to meet the relevant performance standards required below. Verify that network/field/data jumper cables meet all ANSI/EIA/TIA requirements for Category 5e 4-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

(2) Managed Ethernet Switch

Mount and secure the managed Ethernet switch inside a communications rack scale house net rack room. Connect the managed Ethernet switch to the following items in the scale house: WIM server, UPS units, and WIM electronics units. In addition, connect this managed Ethernet switch to the workstations and printer.

(3) Ethernet Edge Switch

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

Ensure that all project IP addresses and VLAN IDs are assigned as defined in the System Design Report. Ensure that at a minimum, the switch configuration includes the following features: SNMP, SNTP, Port Security, all required VLANs. Ensure unused switch ports are disabled.

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the vertical rail of the equipment rack or to a shelf using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware, and fasteners. Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that is connectorized on both ends, primarily used for interconnecting termination or patching facilities and/or equipment. Use fiber-optic jumpers that are factory assembled and connectorized and are certified by the fiber-optic jumpers' manufacturer to meet the relevant performance standards

required below. Verify that network/field/data jumper cables meet all ANSI/EIA/TIA requirements for Category 5e 4-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

(C) Network Management Software

Install the NMS server application on the application server. Configure the NMS to monitor and manage the servers, and Ethernet switches. Install software to provide access to the NMS software from the workstations connected to the network. The Engineer will designate the network administrator. Establish user access rights and monitoring rights. Build the database through an automatic utility within the NMS or manually enter the data. Establish groupings of devices with like functions or features; this would include geographically related, device types, owners. Setup automatic database and configuration backups. Setup system and device alarms and alarm notifications.

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

(D) UPS

Install UPS units with the following equipment connected to them:

- Roadside cabinets housing roadside computers
- Workstations
- Servers
- WIM electronics equipment in scale room

Place the power supply of the managed Ethernet switch on the UPS unit. Allocate the load of the equipment to balance the load while using 120 VAC.

Connect each UPS unit to a power outlet. Connect the UPS monitoring port to the managed Ethernet switch.

Install the UPS monitoring software on the weigh station LAN workstations to remotely monitor the UPS. Run the UPS diagnostics. Configure the remote monitoring to send email alerts.

Plug the power strip mounted on the respective rack frame into the UPS. Plug all communications hardware into the UPS or the power strip.

20.4. MEASUREMENT AND PAYMENT

The Ethernet switches include all appropriate ports, cabling, grounding, redundancies, labeling, and any integration between the switches and the communications network as necessary to make a fully working installation. All power supplies, power cords, adapters, mounting hardware, DIN rail mounting brackets, DIN rails, connectors, serial cables, signs, decals, disconnect switches, installation materials, and configuration software necessary to complete this work, will be included and will be incidental.

Managed Ethernet switch will be measured and paid as the actual number of managed Ethernet switches furnished, installed, and accepted. No separate measurement will be made for fiber-optic port modules, GBICs, and Ethernet ports, as they will be considered incidental to furnishing and installing the managed Ethernet switch.

Ethernet edge switch will be measured and paid as the actual number of Ethernet edge switches furnished, installed, and accepted.

Network management software will be measured and paid as lump sum furnished, installed, and accepted.

UPS will be measured and paid as the actual number of UPS units described in this section of the Project Special Provisions furnished, installed, and accepted in the equipment cabinets and scale house. No separate measurement will be made for UPS units supplied with the computer workstations, as they will be considered incidental to furnishing and installing the computer workstations.

No separate measurement will be made for SMFO jumpers, communication cables, Ethernet patch cables, electrical cables, mounting hardware, nuts, bolts, brackets, connectors, grounding equipment, or surge suppression, as these will be considered incidental to the pay items listed above.

Payment will be made under:

Pay Item	**Pay Unit**
Managed Ethernet Switch	Each
Ethernet Edge Switch	Each
Network Management Software	Lump Sum
UPS	Each

21. ENCLOSED COMMUNICATIONS RACK

21.1. DESCRIPTION

Furnish and install wall-mounted enclosed communication rack inspection building.

21.2. MATERIALS

(A) Wall-Mounted Communications Rack

Furnish a wall-mounted EIA 19-inch equipment rack cabinet for mounting in the inspection building to house a fiber-optic cable termination, managed Ethernet edge switch, UPS, and video encoders. The unit shall be an enclosed rack at least 20 rack units high with approximate dimensions of 36"H x 21" W x 26" D. The rear mounting plate that attaches the cabinet to the wall shall be hinged along one side with latches on the opposite side so that the cabinet can be swung open to access the rear of the cabinet.

Provide a power strip inside that uses 120 VAC 60 Hz power; the power strip shall contain at least six outlets and a six-foot power cord. Provide grounding bus bar system to ground rack-mounted electrical equipment.

Provide racks constructed of all metal components. Supply all screws, nuts, washers, lock nuts, brackets and hardware necessary to assemble equipment described herein. Vents shall be on front and rear panels. Furnish wire entry access plates with dust tight seals.

Provide cable management hardware for attachment to rack frame and between 19-inch rack angles. The hardware shall include cable organizers and clamps to provide strain relief and cable mounting. Provide one shelf.

Construct all rack frames and rack angles of 12-gauge steel or greater. Construct the sides, top and bottom panels of 16-gauge steel or greater.

Paint the panels, rack frames, and rack angles with black polyester powder coating or baked on paint.

21.3. CONSTRUCTION METHODS

(A) General

Ground the racks to a building ground.

(B) Wall-Mounted Communications Rack

Install the wall-mounted communications rack cabinet on the wall of the inspection building as shown in the Plans. Install the fiber-optic splice center, managed Ethernet switch, video encoders and rack-mounted UPS in the rack inside the cabinet.

Furnish and install a power strip and 10-foot power cord on the rear of the rack frame. Furnish and install strip that uses 120 VAC 60 Hz power and that contains at least five outlets. Furnish and install grounding bus bar system to ground the rack-mounted electrical equipment. Equip door with grounding studs.

Furnish and install cable management hardware for attachment vertically along the rack frame and horizontally between 19-inch rack angles. Cable management hardware shall run vertically up one rear rack frame. Provide hardware including cable organizers and clamps to provide strain relief and cable mounting.

21.4. MEASUREMENT AND PAYMENT

Wall-mounted communications rack will be measured and paid as the actual number of wall-mounted communications racks furnished, installed, and accepted.

No separate measurement and payment will be made for rack set-up and assembly, mounting of all accessories and equipment specified for installation within the rack, all brackets, fasteners, and hardware required for properly mounting equipment in the rack, as such materials and work will be considered incidental to furnishing and installing the communications racks.

Payment will be made under:

Pay Item	Pay Unit
Wall-Mounted Communications Rack	Each

22. DIGITAL VIDEO EQUIPMENT

22.1. DESCRIPTION

Furnish and install digital video encoders for converting analog and digital video.

22.2. MATERIALS

(A) Digital Hardware Video Encoder (DVE)

Furnish and install digital hardware video encoder hardware to create a video-over-IP network system, as shown in the Plans. The video encoder units may be shelf or rack-mounted.

Furnish digital hardware video encoder components that utilize the Moving Picture Experts Group's MPEG-4 Part 10/H.264 video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 13818 and 14496-14 standards, respectively. Provide the ability for the user to select the video compression technology. Ensure that the hardware video encoder is capable of unicast and multicast operation, and that they support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974, and Differentiated Services/Quality of Service (DiffServ/QoS) software components. Ensure that the digital video encoder provides 99.999% error-free operation.

Provide a DVE that is a hardware-based network device able to accept a minimum of one analog National Television System Committee (NTSC) video input and digitize it for transport across IP networks. Use a digital video encoder that provides a minimum of two serial data interfaces for transmission of command and control data to other devices (typically camera PTZ commands), as well as console and configuration functions. Provide compatible decoder software along with the digital video encoder at no additional cost.

(1) Video Specifications

Ensure that any video input utilizes a BNC connector and delivers one-volt peak-to-peak (Vp-p) NTSC composite video signals for encoding. Ensure that the DVE operates with both color and monochrome video, and that they allow the user to select and adjust video resolution. Ensure that the DVE support resolutions that include, but are not limited to those in table below. Ensure that the MPEG-4 DVE is capable of delivering color and monochrome video at 30 fps regardless of resolution, and that they can do so using variable, programmable bit rates from 32 Kbps to 4 Mbps. Ensure that the DVE provides fixed and variable bit rate modes.

Resolution Specifications

Compression Technology	Resolution	NTSC Requirements
MPEG-4	QCIF	176 horizontal x 120 vertical
MPEG-4	CIF	352 horizontal x 240 vertical
MPEG-4	2CIF	704 horizontal x 288 vertical

Note: The resolutions attained depend on the data transmission rate.

(2) Environmental Specifications

Unless stated otherwise in the Plans, provide digital video encoders that meet all specifications during and after being subjected to an ambient operating temperature range of -30°F to 165°F as defined in the environmental requirements section of the NEMA TS 2 standard, with a maximum non-condensing relative humidity of 95%.

Ensure that cabinets housing system components comply with the environmental requirements detailed in the NEMA TS 2 standard. House the digital video encoder in a field cabinet with protection from moisture and airborne contaminants, blowing rain, wind, blowing sand, blowing dust, humidity, roadside pollutants, vandalism, and theft. Ensure that the digital video encoder is resistant to vibration and shock, and conforms to Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard.

22.3. CONSTRUCTION METHODS

(A) General

Receive approval for the System Design Report described in these Project Special Provisions before submitting products submittal data, purchasing, installing and configuring the central video equipment described in this section of the Project Special Provisions.

(B) Digital Hardware Video Encoder

(1) Serial Interface

Use hardware-based digital video encoders having a minimum of two serial data interfaces and connectors that conform to EIA-232/422/485 standards. Ensure that the serial interfaces support EIA-232 as well as 2-wire and 4-wire EIA-422/485 connections. Ensure that the serial port(s) support data rates up to 115.2 Kbps. Serial interface parameters, such as data format, number of bits, handshaking, and parity, shall be software programmable through local connection to the digital video encoders and through connections over the network. Serial interface ports may utilize RJ-45 connectors, D-sub connectors, or screw terminals.

(2) Network Interface

Ensure that the digital video encoder local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. Provide a DVE having a minimum of one Ethernet port, which shall be a 10/100 Base-TX connection. Ensure that the connector complies with the EIA and Telecommunications Industry Association (TIA) requirements as detailed in the EIA/TIA-568-A standard. Provide copper-based network interface ports that utilize RJ-45 connectors.

Ensure that all Category 5e unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard. Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).

(3) Front Panel Status Indicators

Ensure the digital video encoders have light-emitting diode (LED) displays, liquid crystal displays (LCDs), or similar illuminated displays to configuration and management. Provide digital video encoders that support local and remote configuration and management. Configuration and management functions shall include access to all user-programmable features, including but not limited to addressing, serial port configuration, video settings, device monitoring, diagnostic utilities, and security functions. Ensure that the digital video encoders and digital video decoders support configuration and management via serial login, telnet login, and Simple Network Management Protocol (SNMP).

(4) Electrical Specifications

Ensure that all wiring meets NEC requirements and standards. Provide equipment that operates on a nominal voltage of 120 VAC. The equipment shall operate within a voltage range of 89 VAC to 135 VAC. The operating frequency range for power shall be 60-hertz ±3 Hz. If the device requires operating voltages of less than 120 VAC, supply the appropriate voltage converter.

Furnish, install, and integrate the digital video encoders in each CCTV cabinet shown in the Plans. Connect the analog input of the digital video encoder to the CCTV camera as defined above. Connect the Ethernet output of the digital video encoder to Ethernet edge switch. Use standard coax cable with BNC (gold-plated center pin) connectors. Connect the RS-422 PTZ serial communications from the camera to the serial port of the digital video encoder. Configure ports and IP addresses for multicast broadcast and VLANs.

22.4. MEASUREMENT AND PAYMENT

The materials provided in this section include all appropriate ports, cabling, grounding, redundancies, labeling, and any integration between the devices and the communications network as necessary to make a working installation.

All power supplies, power cords, adapters, mounting hardware, connectors, serial cables, signs, decals, installation materials, and configuration software necessary to complete this work, are to be included and will be incidental.

Digital hardware video encoder will be measured and paid as the actual number of digital hardware video encoders furnished, installed, and accepted.

No separate measurement will be made for coaxial or DVI-D cables, cable connectors, communication cables, Ethernet cables between equipment housed within the same room/rack/cabinet, electrical cables, video display monitor mounts, mounting hardware, nuts, bolts, brackets, connectors, grounding equipment, surge suppression or documentation as these will be considered incidental to the pay items listed above.

Payment will be made under:

Pay Item	Pay Unit
Digital Hardware Video Encoder	Each

23. CCTV SOFTWARE

23.1. DESCRIPTION

Furnish a network-ready, client-server CCTV system software package that operates over the LAN. The software shall be configurable and scalable to add and delete devices.

23.2. MATERIALS

(A) General

Provide the CCTV system software that will allow users to:

- Select and control selected analog and IP-based cameras via software based graphical controls, including PTZ and other advance features of cameras,
- Assign CCTV images to specific output devices (monitors) and component device inputs,
- Facilitate video sharing,
- Video display control such as individual monitors,
- Video image capture, and
- Video archiving.

The system software shall support TCP/IP and SNMP.

Software shall be a scalable product that controls both analog and IP video streams.

The software shall provide the capability for up to 16 videos per windows. A window can span one or more display monitors. Provide the following features:

- Zoom in and out feature,
- Pan/tilt control of cameras, and
- Presets for setting camera positions.

(B) Access Controlled Privileges

Provide up to 20 unique operator identification passwords. Operator privileges shall be definable by the system administrator. The software shall allow these privileges to be assigned by time of day/week and year. At a minimum, the following privileges shall be definable for each operator:

- Individual workspace definition (content, size, position, and number of windows),
- Device access,
- Camera pan, tilt, zoom camera control, and
- Device programming control.

Provide the ability to configure the access privileges of individual and groups of users.

(C) Programming Control

Provide user-defined programming scripts of up to 100 timed events. Provide the user with the option to associate an alphanumeric name with each event. Provide 7-day, 24-hour programming ability. At a minimum, programmed events shall include:

- Windows based user interfaces for client server architecture,

- Simple-to-use Telnet hook commands for incorporation into map based GUI,
- Quad displays for viewing of four (4) individual video signals to be displayed in one full screen view,
- Video server and camera to any monitor (including remote monitors),
- Command pan/tilt unit to a defined pre-set,
- Programming of time-based execution of actions or events,
- Alarms and notifications,
- Defining and initiating video tours, and
- Activate (or deactivate) a relay to turn the NVR on or off.

The software shall allow for up to four (4) events to be initiated per timed event. The software shall permit the manual override of the scheduled events.

(D) Graphical User Interface

The graphical user interface (GUI) shall consist of an interface for configuring all devices and variables of the system, the configuration GUI shall permit those users with access privileges to add, delete, or modify devices.

The GUI shall also consist of the users' normal operational interface. At a minimum, include the users' GUI with available device list and viewer to see current events.

(1) Device List

Clicking on an icon in the CCTV system software shall produce a scrollable, drop-down list that contains the name of all video outputs (such as monitors, NVR, encoders, etc.) that are connected to the system. A subsequent click on the appropriate video output name shall select the device on which the video is to be displayed or transmitted and provide access to that device's controls available to the user. Output devices presently in use shall not be available for use until they have been de-selected.

Programming an alarm on the map shall include the ability to include animation, program scripts.

The same user GUI shall provide access to retrieve archived video.

The Client application shall automatically discover the server upon login. When a user logs into the system the client workstation and server shall automatically synchronize maps, databases and other configuration variables.

(2) Event Viewer

Provide an event viewer to show a log of events that have occurred and are scheduled to occur. Provide a means to search the event log.

(E) Device Drivers

Provide device drivers for each device in the system including cameras and monitors, provided with this project. Provide the ability to share device drivers. Device drivers may run as an executable program or window service.

23.3. CONSTRUCTION METHODS

Install the CCTV central software on the workstation in the scale room dedicated to CCTV. Install the client software on the other workstations in the scale room.

Install up to three (3) machines of the CCTV system client application in scale room. Verify that the software is fully operable on the applicable workstations included in the project and designated by the Engineer. Provide licenses for the CCTV devices described in this project and for up to four simultaneous users. Provide free software upgrades for three years.

For each camera, assign names consistent with the existing system. Configure presets and tours for each camera.

Assign operator rights to staff provided by the Engineer. Assign a SHP staff person with administrator rights. Provide NCDOT staff access for those provided by the Engineer.

23.4. MEASUREMENT AND PAYMENT

CCTV Software shall be measured and paid as a lump sum. This shall include the furnishing, installation, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to install the software, complete system integration, and provide a complete operating system. No payment will be made for providing software license and source code as required in these Project Special Provisions.

Payment will be made under:

Pay Item	Pay Unit
CCTV Software	Lump Sum

24. LANE USE CONTROL SIGNALS

24.1. DESCRIPTION

Furnish and install LED lane use control signs signal heads, wire entrance fittings, mounting assemblies, signal cable, grounding systems, visors, and all necessary hardware.

24.2. MATERIALS

(A) General

When power is applied to the signal, the desired double stroke red "X" or green arrow symbol will be displayed with 5 mm LEDs. The overall image will be progressively dimmed relative to the ambient light level changes detected by the photo sensor installed in the sign. The sign control consists of one power control board with opti-coupler isolated input control. The opti-coupler inputs can be used to activate externally controlled dimming, flashing, and multiple message functions as required. This is a two message signal where the image is displayed with LEDs mounted directly on a black powder coated aluminum doorplate.

A sealed polycarbonate protective slide out lens shields the LEDs from the environment. The assembly is housed in a hinged 8" deep cabinet with 7" visors. The display of the signal message is configured so that no latent image is visible under any lighting conditions when the signal is off. Optional aluminum louvers can be installed over the front of the signal face to provide additional sun shading.

(B) Electronic Requirements

The LED circuitry will consist of two main sub-circuits: the signal power control system and the LED power bus system. The power control circuitry shall be supplied with 115VAC (optional 12 or 24VDC). Protection components to guard the system against power surges and short circuits are built into the input power circuitry. The power supply will maintain regulation over the input voltage range of 90-130VAC (115VAC version). Opto-coupler isolated inputs provide control for LED functions such as dimming, flashing, and multiple messages as required. Progressive dimming is activated when an integrated photo-diode sensor is installed. The output of the signal is then adjusted proportional to the changes in the ambient light conditions over time. The flash function is activated by connecting an external sync signal to the opti-coupler input of the sign control or by setting a jumper that causes the sign to self-flash whichever is required. Individual messages are selected by applying power to the opti-coupler isolated control inputs, which can control as many as five different sign states.

All the features such as maximum dimming level, current sense level, and flash rate are factory set and user programmable. Special features like adjustable dimming for each channel (used to control brightness of one color or one image), and individual channel flashing (used to flash part of the image while the rest remains steady) allows for customized configurations with a standard interchangeable power control board. Consult the factory for specific ranges and limitations.

All the sub-circuits are designed in a modular fashion, allowing the replacement of any defective circuit strip or supply/control by a qualified technician without the use of a soldering iron. The circuit strips and boards are conformal coated to protect the individual devices and connections against moisture and corrosion.

The LED's that are used for displaying messages or creating traffic control signals are available in several viewing angle and color combinations. The appropriate devices are selected according to the installation and application requirements specified by the customer. Standard viewing angles available from most manufacturers for 5mm (T1-3/4) LEDs are 6°, 15°, 23°, and 30°. Luminous intensity in milli-candela (mcd) output varies based on color and viewing angle. The following device specifications reflect one manufacturer's data sheets for the components used in this application. Any alternate manufacturer's components used will meet or exceed these specifications.

(C) LED Specifications

AlInGaP (yellow & red) and InGaN (green) devices have a luminous intensity degradation of approximately 20% over 100,000 hours (11 years) when operated at a non-pulsed 20ma level.

Color	Dominant Wavelength	Min. Lum. Int. @ 20ma	Max. Lum. Int. @ 20ma	Viewing Angle
Green	520 nm	4600 mcd	9200 mcd	30°
Red	626 nm	4180 mcd	8200 mcd	30°

(D) Enclosures and Finishes

The final enclosure, slide-in panels, visors, and associated hardware will be fabricated from aluminum or stainless steel as specified. The exterior aluminum enclosure, panels, and visors will have a black powder coated finish as well as the interior faceplates. All openings shall be gasketed or sealed and drain holes will be located in the lower corners of the enclosure to control condensation. The signals will be mounted with a user defined, optional mounting fixture. A textured polycarbonate panel will be incorporated into the sign to provide better blanking.

(E) Power Requirements

The power consumption for the red LEDs is 4 watts per 100 LEDs and for green LEDs it is 8 watts per 100. Input power and controls are designed for accept 120 VAC and total power will not exceed 15 watts when any single message is activated. A terminal strip is provided and is clearly marked by an in-cabinet circuit diagram for easy installation and service.

(F) Operator Control

Provide a rotary manual switch in each lane control signal cabinet for a technician to select the messages described below. Provide in the scale house a manual switch for the operator or officer to perform the same message selection. The switch position shall clearly align with labels so it is clear what message has been selected.

For the lane control signals at the beginning of the bypass lane, the switches describe above shall include the following messages:

- Bypass – station open and sign displays green arrow, system software does not sort vehicles, all vehicles bypass static lanes
- Auto - station open and sign displays green arrow or red "X" as system software sorts vehicles

- Report – station open and sign displays red "X", system software does not sort vehicles, all vehicles diverted to static scales
- Off – sign displays no message

For the lane control signals at the beginning of the bypass lane, the switches describe above shall include the following messages:

- Front – station open and signal directs traffic to front static scale
- Both - station open and signal directs traffic to both static scales
- Rear – station open and signal directs traffic to rear static scale
- Off – sign displays no message

The scale house operator panel in the scale house and the technician switches in the lane control signal cabinets shall be housed in metal boxes. The switches shall be permanently labeled. Provide strain relief and grommets on all cable entrances into the switch housings.

24.3. CONSTRUCTION METHODS

(A) General

The LED lane use control signals shall be manufactured in accordance with the requirements set forth in the Manual on Uniform Traffic Control Devices, Chapter 4M. The overall requirements include legibility at a minimum distance of 300 feet, message blackout regardless of lighting conditions, limited viewing angles based on application requirements, and readability in all specified lighting conditions. The product shall be able to operate within specifications over an ambient temperature range of -35°F to +165°F.

Mount the lane control signals on the monotube gantry structures using stainless steel band clamps.

(B) Operator Control

Install manual switches in the lane use vehicle signal cabinet for a technician to select the "open" or "closed" message. Install in the scale house the manual switch for the operator or officer to select any the message described above.

Permanently secure the manual switches in the open/closed sign cabinet to the cabinet wall or shelf.

24.4. MEASUREMENT AND PAYMENT

Lane control signal will be measured and paid for as the actual number of lane control signals furnished, installed, and accepted.

No measurement will be made for visors, wire entrance fittings, interconnecting brackets, mounting assemblies, and control panels as these will be considered incidental to furnishing and installing the lane control signs.

Signal cable will be measured and paid for as actual linear feet of signal cable furnished, installed, and accepted. Measurement will be point to point with no allowance for sag. Twenty-five feet will be allowed for vertical segments up or down poles.

Payment will be made under:

Pay Item **Pay Unit**

Lane Control Signal	Each
Signal Cable	Linear Foot

25. SIGNAL HEADS

25.1. DESCRIPTION

Furnish and install vehicle LED signal heads, visors, interconnecting brackets, wire entrance fittings, mounting assemblies, signal cable, grounding systems, and all necessary hardware.

25.2. MATERIALS

(A) General

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate tunnel and traditional visors for die-cast aluminum signal heads from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Use electrostatically-applied, fused-polyester paint a minimum of 2.5 to 3.5 mils thick. Do not apply paint to the latching hardware or rigid vehicle signal head mounting brackets for mast arm attachments.

For signals at all other locations, paint the signal housings highway yellow (Federal Standard 595C, Color Chip Number 13538).

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and that meets the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters. Furnish post-top slipfitter mounting assemblies that are either the same color as the housing of the pedestrian or vehicle signal head that will be attached to them (e.g., furnish black assemblies for black signal heads and yellow assemblies for yellow signal heads) or which have a natural aluminum finish. Comply with the painting requirements for signal heads listed above.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the ITS & Signals Qualified Products List (QPL) for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in Section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:

   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement

   (Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with

Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department.

3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters,
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide replacement modules at no cost to the City within 45 days of receipt of modules that have failed. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on the Department's QPL.

(B) Vehicle Signal Heads

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 8 inches in length for 8-inch vehicle signal head sections. Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For mast arm mounting, provide rigid vehicle signal head mounting brackets and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the mast arms and to provide a means for vertically adjusting the vehicle signal heads to proper alignment. Fabricate the mounting assemblies from malleable iron or aluminum, and provide serrated rings made of aluminum.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP)

technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow, and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on this project shall appear on the current NCDOT ITS & Signals Qualified Products List (QPL).

Provide the manufacturer's model number and the product number assigned by the Department for each module that appears on the 2006 or most recent ITS & Signals QPL. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red circular	17	11
12-inch green circular	15	15

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module and 13 Watts or less for the 8-inch circular module.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

(C) Operator Control

Provide a manual pushbutton switch with a ten-foot extension in the scale house for each static scale for a scale house operator to switch the red/green signals in the respective static scale lane. A single push of the switch the signals to the other color. Provide strain relief and grommets on all cable entrances into the pushbutton, its extension cable and where the extension cable connects to the system electronics, interface panel or termination panel.

25.3. CONSTRUCTION METHODS

Bag new signal heads with burlap bags or bags made of non-ripping material specifically designed for covering signal heads until signal heads are placed in operation. Do not use trash bags of any type.

Adjust each signal head vertically and horizontally so that light output will be of maximum effectiveness for traffic and pedestrians. Do not tilt signal heads forward.

Install vehicle signal heads at the heights required in the *North Carolina Supplement to the MUTCD* in effect on the date of advertisement.

Where vehicle signal heads are installed on mast arms, install mounting hardware consisting of rigid vehicle signal head mounting brackets.

Install signal cable in continuous lengths between equipment cabinets and lane use control signals and signal heads. Route signal cable to minimize the length of cable installed and the number of cables and conductors in each run. Pull 36 inches of additional signal cable into equipment cabinets.

Make electrical connections inside each signal head, equipment cabinet, and termination compartment in metal poles. Do not splice cable at any other point between signal heads and equipment cabinet.

Coil sufficient signal cable beside each vehicle signal head to accommodate head shifts during various construction phases. For final signal head locations, coil 36 inches on each side of signal head if signal cable comes from both directions. If signal cable terminates at the signal head, coil 36 inches of signal cable on the same side as the cable run.

25.4. MEASUREMENT AND PAYMENT

Vehicle signal head (_____) will be measured and paid for as the actual number of signal heads of each type, size, and number of sections furnished, installed, and accepted.

No measurement will be made of visors, wire entrance fittings, interconnecting brackets, mounting assemblies, as these will be considered incidental to furnishing and installing signal heads.

Signal cable will be measured and paid for in accordance with the "Lane Use Control Signs" section of these Project Special Provisions. No measurement will be made for drip loops, coiled sections, or lashing wire as these will be considered incidental to furnishing and installing signal cable.

Payment will be made under:

Pay Item	Pay Unit
Vehicle Signal Head (12" 2-Section, Red-Green)	Each

26. OPEN/CLOSED DMS PANELS

26.1. DESCRIPTION

Furnish and install LED OPEN/CLOSED DMS panels, communications cable, DMS control electronics, wire entrance fittings, grounding, and mounting brackets, and all necessary hardware.

26.2. MATERIALS

(A) General

When power is applied to the sign, the desired text "OPEN" or "CLOSED" will be displayed with .20" LEDs. The overall image will be progressively dimmed relative to the ambient light level changes detected by the photo sensor installed in the sign. The sign control consists of one power control board with opto-coupler isolated input control. The opto-coupler inputs can be used to activate externally controlled dimming, flashing, and multiple message functions as required. This is a two message sign where the image is displayed with LEDs mounted directly on a black powder coated aluminum doorplate.

A sealed polycarbonate protective slide out lens shields the LEDs from the environment. The assembly is housed in a hinged 8" deep cabinet with 7" visors. Provide a housing constructed of .125" extruded aluminum with welded corners. The display of the sign message is configured so that no latent image is visible under any lighting conditions when the sign is off. Optional aluminum louvers can be installed over the front of the sign face to provide additional sun shading.

(B) Electronic Requirements

The LED circuitry will consist of two main sub-circuits; the sign power control system and the LED power bus system. The power control circuitry shall be supplied with 115VAC (optional 12 or 24VDC). Protection components to guard the system against power surges and short circuits are built into the input power circuitry. The power supply will maintain regulation over the input voltage range of 90-130VAC (115VAC version). Opto-coupler isolated inputs provide control for LED functions such as dimming, flashing, and multiple messages as required. Progressive dimming is activated when an integrated photo-diode sensor is installed. The output of the sign is then adjusted proportional to the changes in the ambient light conditions over time. The flash function is activated by connecting an external sync signal to the opto-coupler input of the sign control or by setting a jumper that causes the sign to self-flash whichever is required. Individual messages are selected by applying power to the opto-coupler isolated control inputs, which can control as many as five different sign states.

All the features such as maximum dimming level, current sense level, and flash rate are factory set and user programmable. Special features like adjustable dimming for each channel (used to control brightness of one color or one image), and individual channel flashing (used to flash part of the image while the rest remains steady) allows for customized configurations with a standard interchangeable power control board. Consult the factory for specific ranges and limitations.

All the sub-circuits are designed in a modular fashion, allowing the replacement of any defective circuit strip or supply/control by a qualified technician without the use of a soldering

iron. The circuit strips and boards are conformal coated to protect the individual devices and connections against moisture and corrosion.

The LED's that are used for displaying messages or creating traffic control signals are available in several viewing angle and color combinations. The appropriate devices are selected according to the installation and application requirements specified by the customer. Standard viewing angles available from most manufacturers for 5mm (T1-3/4) LEDs are 6°, 15°, 23°, and 30°. Luminous intensity in milli-candela (mcd) output varies based on color and viewing angle. The following device specifications reflect one manufacturer's data sheets for the components used in this application. Any alternate manufacturer's components used will meet or exceed these specifications.

(C) LED Specifications

AlInGaP (yellow & red) and InGaN (green) devices have a luminous intensity degradation of approximately 20% over 100,000 hours (11 years) when operated at a non-pulsed 20ma level.

Color	Dominant Wavelength	Min. Lum. Int. @ 20ma	Max. Lum. Int. @ 20ma	Viewing Angle
Green	520 nm	4600 mcd	9200 mcd	30°
Red	626 nm	4180 mcd	8200 mcd	30°

(D) Enclosures and Finishes

The final enclosure, slide-in panels, visors, and associated hardware will be fabricated from aluminum or stainless steel as specified. The exterior aluminum enclosure, panels, and visors will have a black powder coated finish as well as the interior faceplates. All openings shall be gasketed or sealed and drain holes will be located in the lower corners of the enclosure to control condensation. The signs will be mounted with a user defined, optional mounting fixture. A textured polycarbonate panel will be incorporated into the sign to provide better blanking.

(E) Power Requirements

The power consumption for the red LEDs is 4 watts per 100 LEDs and for green LEDs it is 8 watts per 100. Input power and controls are designed for accept 120 VAC and total power will not exceed 15 watts when any single message is activated. A terminal strip is provided and is clearly marked by an in-cabinet circuit diagram for easy installation and service.

(F) Operator Control

Provide in the scale house a rotary manual switch for the operator or officer to perform the same message selection. The switch position shall clearly align with labels so it is clear what message has been selected. There shall be a "lockout" so the technician and scale house switches cannot be used to select conflicting messages.

Provide a rotary manual switch in the DMS cabinet for a technician to select the messages described below. Provide in the scale house a rotary manual switch for the operator or officer to perform the same message selection. The switch position shall clearly align with labels so it is clear what message has been selected.

The manual switches shall select one of the following messages:

- Open – station open and sign displays "Open" message
- Auto - station open and sign displays "Open" message as long as queue detectors do not determine stations should be closed.
- Closed – station closed, sign displays "Closed" message
- Off – sign displays no message

The scale house operator panel and technician switches in the open/closed sign cabinet shall be housed in metal boxes. The switches shall be permanently labeled. Provide strain relief and grommets on all cable entrances into the switch housings.

26.3. CONSTRUCTION METHODS

(A) General

The overall requirements include legibility at a minimum distance of 300 feet, message blackout regardless of lighting conditions, limited viewing angles based on application requirements, and readability in all specified lighting conditions. The product shall be able to operate within specifications over an ambient temperature range of -35°F to +165°F.

Mount the DMS panel to an overhead static sign as shown in the Plans.

(B) Operator Control

Install a manual rotary switch in the DMS cabinet for a technician to select the "open" or "closed" message. Install in the scale house a manual rotary switch for the operator or officer to select any the message described above.

Permanently secure the manual switch in the open/closed sign cabinet to the cabinet wall or shelf.

26.4. MEASUREMENT AND PAYMENT

Open/Closed DMS Panel will be measured and paid lump sum for the DMS, sign controller, cabling and mounting hardware furnished, installed, and accepted.

No measurement will be made for communications cable, DMS control electronics, manual rotary switches, wire entrance fittings, grounding, and mounting brackets, as these will be considered incidental to furnishing and installing the DMS panel.

Payment will be made under:

Pay Item	Pay Unit
Open/Closed DMS Panel	Lump Sum

27. DYNAMIC MESSAGE SIGN (DMS)

27.1. DESCRIPTION

The DMS used on the State Highway System shall be preapproved on the current NCDOT ITS & Signals 2012 Qualified Products List (QPL) by the date of installation. DMSs not preapproved will not be allowed for use on the project. To ensure compatibility with the existing DMS Control Software deployed in the State, furnish a NTCIP compliant DMS that is fully compatible with Daktronics, Inc. Vanguard Version 4 software (also referred to hereinafter as the "Control Software"). The QPL is available on the Department's website. The QPL website is:

http://www.ncdot.org/doh/preconstruct/traffic/ITSS/SMS/qpl/

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

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

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

- Full Matrix, 66 mm, 27 pixel high and 60 pixels wide LED DMS, 12" border
- Front Access, 8' x 15'
- DMS mounting hardware
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- Branch circuit conductors and related equipment
- DMS operator control panel in the scale house
- All other equipment and incidentals required for furnishing, installing, and testing the DMS system and system components

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

27.2. MATERIALS

(A) Environmental Requirements

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

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

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

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

When displaying three lines, each line must display at least 10 equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height and composed from a luminous dot matrix. Provide an entire LED matrix that is a minimum of 27 pixels high and 60 pixels wide.

(1) DMS Enclosure

Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8-inch thick. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

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

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

Provide one front access door for each 10-15 pixel wide section of the sign enclosure. Vertically hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend each door the full height of the display matrix. Provide a retaining latch mechanism for each door to hold the door open at a 90-degree angle. Each door will form the face panel for a section of the sign. Mount the LED modules to the door such that they can be removed from the door when in the open position. Other sign components can be located inside the sign enclosure and be accessible through the door opening. Provide for each door a minimum of two (2) screw-type captive latches to lock them in the closed position and pull the door tight and compress a gasket located around the perimeter of each door. Install the gasket around the doors to prevent water from entering the cabinet.

Furnish the sign face, excluding the front panel with a flat black, UV treated, colorfast material. Prepare all surfaces for application according to the sheeting manufacturer's recommendations prior to applying the sheeting. Furnish DMS with UV-treated, colorfast border with a minimum width of 12 inches.

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

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

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

(2) DMS Interior Environment Control for Front Access Enclosures

Install a minimum of one (1) temperature sensor that is mounted near the top of the DMS interior. The sensor(s) will measure the temperature of the air in the enclosure over a minimum range of -40°F to +176°F. Ensure the DMS controller will continuously monitor the internal temperature sensor output and report to the DMS control software upon request.

Design the DMS with systems for enclosure ventilation, face panel fog and frost prevention, and safe over-temperature shutdown.

Design the DMS ventilation system to be thermostatically controlled and to keep the internal DMS air temperature lower than +140°F, when the outdoor ambient temperature is +115°F or less.

The ventilation system will consist of two or more air intake ports located near the bottom of the DMS rear wall. Cover each intake port with a filter that removes airborne particles measuring 500 microns in diameter and larger. Mount one or more ball bearing-type fans at each intake port. These fans will positively pressure the DMS enclosure.

Design the fans and air filters to be removable and replaceable from inside the DMS housing. To ease serviceability, mount the fans no more than four (4) feet from the floor of the DMS enclosure.

Provide each ventilation fan with a sensor to monitor its rotational speed, measured in revolutions per minute and report this speed to the sign controller upon request.

The ventilation system will move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. Design the airflow system to move air from the bottom of the enclosure towards the top to work with natural convection to move heat away from the modules.

Install each exhaust port near the top of the rear DMS wall. Provide one exhaust port for each air intake port. Screen all exhaust port openings to prevent the entrance of insects and small animals.

Cover each air intake and exhaust port with an aluminum hood attached to the rear wall of the DMS. Thoroughly seal all intakes and exhaust hoods to prevent water from entering the DMS.

Provide a thermostat near the top of the DMS interior to control the activation of the ventilation system.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal enclosure air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F.

(3) Front Panel

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

Furnish polycarbonate panels with the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch

- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

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

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

(4) Display Modules

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

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

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

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

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

(5) Discrete LEDs

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

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology. Provide T1 ¾, 0.2 inch size LEDs that emit a true amber color at a wavelength of 590 ± 5 nm.

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

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

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

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

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

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

(6) LED Power Supplies

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

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

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

(7) LED Pixels

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

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

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

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

(8) Character Display

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

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

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

(9) Display Capabilities

Design the DMS with at least the following message displays:

- Static display
- Flashing display with Dynamic flash rates
- At least two alternating Static and / or Flashing sequences (multi-page messages)

(10) DMS Mini Controller

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

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

(11) DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the supporting structures of the type specified in the Plans. Design the DMS enclosure supports and structure to allow full access to the DMS inspection panels.

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

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

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

Design the DMS structure to conform to the applicable requirements of the 6th edition of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires*, and the section titled "DMS Assemblies" of these Project Special Provisions.

(12) DMS / DMS Controller Interconnect

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

(13) DMS Controller and DMS Cabinet

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

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

- Furnish the controller cabinet with, but not limited to, the following:
- Power supply and distribution assemblies
- Power line filtering hybrid surge protectors
- Radio Interference Suppressor
- Communications surge protection devices
- Industrial-Grade UPS system and local disconnect
- Microprocessor-based controller
- Display driver and control system (unless integral to the DMS)
- Industrial-grade dial-up modem and interface cable
- Industrial-grade telephone line surge and lightning protector

- Serial interface port for local laptop computer
- Local user interface
- Interior lighting and duplex receptacle
- Adjustable shelves as required for components
- Temperature control system
- All interconnect harnesses, connectors, and terminal blocks
- All necessary installation and mounting hardware

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

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

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

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

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

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

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

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

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

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 75% of the useable space in the cabinet.

Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

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

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

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

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

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

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

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

a) Wiring

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

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

Individually and uniquely label all conductors. Ensure all conductor labels are clearly visible without moving the conductor. Connect all terminal conductors to the terminal strip in right angles. Remove excess conductor before termination of the conductor. Mold the conductor in such a fashion as to retain its relative position to the terminal strip if removed from the strip. Do not run a conductor across a work surface with the exception of connecting to that work surface. No conductor bundles can be support by fasteners that support work surfaces. Install all connectors, devices, and conductors in accordance to manufactures guidelines. Comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang

loose or create a snag hazard. Protect all conductors from damage. Ensure all solder joints are completed using industry accepted practices and will not fail due to vibration or movement. Protect lamps and control boards from damage.

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

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

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

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

Label all equipment and equipment controls clearly.

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

b) Power Supply and Circuit Protection

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

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

c) Circuit Breakers

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

d) Surge Suppressor

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

Provide power line surge protector that meets the following requirements:

Peak surge current occurrences	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape	50,000 amperes
Energy absorption	> 500 Joules

Clamp voltage	240 volts
Response time	<1 nanosecond
Minimum current for filtered output	15 amperes for 120VAC*
Temperature range	-40°F to +158°F

*Capable of handling the continuous current to the equipment

e) Radio Interference Suppressor

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

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

f) Communications Surge Protector

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

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

g) Lightning Arrester

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

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

h) Uninterruptible Power Supply (UPS)

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

- Input Voltage Range: 120VAC +12%, -25%
- Power Rating: 1000 VA, 700 Watts
- Input Frequency: 45 to 65 Hz
- Input Current: 7.2A
- Output Voltage: 120VAC +/- 3%
- Output Frequency: 50/60 +/-1 Hz
- Output Current: 8.3A
- Output Crest Factor Ration: @50% Load Up to 4.8:1
@75% Load Up to 3.2:1
@100% Load Up to 2.4:1
- Output THD: 3% Max. (Linear)
5% Max. (Non-Linear)
- Output Overload: 110% for 10 min; 200% for 0.05 sec.
- Output Dynamic Response: +/- 4% for 100% Step Load Change
0.5 ms Recovery Time.
- Output Efficiency @ 100% Load: 90% (Normal Mode)
- Operating Temperature: -40° F to +165° F
- Humidity: 0% to 95% Non-condensing

- Remote Monitoring Interface: RS-232
- Protection: Input/Output Short Circuit
  Input/Output Overload
  Excessive Battery Discharge
- Specifications: UL1778, FCC Class A, IEEE 587

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

i) Controller Communications Interface

Provide the controller with the following interface ports:

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

j) Controller Local User Interface

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

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

k) Controller Address

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

l) Controller Functions

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

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

m) DMS Controller Memory

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

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

n) Photo-Electric Sensors

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

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

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

(14) Equipment List

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

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

(15) Physical Description

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

(16) Parts List

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

(17) Character Set Submittal

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

(18) Wiring Diagrams

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

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

(19) Routine of Operation

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

(20) Maintenance Procedures

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

(21) Repair Procedures

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

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

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

(22) Field Trial

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

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

(C) Operator Control

Provide a rotary manual switch in the DMS cabinet for a technician to select the messages described below.

Provide in the scale house a rotary manual switch for the operator or officer to perform the same message selection. The switch position shall clearly align with labels so it is clear what message has been selected. There shall be a "lockout" so the technician and scale house switches cannot be used to select conflicting messages.

The switches shall select one of the messages:

Control Panel Selection	Message	Purpose
Inspection	Proceed to Inspection Area →	Proceed to inspection area
Containment	Proceed to Inspection Area →	Proceed to containment area
Off	(Sign dark)	Sign dark, proceed
Parking	Proceed to Parking Area →	Proceed to parking area

The scale house operator panel and technician switches in the DMS cabinet shall be housed in metal boxes. The switches shall be permanently labeled. Provide strain relief and grommets on all cable entrances into switch housing.

27.3. CONSTRUCTION METHODS

(A) Description

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

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

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

(B) Layout

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

(C) Construction Submittal

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

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

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

(D) Conduit

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

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

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

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

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

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

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

(E) Wiring Methods

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

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

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

(F) Equipment and Cabinet Mounting

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

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

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

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

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

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

(C) Operator Control

Install the rotary manual switch in the DMS cabinet for a technician to select the "inspection", "containment" "off", or "parking" messages. Provide in the scale house a manual switch for the operator or officer to select each message described above.

(G) Work Site Clean-Up

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

27.4. MEASUREMENT AND PAYMENT

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

Payment will be made under:

Pay Item	Pay Unit
DMS	Lump Sum

28. NTCIP REQUIREMENTS

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

28.1. REFERENCES

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

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

Table 1: NTCIP Standards

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

Abbreviated Number	Full Number	Title
		Internet Transport Profile (TCP/IP and UDP/IP)
NTCIP 2301	**NTCIP 2301**	AP-STMF AP for Simple Transportation Management Framework

(A) General Requirements

(1) Subnet Level

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

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

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

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

Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

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

(2) Transport Level

Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

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

(3) Application Level

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

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

(4) Information Level

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

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

Table 2: Modified Object Ranges for Mandatory Objects

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Contains at least one row with moduleType equal to 3 (software). The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the modelVersion indicates the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	At least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	At least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	At least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	At least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	At least 20 when no messages are stored.
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS supports any valid MULTI string containing any subset of those MULTI tags

Object	Reference	Project Requirement
		listed in Table 4
DmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Support at least the following modes: Local External central CentralOverride

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

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

Table 3: Content of Permanent Messages

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

Table 4: Required MULTI Tags

Code	Feature
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 – day of month
f9	field 9 – month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year
fl (and /fl)	Flashing text on a line-by-line basis with flash rates controllable in 0.5-second increments.
fo	Font
jl2	Justification – line – left
jl3	Justification – line – center
jl4	Justification – line – right
jl5	Justification – line – full

jp2	Justification – page – top
jp3	Justification – page – middle
jp4	Justification – page – bottom
Mv	Moving text
Nl	New line
Np	New page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page)
Pt	Page times controllable in 0.5-second increments.

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

(5) Test Heading

i. Time Management

As defined in NTCIP 1201

ii. Timebase Event Schedule

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

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

Object	Reference	Project Requirement
MaxTimeBaseScheduleEntries	NTCIP 1201 Clause 2.4.3.1	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

iii. Report

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

Table 6: Modified Object Ranges for the Report Conformance Group

Object	Reference	Project Requirement
maxEventLogConfigs	NTCIP 1201 Clause 2.5.1	At least 50
eventConfigurationMode	NTCIP 1201 Clause 2.4.3.1	The NTCIP Component supports the following Event

Object	Reference	Project Requirement
		Configuration Modes: 1) onChange, 2) greaterThanValue and 3) smallerThanValue
MaxEventLogSize	NTCIP 1201 Clause 2.5.3	At least 200
MaxEventClasses	NTCIP 1201 Clause 2.5.5	At least 16

iv. PMPP

v. Font Configuration

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

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

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

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

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

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

vi. DMS Configuration

As defined in NTCIP 1203.

vii. MULTI Configuration

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

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

Object	Reference	Project Requirement
DefaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS 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

viii. Default Message Control as defined in NTCIP 1203

ix. Pixel Service Control as defined in NTCIP 1203

x. MULTI Error Control as defined in NTCIP 1203

xi. Illumination/Brightness Control

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

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

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

a) Auxiliary I/O

b) Scheduling

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

Table 10: Modified Object Ranges for the Scheduling Conformance Group

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

c) Sign Status as defined in NTCIP 1203

d) Status Error as defined in NTCIP 1203

e) Pixel Error Status as defined in NTCIP 1203

f) Fan Error Status as defined in NTCIP 1203

g) Power Status as defined in NTCIP 1203

h) Temperature Status as defined in NTCIP 1203

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

Table 11: Some Optional Object Requirements

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

Object	Reference	Project Requirement
DmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.7.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error.

(6) Documentation

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

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

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

(B) NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also, provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

28.2. MEASUREMENT AND PAYMENT

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

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

29. DMS TESTING REQUIREMENTS

29.1. GENERAL TEST PROCEDURE

Test the DMS system in a series of design approval and functional tests. The results of each test must meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the North Carolina Department of Transportation, to incorporate all design changes necessary to pass the required tests.

Provide four copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence, showing a test of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. The Engineer will reject all equipment not tested according to these requirements. It is the Contractor's responsibility to ensure the DMS system functions properly even after the Engineer accepts the DMS test results.

Provide four copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

29.2. DESIGN APPROVAL TESTS

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

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

PROTOTYPE – Manufacture a prototype DMS and controller of the type and size described in the Project Special Provisions. In the presence of the Engineer, test the prototype according to the Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department may accept the prototype DMS and controller as the physical and

functional standard for the system furnished under this contract. You may use the prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Contractor can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests.

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

29.3. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

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

(A) Physical Examination

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

Perform the following tests as a minimum:

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

(B) Continuity Tests

Check the wiring to assure it conforms to the requirements of these Project Special Provisions.

(C) Functional Tests

Perform the following functional tests:

- Start-up and operate the DMS locally using a laptop computer.
- Use automatic (photo-electric sensor controlled) DMS Control Software to switch between "dim", "normal", and "bright" light levels.
- Operate the DMS with all display elements flashing continuously for 10 minutes at the maximum flash rate.
- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences.
- Automatic poll the DMS by the Control Software at various intervals and verify the data received by Control Software from DMS.
- Download and edit messages using Control Software.
- Execute status request on the DMS controller.
- Observe normal operations during uploading and downloading messages.
- Input and select messages from the sign controller's local user interface.

- Test sequence activation at chosen intervals.
- Display and verify all stored messages.
- Verify resumption of standard operation upon interruption of electrical power.
- Demonstrate detected failures and response functions.
- Demonstrate proper operation of the Failure Log.
- Set controller clock using the Control Software.
- Execute system shutdown using the Control Software and local user interface.
- Verify detection of a power failure in the DMS enclosure and the report feature of the failure to the Control Software.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

30. DMS ASSEMBLIES

30.1. DESCRIPTION

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

Provide pedestal type DMS assembly structures with a minimum of 20 feet from the high point of the road to the bottom of the DMS enclosure.

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

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

30.2. MATERIAL

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

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

30.3. CONSTRUCTION METHODS

(A) General

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

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

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

Erect DMS in accordance with the requirements indicated on the Plans and in these Project Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to the structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt connection such as 1) each truss chord to sign hanger, or 2) each truss chord to platform support.

Provide two (2) U-bolts at each U-bolts connection where ends of truss chords are supported. Minimum diameter of all U-bolts is to be ½ inch.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials. See Standard Specifications for Roads and Structures Section 1076-7.

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

(B) Shop Drawing

Submit to the Engineer for approval a complete design for the DMS assemblies (including footings), DMS mounting assemblies, DMS assembly hardware, and brackets for supporting the DMS. Base the design on the line drawings and correct wind speed in accordance with the latest edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, 6th Edition, 2013".

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

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

Allow a minimum of 40 working days for shop drawing approval after the Engineer receives them. If revised drawings are necessary, allow appropriate additional time for review and approval of final shop drawings.

Approval of shop drawings by the Engineer will not relieve the Contractor of his responsibility for the correctness of drawings, or for the fit of all shop and field connections and anchors.

(C) Design and Fabrication

(1) Dynamic Message Sign Assembly and Dynamic Message Sign Mounting Assembly

- Design must be in accordance with the Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition, 2013, and the latest Interim Specifications.
- The wind pressure map that is developed from the 3-second gust speeds, as provided in Article 3.8, shall be used.
- The natural wind gust speed in North Carolina shall be assumed to be 5 meters per second or 11.6 mph for inland areas, and 7 meters per second or 15.7 mph for coastal areas. The coastal area shall be defined as any area within 2 miles from the waterfront facing the ocean or sound and all area where the design basic wind speed is above 120 mph, as shown in Figure 3-2.
- The fatigue importance category used in the design, for each type of structure, as provided for in Article 11.6, Fatigue Importance Factors, shall be Category II unless otherwise shown on the contract plans.

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

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

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

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

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

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

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

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

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

Where

fa = Computed axial compression stress at base of post

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

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

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

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no

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

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

- M, bending moment at the critical section of the base plate induced by one anchor bolt
- P, anchoring force of each anchor bolt
- D_1, horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
- D_2, horizontal distance between the face of the upright and the face of the anchor bolt nut

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

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

Horizontal components of the supporting structures for overhead DMS must be of a truss design to support the DMS. Truss centerline must coincide with centerline of the DMS design area shown on the structure line drawing. Provide permanent camber in addition to dead load camber in accordance with the "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals". Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Fabricate attachment assemblies for the mounting DMS in a manner that allows easy removal of the sign.

30.4. MEASUREMENT AND PAYMENT

DMS Pedestal Type Structure will be measured and paid as the actual number of dynamic message sign assemblies furnished, installed, and accepted. Payment includes all design (including S-dimensions), fabrication, construction, transportation, and attachment of the dynamic message sign assemblies (including Z-bars and U-bolts), supporting structure, hardware, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

Payment will be made under:

Pay Item	Pay Unit
DMS Pedestal Type Structure	Each

31. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES

SP9 R05REV

31.1. DESCRIPTION

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low-level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low-level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low-level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

31.2. Materials

Refer to the 2012 Standard Specifications.

Item	Section
Conduit	1091-3
Grout, Nonshrink	1003
Polymer Slurry	411-2(B)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the 2012 Standard Specifications for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Damaged or deformed materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:

www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html

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

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

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

31.3. Construction Methods

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2012 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

(A) Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring, and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles, or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2012 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving, or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *2012 Standard Specifications* except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place drilled pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages, and drilled pier concrete in accordance with Subarticle 411-4(E) of the *2012 Standard Specifications* except for the following:

- Inspections for tip resistance and bottom cleanliness are not required,
- Temporary casings may remain in place if approved, and
- Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
- 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:

a) 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.

b) 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.

c) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.

d) 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.

e) 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.

f) 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.

g) 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.

h) Repeat (g) for leveling nuts.

i) 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 (g) and (h).

j) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of two flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total of one flat (1/6 revolution) for anchor rod diameters greater than 1 1/2" and two flats (1/3 revolution) for anchor rod diameters 1 1/2" or less. Follow a star pattern cycling through each top nut at least twice.

k) 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.

l) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect

mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	**Requirement, ft-lb**
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not over tighten top nuts.

m) Do not grout under base plate.

31.4. MEASUREMENT AND PAYMENT

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

32. OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS

32.1. DESCRIPTION

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the 6th edition of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

32.2. MATERIAL

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

(A) Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

- Unit weight (γ) = 120 lb/cf,
- Friction angle (ϕ) = 30°,
- Cohesion (c) = 0 lb/sf, and
- Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck, or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

(B) Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to two drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

(C) Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams, and wings in accordance with the 6th Edition of the AASHTO *Standard Specifications for Structural*

Supports for Highway Signs, Luminaires and Traffic Signals. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the AASHTO *Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit, and anchor rod assembly details. Include all boring logs, design calculations, and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed, and sealed by an engineer licensed in the state of North Carolina.

32.3. CONSTRUCTION METHODS

Construct footings, pedestals, drilled piers, grade beams, and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

32.4. MEASUREMENT AND PAYMENT

DMS Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams, and wings shown on the accepted submittals. The contract unit price for DMS *Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies, and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
DMS Overhead Footings	Cubic Yard

33. OVER-HEIGHT VEHICLE DETECTION SYSTEM

33.1. DESCRIPTION

Furnish and install the over-height detection system with all necessary hardware in accordance with the Plans and Special Provision.

The over-height vehicle detection system consists of a transmitter and a receiver. The transmitter and receiver system will be mounted on poles or mast arm poles on each side of the roadway. The pole or mast arms will be paid separately. A beam of infrared light from the transmitter is aimed at two light detectors in the receiver. When the light reaching the two detectors is interrupted in the proper sequence, the receiver closes an electrical contact. The transmitter and receiver are mounted at such a height that over-height vehicles break the beam but other vehicles do not. The receiver's contact closure output is connected to the WIM computer at the Advance Location, and any truck breaking the beam is flagged as over-height in the message about the truck that the Advance Location roadside computer sends to the server.

33.2. MATERIALS

(A) Over-Height Detector

Furnish the over-height detector assembly to include the transmitter and receiver with the following characteristics:

- Power: 120 VAC power,
- Output: Form C dry relay contact closure with contacts rated 115 VAC, 10 amps. Protected by an 8 amp circuit breaker,
- Weight : 30 pounds or less, each unit,
- Operating temperature: -40° F to +135° F,
- Response: Within 1 second of beam break,
- Enclosure: NEMA 6P, ALMAG casting and sheet aluminum at least 1/8-inch thick,
- Range: 10-700 feet under ideal conditions; 200 feet in bad weather.
- Reaction Speed: 1 to 75 mph for 2.5-inch diameter object that is one inch above the detection height,
- Two LEDs, bore sight, and meter for alignment,
- Bird perch denial rod for each eye cone, and
- Furnish the transmitter and receiver with mounting hardware, power and communication cables, connectors, and power connection.

(B) Overheight Detector Cable

The overheight detector cable shall include conductors to carry power and data. The Contractor shall determine the number and type, and size of the conductors according to the overheight detector furnished.

(C) Mounting

Mount the over-height detector and receiver units on either a galvanized steel pole or mast arm pole as shown in the Plans.

(D) Steel Pedestal Pole

Provide a galvanized steel pole that conforms to Section 1098-14 of the Standard Specifications with the following modifications to the standard:

- Bracket arms and transformer bases shall not be required,
- Design the standard to support the over-height detection equipment specified herein, and
- Furnish the pole with a height as shown on the Plans.

(E) Steel Pedestal Foundations

Construct the steel pedestal pole on a standard foundation as defined in Section 1743 of the Standard Specifications. Design the foundation type and depth and submit for approval by the Department.

33.3. CONSTRUCTION METHODS

Mount the over-height detector transmitter unit to the proposed mast arm pole supporting the AVI antenna at the Advance Location using stainless steel band clamps at the heights shown in the Plans.

Mount the other over-height detector transmitter and detector units on steel pedestal poles.

Install the over-height vehicle detectors and align in accordance with the recommendations of the detector manufacturer. Mount the detector units so the beam is parallel to the cross slope of the roadway. Field verify the detector mounting to assure that the infrared beam is transmitted at 13'-6" above the lowest point of each travel lane that is equipped with the WIM sensors.

33.4. MEASUREMENT AND PAYMENT

Over-height vehicle detection system will be measured and paid as the actual number of over-height vehicle detector systems, furnished, installed, and accepted. Payment includes detectors and their mounting brackets.

Steel pedestal pole will be measured and paid as the actual number of steel pedestal poles and foundations, furnished, installed and accepted. Payment includes steel pedestal pole and steel pedestal pole foundation.

No measurement will be made for mounting hardware, overheight detector cables, electrical conductors, connectors, surge protectors, documentation, and testing as these will be considered incidental to furnishing and installing over-height vehicle detector systems.

Payment will be made under:

Pay Item	Pay Unit
Over-height Vehicle Detection System	Each
Steel Pedestal Pole	Each

34. AUTOMATIC VEHICLE IDENTIFICATION EQUIPMENT

34.1. DESCRIPTION

Furnish and install automatic vehicle identification (AVI) equipment with all necessary hardware and software in accordance with the Plans and Project Special Provisions.

34.2. MATERIALS

(A) General

Furnish AVI readers that are user-configurable RF and data processing units that support two-way communications with in-vehicle transponders using ASTM V6 Slotted-Aloha Time Division Multiple Access (TDMA) protocol. The physical layer must be compatible with ASTM PS111-98.

Integrate the AVI system into the operation of the WIM System. Furnish the AVI systems with hardware and software interfaces for communications with the WIM system. Design the AVI system to transmit AVI transponder information to the roadside electronics. Include the transponder ID into the roadside electronics as part of the vehicle record.

At a minimum, design the AVI system to read transponders and cause the transponder to activate red or green signals and audible alerts on the transponder. The AVI system shall be able to direct a specific trigger to a specific target transponder.

(B) AVI Reader

Install AVI readers (Telematics FP-300x or approved equivalent) at the Advance, Notification, and the Compliance Locations as shown on the Plans. Furnish readers that automatically identify passing transponders. Additionally, readers must be able to retrieve information from the transponder and instruct it to alert the driver by audio or visual means (beeps, red/yellow/green indicators, etc.).

With an accuracy of 99.95%, design the AVI reader to read and write to transponders at vehicle operating speeds up to 125 mph and correctly report the transponder ID to the WIM computer system.

Furnish AVI readers meeting the following requirements:

- voltage range: 9 to 30 VDC,
- Average power consumption: 5 W (maximum peak current 2A @ 12 VDC),
- Transmit frequency: 912 MHz to 918 MHz,
- Receiver frequency: 915 MHz,
- Data rate: 500 kbps, with ASK modulation,
- Communications interface: n EIA-232 or EIA-422, and
- Minimum data rate: 9600 baud asynchronous.

(C) AVI Antennae

Provide an antenna compatible with AVI readers described herein. Use a dipole 915 MHz antenna at the Advance, Notification, and Compliance Locations and on the ramp into the weigh station. Provide lane discrimination with the dipole antenna where transponders installed in vehicles in adjacent lanes will not be read by the antenna. This functionality is required at the Advance Location because the AVI record for the vehicle shall be matched up with the WIM and other in-lane sensors to create a complete vehicle record for processing. The functionality is

required at the Notification and Compliance Locations to clearly identify a violating vehicle's lane position and capture the image of violating vehicles using the freeze-frame CCTV camera at this location.

Provide flat panel antennae meeting the following requirements:

- Antenna type: Panel,
- Frequency: 900-060 MHz,
- Gain: 10 dB,
- Input VSWR: 1.5:1,
- Polarization: Horizontal,
- Pattern: Directional,
- Horizontal beam width: 20 degrees,
- Vertical beam width: 95 degrees,
- Lightning Protection: DC grounded,
- Bandwidth: 60 MHz, and
- Front-to-back ratio: 25 dB.

Provide antennae meeting the following environmental requirements:

- Temperature range: -40 to 158 degree F,
- Wind load velocity (no ice): 100 mph,
- Wind load velocity (1/2" radial ice): 85 mph,
- Lateral thrust (100 mph): 116 pounds,
- Torsional moment: 50 ft/lbs.

Provide AVI antenna with DC source capable of providing a required supply voltage (9 to 30 VDC) at maximum 5 W.

Provide a means for communicating with the host (serial asynchronous communication link).

(D) AVI Cable

The AVI cable shall include conductors to carry power and data. The Contractor shall determine the number and type, and size of the conductors according to the AVI reader and antenna furnished.

34.3. CONSTRUCTION METHODS

Complete an RF survey at the locations where the AVI system is to be installed. Identify with the RF survey all potential interference effects caused by permanent RF sources, operating within the same frequency bandwidth as the AVI. Report the survey results to the Department and provide recommendations on the installation of the AVI system to ensure that the system meets the requirements of these Project Special Provisions. Do not install AVI equipment until the completion of the RF survey and acceptance by the Department of AVI installation recommendations.

To remove interference effects between AVI readers, designate one of the readers as the master reader and the other reader as slave reader. A synchronization signal shall be transmitted from the master reader to synchronize readers for the purposes of removing the interference effects.

Mount the AVI readers in cabinets as identified on the Plans. Install the AVI antenna per AVI reader manufacturer's specifications. Mount the AVI antenna at a height and angle to ensure the lane coverage as identified in this Special Provision for each antenna type. At a minimum, mount the antenna at a sufficient height to meet Department requirements for vertical clearances of sign and bridge structures.

Prepare all forms and complete all necessary requirements on behalf of the Department to obtain any FCC licenses required for the AVI equipment provided under this Contract.

34.4. MEASUREMENT AND PAYMENT

AVI reader will be measured and paid as the actual number of AVI readers furnished, installed, and accepted.

AVI antenna will be measured and paid as the actual number of AVI antennas furnished, installed, and accepted.

No measurement will be made for the FCC license or of AVI cables as these will be considered incidental to furnishing and installing AVI readers and AVI Antennas.

Payment will be made under:

Pay Item	Pay Unit
AVI Reader	Each
AVI Antenna	Each

35. PIEZOELECTRIC QUARTZ SENSORS

35.1. DESCRIPTION

Furnish and install the piezoelectric quartz sensors with all necessary hardware and software in accordance with the Plans and Project Special Provisions. The piezoelectric quartz sensors shall meet or exceed the performance criteria of Type I Weigh-In-Motion (WIM) Systems, ASTM E 1318-02 Standard Specification for Highway WIM Systems with User Requirements and Test Methods.

35.2. MATERIALS

(A) Piezoelectric Quartz Sensors

Install piezoelectric quartz sensors manufactured by Kistler Instruments, or approved equivalent. Furnish piezoelectric quartz sensors that have an uncompensated temperature coefficient of sensitivity of no more than +/-0.02%/°C.

The piezoelectric quartz sensors shall automatically and accurately weigh, with the tolerances set forth herein, each axle of a multi-axle vehicle and calculate the gross weight of the vehicle by summing the individual axle weights. Each vehicle having a gross weight of 39,000 pounds or more shall be checked for compliance with the Bridge Formula Weights (23 U.S.C. 127, 23 CRF 658) as defined by the Federal Highway Administration. The piezoelectric quartz sensors shall perform these measurements and calculations while the vehicle passes over the piezoelectric quartz sensors but not to exceed 5 seconds.

The gross and individual axle weights of each vehicle shall be accurately established to within the error limits listed in Table 1. These error limits shall be maintained within a confidence level of two standard deviations (96%) for a minimum sample of 100 vehicles. The sample shall consist of a variety of multiple-axle trucks passing over the sensors at speeds ranging from a minimum of 10 mph to a maximum of 100 mph. Tank trucks, livestock, car haulers and those vehicles whose suspension characteristics are determined to affect the scale performance shall not be included in the sample nor shall trucks whose speed varies by 10% or more.

Table 1 - Piezoelectric Quartz Sensors Accuracy

PARAMETER	TOLERANCE
Single Axle Weight	± 10% of actual weight
Axle Group (2 or more) Weight	± 6% of actual weight
Gross Weight	± 4% of actual weight
Axle Spacing	± 6 inches
Vehicle Speed	± 2 mph
Temperature Coefficient of Sensitivity	-.02% per degree C

The actual weight is defined as that vehicle weight established by static weighing on a multi-platform truck scale properly operating within the appropriate tolerance as established for a Class

IIIL device as defined by the National Institute of Standards and Technology Handbook 44. The piezoelectric quartz sensors shall operate over an ambient temperature range of -40 to +134 degrees F with 10 to 100% humidity.

Supply a list of at least five installations where piezoelectric quartz sensors have been installed in similar environmental conditions with the same or higher traffic volume and speeds for a minimum of five years. Also, supply clients' contact information for the five installations.

The piezoelectric quartz sensors shall perform the following functions:

- Operate at vehicle speeds between 10 and 80 mph.
- Determine the compliance of each vehicle based on single-axle weight, axle group weight, and GVW.
- For each vehicle in excess of 39,000 pounds GVW, determine the compliance of the on-sensor vehicle with the Bridge Formula.
- Store data (including images) by truck classification broken down by day, month, and calendar year.
- The piezoelectric quartz sensor classifier/controller shall be capable of downloading all data stored on its internal or external storage device.
- The piezoelectric quartz sensor classifier/controller shall be capable of receiving executable control command.
- Suitably demonstrate that the piezoelectric quartz sensors will provide a service life exceeding 7 years. This can be provided by documented customer feedback on operating sites in use and by life cycle cost evaluation.

Attach the piezoelectric quartz sensors to a lead-in cable, which extends from the piezoelectric sensor to the equipment cabinet. The lead-in cable shall be a two-conductor 18 AWG twisted shielded cable.

(B) Sensor Sealant

Provide a sand-epoxy resin sealant/grout to secure and seal the sensor and lead-in cable into the pavement. Provide a shrink-free material that adheres to both concrete and asphalt.

Provide a sealant that meets the following requirements:

- Pot Life: 20-40 minutes at 32 degrees F,
- Minimum Curing Temperature: 46 degrees F and
- Density: 1 ounce/cubic inch.

Provide a sealant that meets the following mechanical requirements after seven days:

- Compressive strength: > 8,365 tons/ft.^{2}
- Flexural strength: > 365 tons/ft.^{2}
- Compressive strength: > 8,365 tons/ft.^{2}
- Adhesive strength on steel: > 42 tons/ft.^{2}
- Adhesive strength on concrete: > 10 tons/ft.^{2}

35.3. CONSTRUCTION METHODS

(A) General

Install piezoelectric quartz sensors as shown in the Plans and as recommended by the manufacturer.

The piezoelectric quartz sensor configurations shall consist of two sets (4 sensors in each set) of piezoelectric quartz sensors in a single traffic lane, as shown in the Plans. Each set of four sensors shall occupy the entire lane and be positioned such that each sensor set weighs one side of the vehicle thus obtaining weight information sufficient to determine any side-to-side balance condition of the vehicle.

Space the piezoelectric quartz sensors as shown in the Plans.

The piezoelectric quartz sensor slot in the pavement shall be no larger than 3.5" wide and extend no deeper than 2.8". Mount piezoelectric quartz sensors precisely flush with the surface of roadway.

Seal the piezoelectric quartz sensors and associated coaxial cable in a epoxy sealant to prevent moisture penetration. Install piezoelectric quartz sensors in such a manner that they will not be damaged by road maintenance such as snow removal. Warranty piezoelectric quartz sensors for a minimum of two years against defects in materials or workmanship.

Furnish on-site engineering consulting by the manufacturer for the installation of the piezoelectric quartz sensors.

(B) Calibration and Acceptance

Perform calibration using a single calibration truck within 72 hours of installation. The five (5) axle, test vehicle shall be of a tractor/trailer combination (3S2), complete with air ride suspension and a non-shifting static load. Load the truck to within 90 to 100% of allowable Gross Vehicle Weight for the road under test.

Conduct the calibration procedure as follows:

- Weigh the vehicle weigh using the static weigh scales. Record the weight information on the front (single axle), drive (tandem axle group), and trailer (tandem axle group). Calculate the Gross Vehicle Weight (GVW) of the vehicle by adding the three weights together,
- Measure and record the distance between the five (5) individual axles on the truck,
- Use a test vehicle and make three (3) test passes over the system under test at a selected speed, which is indicative of the truck traffic at the site. Make adjustments on site during this time to fine tune the axle spacing, and weight output of the WIM system, and
- Once all initial adjustments have been made, make two (2) additional test passes with the test vehicle to confirm the accuracy of the adjustments. If all the readings fall within the ASTM ranges for the WIM, continue the tests. If this is not the case, make additional adjustments and make two (2) more confirming passes with the test truck.

Demonstrate through the acceptance tests that the system passes all criteria according to ASTM E1318 Standard, achieving ASTM accuracy type I. Perform the acceptance test as follows:

- Using the test truck, make an additional ten (10) passes at a selected speed that is indicative of the truck traffic at the test site;
- Place all of the data into a spreadsheet with the approval of the Department;
- Calculate the mean error and standard deviation for all recorded measurements at the end of the ten (10) test passes. Perform the calculations as follows:

For weight measurements, calculate the percent error for each test pass using the following formula,

[(WIM Weight - Static Weight)/Static Weight] x 100 = % error,

Calculate the mean error for each weight type (single, group, GVW) as follows (with each weight type calculated individually),

- % errors for single, group or GVW/# of samples = Mean error,
- Calculate the error for individual axle spacings using the following formula (each of the four axle spacings calculated individually), and
- 10 of [(WIM Axle Spacings - Actual Axle Spacing)]/10 = Mean Axle Spacing Error,

- Enter all of the calculated errors into the spreadsheet;
- Check the calculated result against the acceptable range for the ASTM values. There will be one of two results;
  - If 95% of all recorded test results, (single axles, axle groups, GVW, axle spacing) fall within the ASTM specified tolerance then the system will have passed the requirements, or
  - If less than 95% of the calculated differences fall within the ASTM specified tolerance then readjust the system make and an additional ten (10) test passes to retest the system.

35.4. MEASUREMENT AND PAYMENT

Piezoelectric quartz sensor set will be measured and paid as the actual number of piezoelectric quartz sensor sets furnished, installed, and accepted. No measurement will be made for cables, amplifiers, epoxy, temperature sensors, electrical conductors, or conduit fittings as this will be considered incidental to furnishing and installing the piezoelectric quartz sensor sets.

Piezoelectric axle sensor will be measured and paid as the actual number of piezoelectric axle sensors furnished, installed, and accepted. No measurement will be made for cables, amplifiers, epoxy, temperature sensors, electrical conductors, or conduit fittings as this will be considered incidental to furnishing and installing the piezoelectric axle sensors.

Payment will be made under:

Pay Item	Pay Unit
Piezoelectric Quartz Sensor Set	Each
Piezoelectric Axle Sensor	Each

36. COMPUTER HARDWARE AND PERIPHERALS

36.1. DESCRIPTION

Install all materials with the most recently developed and approved product versions that meet or exceed all applicable standards, specifications, and requirements before the system is considered for acceptance. Ensure that all equipment features, functions, and performance measures are met.

The Engineer will provide the Contractor all workstations, servers and printer described in the section. Assemble and install new products obtained from the Engineer. **If the Contractor's system requires additional servers, the Contractor shall notify Engineer so the NCSHP can obtain the additional servers.** Provide commercial off-the-shelf materials, equipment, and components.

Install two servers, one printer, and three computer workstations in the scale house. Ensure that all workstation and servers can access the LAN and can be used to monitor, interact, and control all weigh station operations.

(A) Servers

Install servers in the scale house net rack room as described in the Plans and these Project Special Provisions. Furnish and install one application server for the weigh station operations, and one video application server. Connect the servers to the managed Ethernet switch and the respective UPS unit.

(B) Computer Workstations

Install computer workstations consisting of a CPU, monitor(s), keyboard, UPS, and mouse in the scale house scale room.

(C) Printer

Install one laser printer in the scale house scale room.

36.2. MATERIALS

All materials described in this subsection will be furnished by the Engineer off the State contract. If the equipment described herein does not meet the Contractor's requirements to support the software, then the Contractor shall add the appropriate components to do so.

(A) Servers

(1) Functional

The servers shall integrate the workstations shall enable video and data accessibility and exchange between various systems. The servers will meet the following functional requirements:

- Handle commands from system clients via ASN.1 and/or XML defined protocol over standard TCP/IP connection.
- Command underlying nodes (devices such as encoders, video servers).
- Report status of system nodes and alarms.
- Monitor system nodes connections.
- Store recent alarms in internal database.

- Receive Simple Network Management Protocol (SNMP) traps generated by network infrastructure, translate SNMP traps as system alarms, and send alarms as SNMP traps.
- Support remote configuration and diagnostics.
- Restore video and connections in case of system component restarts.
- Support protocols: TCP, UDP, NTP, and IP Multicast IGMP.

(2) Performance

The application servers will meet the following minimum requirements:

- Processer: Six core at 2.0 GHz or greater, 15 MB cache processor, Turbo, L2 cache at 1333 MHz,
- Memory: Minimum 4 GB single-ranked RDIMMS at 1333 MHz,
- Power Supply: Redundant power supplies with separate cords,
- Riser: Riser with two PICe x 8 and two PICe x slots
- Drive Controller: PERC H310 RAID controller,
- Hard Drives: 4x146 GB, 15k RPM serial SCSI drives, 6 Gbps, 3.5 inch,
- CD-ROM: DVD +/-RW SATA Drive, internal,
- Video Card: Integrated video chipset controller 8 MB SD RAM with 480 MB/s memory bandwidth and DirectX 5.0,
- Video Adaptor: SGVA,
- Mounting: Slide ready rails and cable management
- Network: Dual-port Gigabit Network Adaptor with TOE, PCIe-4, and
- Operating System: Microsoft Server 2008 Release 2 with Service Pack 2, Standard Edition and 5 CALs, and Microsoft SQL 2008 Standard Edition.

(3) Physical Features

The rack-mounted servers will be a maximum size of three RUs each.

The servers will meet the minimum following power requirements:

- Power supply: 110-130 VAC.
- Power consumption: Typical 600-800 W per power supply.

The servers will meet the following data port requirements:

- Serial: One standard serial port,
- Audio: Three jacks – channel out, line in, and microphone.
- Ethernet: Dual 1000 Base T Ethernet with RJ-45 connectors as described above and
- USB port: Six USB 2.0 ports.

The servers will have at least one direct 10/100/1000 Base T Ethernet LAN interface. The network connector will be RJ-45 for Category 5e UTP for interfacing with the Managed Ethernet switch.

(B) Computer Workstations

(1) Functional

The computer workstations will operate the central control software and the video control software over an Ethernet network in the scale house. Each computer will be provided with dual monitors.

(2) Performance

The computer workstations will meet the following requirements:

- Processor: Dual core processor at 3.10 GHz with Turbo Boost 2.0 up to 3.5 GHz or greater, 8 MB cache, L2 cache at 1333 MHz,
- Memory: 4 GB Dual Channel DDR3 SDRAM, 1600 MHz,
- Network: 10/100/1000 Base T Ethernet PCI Express with RJ-45 connector,
- Hard Drive Controller: C1, All SATA drives, non-RAID,
- Hard Drive: 500 GB SATA, 3.0 Gbp/s, operating at 7200 RPM, 8 MB data burst cache,
- CD-ROM: 16X DVD and 16x DVD+/- RW,
- Keyboard: USB 104-key model,
- Mouse: USB 3-button optical mouse with center scroll,
- Sound: 16-bit integrated audio with external speakers,
- Video Card: 128-bit, DDR3 memory interface, 2560 x 1600 digital resolution, two DVI video outputs, open GL 4.1, PCI Express 2.0 bus, DirectX 11
- Video Output: Two DVI connectors,
- Desktop Monitor Color: 16.7 million colors,
- Operating System: Windows® 7 Professional, latest version,
- Application software: Microsoft Office (latest version), Antivirus software compatible with State requirements, and DVD burning software, and
- Desktop Monitor: Two LED, 24-inch, digital flat panel display, DVI-D and HDCP display ports,
  - USB Ports: One USB upstream port and three downstream ports,
  - Resolution: 1,920 x 1,080 dpi,
  - Pixel Pitch: 0.265 mm
  - Viewing Angle: 178 degrees vertically and horizontally
  - Contrast Ratio: 1,000:1 (typical) and 10,000:1 (dynamic)
  - Brightness: 300 cd/m^2
  - Colors: 16.7 million colors.

(3) Physical Features

The computer workstations will meet the minimum power requirements:

- Input voltage: 90-135 V at 50/60 Hz,
- Output wattage: 460 W, and
- Heat Dissipation: 93.1 BTU/hour (fully loaded computer without monitor).

The computer workstations will have the following minimum ports:

- Keyboard: One USB connection,
- Mouse: One USB connection,
- Audio: Miniature phono jacks – line out, line in, and microphone,
- Ethernet: 10/100 Base T Ethernet with RJ-45 connector, and
- USB Port: At least 4 rear and 2 front USB 2.0 ports (min. 6 total)

The computer workstations will have at least one direct 10/100 Base T Ethernet LAN interface. The network connector shall be RJ-45 for Category 5e or 6 UTP for interfacing with the managed Ethernet switch.

(C) Printer

The laser printer will have the following features:

- Memory: Minimum of 16 MB of RAM,
- Communications: Ethernet 10/100 Base-T network card with RJ-45 connector, bi-directional IEEE 1284 ECP-compliant parallel interface, and one (1) open EIO expansion slot,
- Typefaces: Latest version of Windows print typefaces,
- Printer Language: PCL 6 with commands for fully integrated HP-GL/2 vector graphics and advanced imagery/special effects printing with a minimum of 80 internal and scaleable fonts,
- Printer Speed: 17 pages per minute (ppm),
- Paper Tray Capacity: 1,100 sheet capacity, and
- Tray Sizes: 8.5 x 11 inch.

36.3. CONSTRUCTION REQUIREMENTS

(A) General

Integrate all servers, workstations, and printers on the ITS LAN so all applications will be fully functional. Install the operating system, software, and antivirus software to the NCDOT IS standards.

Furnish all tools, equipment, materials, supplies, manufactured hardware, and perform all operations and equipment integration necessary to provide a complete, operational network. Mount all equipment as shown in plans in enclosed 19" communications racks. All cabling shall be:

- Neatly tagged with permanent labels at both ends of every cable,
- Secured with wire ties and cable management hardware in the communications racks, and
- Grounded to rack grounding hardware.

Ensure that all project IP addresses are assigned as defined in the System Design Report. Ensure the as-built documentation includes the identification of all IP addresses and VLANs, and associated hardware devices and device locations.

(B) Servers

Install the servers in the proposed enclosed 19-inch communications rack located in the scale house net rack room. Install the software packages described in these Project Special Provisions.

Install all software necessary to support the central control software and to meet all of the data communications requirements described in these Project Special Provisions.

Connect the existing and proposed servers to the managed Ethernet switch. Install Ethernet patch cords between the Ethernet patch panel and the managed Ethernet switch in the scale house. Plug power supplies into outlets on separate circuits. Power up and run diagnostics.

(C) Computer Workstation

Install the computer workstations in locations as shown in the Plans. Install the client software packages described in these Project Special Provisions.

Connect the workstations to the LAN by installing Ethernet patch cords between the Ethernet patch panel and the managed Ethernet switch in the scale house. Perform the following operational tests for each computer component in accordance with the test plans. After the equipment has been installed, perform the following:

- Connect all components (monitors, mice, keyboards, existing printers, network cables, power supplies),
- Install all software required in these Project Special Provisions,
- Configure network communications,
- Map network drives and existing printers,
- Run diagnostic utilities on the hardware, and
- Print test pages for each workstation on each existing printer to verify printer configuration.

(D) Printer

Install a laser printer in the scale house scale room as directed by the Engineer. Connect the printer to the Ethernet network, setup the workstations on the network to use the printer and print a test page from each printer.

36.4. MEASUREMENT AND PAYMENT

Server will be measured and paid as the actual number of servers installed and accepted.

Computer workstation will be measured and paid as the actual number of computer workstations with monitor(s), keyboard, UPS, mouse, operating system, and software installed and accepted.

Printer will be measured and paid as the actual number of printers installed and accepted

No separate measurement will be made for coaxial cables, communication cables, electrical cables, mounting hardware, nuts, bolts, brackets, connectors, risers, grounding equipment, or surge suppression, as these will be considered incidental to the pay items for servers, and workstation computers.

No separate measurement and payments for any additional equipment or components not provided by the Engineer will be considered incidental to the pay items for installing servers and workstation computers.

No separate measurement will be made for UPS units supplied with each workstation computer.

Payment will be made under:

Pay Item	Pay Unit
Server (Install)	Each
Computer Workstation (Install)	Each
Printer (Install)	Each

37. CENTRAL CONTROL SOFTWARE

37.1. DESCRIPTION

(A) General

Furnish and install central control software in accordance with the Plans and these Project Special Provisions. The system will operate automatically and continuously, without the need for human intervention, weighing and screening trucks, collecting other data, controlling the lane control signs, making that data available electronically to the operators. Furnish and install an integrated software package under this Contract, which provides, at a minimum, the functionality described in Section 1 of these Project Special Provisions and described herein.

Information security and accountability must meet Federal and State Information Security Directives, Laws, and Policies. Security Architecture must be approved by North NCSHP and the NC Department of Justice Information Security office prior to installation.

Furnish and install software that distinguishes potential weight violators from the real-time traffic stream based on automatic weight measurements that exceed the established thresholds.

Capture transponder data and ALPR data for each vehicle in the deceleration lane and entrance ramp as shown in the Plans approaching the weigh station. Furnish and install software that distinguishes high safety risk motor carriers and vehicles from the real-time traffic stream based on an automatic screening algorithm that indicates the presence of safety risks, credentials, or other criteria described in these Project Special Provisions.

(B) Screening Criteria

(1) Operation Overview

Interface the roadside operations controllers to the WIM Sorting System and preclearance program. The only vehicles that will be notified by the roadside operations system will be commercial vehicles that possess a preclearance transponder; not all other vehicles will be affected. The ROS system must match the data structure used of the existing Hillsborough roadside operations system so the Department can use their existing data transfer procedures. The system must be upgradeable to the newest version of SAFER.

The roadside operations system will provide two-way communications between vehicle-mounted active transponders and a roadside-based reader unit. The roadside operations system shall have the capability to read transponders and cause the transponder to activate red or green signals and audible alerts on the transponder. The roadside operations system shall be able to direct a specific trigger to a specific target transponder.

The roadside operations system interfaces to three locations: Advance, Notification, and Compliance locations.

The advance location purpose is to read transponders of specific carriers. Carrier identification is obtained from the transponder at this location. This information is cross-referenced with valid transponders in the preclearance system to determine credential and load information.

As the driver passes the notification location, the preclearance system will send a signal to the in-cab transponder, which conveys the response. This notification is presented to the driver

visually and/or audibly. The driver will either receive a green light to bypass the weigh station or a red light and audible sound to enter the weigh station.

The final AVI location that a preclearance user will encounter is the Compliance location. This location is used to verify that the user has performed the action as communicated to them via their transponder.

If a commercial vehicle continues down the mainline, bypassing the weigh station exit ramp, the vehicle will pass by a sensor configuration of loop-axle sensor-loop -axle sensor-loop. This sensor configuration is used for the purpose of vehicle tracking and data collection. An alarm will sound on the scale house manual console in the event that a commercial vehicle bypasses an "open" station.

Provide a roadside operations system that consists of three major components:

- A snapshot database containing a local copy of CVIEW and SAFER data,
- A credential processing and screening software algorithms, and
- A Windows-based graphical user interface (GUI) for accessing the snapshots and credential screening components.

The specific major functions fulfilled by the baseline roadside operations software are:

- Record all vehicle characteristics in a database,
- Produce reports of recorded vehicle characteristics,
- Screen vehicles for credential violations,
- Screen vehicles for safety violations,
- Screen vehicles using operator defined hot lists,
- Allow duly authorized operators to adjust screening criteria, and
- Allow the operator to view vehicle screening results and CVIEW snapshot information.

The software must maintain a configurable number of months, minimum of 3 months, maximum of 12 months, of historical vehicle data for analysis and reporting. Purge this data from the system on a weekly basis (i.e., once per week the software will examine all of the vehicle records to determine which are older than the specified expiry period and delete them from the database). The day and time at which this purging takes place shall be configurable by a system administrator. Set the purging to occur normally during Saturday or Sunday or during some other time when the weigh station is not busy.

(2) Roadside Operations System Characteristics

a) Roadside Operations Requirements

Provide the roadside operations system with the following functions:

- Vehicle screening,
- Vehicle display,
- Vehicle reporting,
- CVIEW interface, and
- Station controls (CMS, VMS, LCS1, LCS2, static scales)

Furnish the roadside operations system to produce printed reports detailing vehicle activity at the weigh station. This function is known as vehicle reporting.

Furnish the roadside operations system to provide an interface to the state CVIEW system to update the local credential and safety database. This function is known as the CVIEW interface.

Furnish the roadside operations system maintain a vehicle record for each vehicle entered into the system.

Furnish the roadside operations system vehicle record to contain the following information about each vehicle (when available):

- Unique vehicle identifier,
- Vehicle number,
- Time and date stamp,
- Lane,
- Axle counts,
- Vehicle classification,
- Overall vehicle weight,
- Maximum gross vehicle weight,
- Vehicle length,
- Error code,
- Vehicle speed,
- Axle record type,
- ESAL value,
- Screening decision,
- Transponder ID from DSRC transponder,
- Vehicle identification number from DSRC transponder,
- Carrier ID from DSRC transponder,
- Carrier ID (USDOT number) from CVIEW data,
- Axle weights, and
- Axle spacing.

Retain a configurable number of months in the roadside operations system, minimum 3 months, and maximum 12 months, of historical vehicle records.

Interface the roadside operations system to the CVIEW system for receiving commercial vehicle data as described below.

b) Screening Requirements

Design the roadside operations system to maintain an operator-defined hot list of carriers that are required to report to the scale house regardless of their weight or safety credential status.

Include on the carrier hot list an active date range for each entry defining the period in which the entry is valid.

Include the following information on the carrier hot list:

- Carrier ID,
- Comments – the user can enter what action to take when the vehicle reports or any other information that would be useful,
- Start date – when the hot list status starts, and
- End date – when the hot list status ends.

Design the roadside operations system to maintain an operator-defined hot list of vehicles that are required to report to the scale house regardless of their weight or safety credential status.

Include on the vehicle hot list an active date range for each entry defining the period in which the entry is valid.

Include the following information on the vehicle hot list:

- Vehicle ID (which could be the VIN or license plate number),
- Comments – the user can enter what action to take when the vehicle reports or any other information that would be useful,
- Start date – when the hot list status starts,
- End date – when the hot list status ends, and
- Jurisdiction – identifies registering jurisdiction.

Program the roadside operations system to maintain a local database of carrier snapshot data received from CVIEW.

Program the roadside operations system to maintain a local database of vehicle snapshot data received from CVIEW.

Program the roadside operations system to permit the operator to override each specific credential/safety screening check on a carrier-by-carrier basis. Any credential or safety item that is overridden is not checked as part of the screening process for the designated carrier.

Program the roadside operations system to permit the operator to override each specific credential/safety screening check on a vehicle-by-vehicle basis. Any credential or safety item that is overridden is not checked as part of the screening process for the designated vehicle.

c) Display Requirements

Program the roadside operations system to provide a screening results display screen that permits the operator to do the following:

- View the credentials and safety scores that were used in screening a particular vehicle,
- Display which credentials and safety scores failed,
- Display which credentials and safety scores a vehicle is currently failing (if the operator requested updated snapshot data from CVIEW, the screening results may no longer be accurate), and
- Display whether the vehicle was directed to report as a result of appearing on a particular hot list.

Design the roadside operations system to permit an operator with the proper authority to:

- Specify which credentials and safety items to use to screen vehicles,
- Enable or disable each individual screening criteria,
- Enter a minimum/maximum allowable value to be used for each safety item while screening vehicles,
- Save a default configuration of screening criteria to be recalled at some point in the future,
- Quickly and easily return all credential and safety score screening criteria to their default values,
- Permit the operator to retrieve current vehicle and carrier snapshot data from CVIEW and store it in the local database,
- View snapshot data retrieved from CVIEW for any requested vehicle or carrier.
- Restrict access to system functions with a user identification and password scheme. The adjustment of screening criteria in particular must be restricted to only personnel with the required privileges,

- Produce reports on vehicle data,
- Permit the operator to view all historical, vehicle data for any vehicle that has passed through the station in the last three months, and
- Edit each of the hot lists.

d) Reporting Requirements

Program the roadside operations system to produce the following reports:

- CLASS BY HOUR: showing the count of vehicles in each class for each hour of the day,
- CLASS BY DAY: showing the count of vehicles in each class for each day of the week,
- SPEED BY CLASS: showing the count of vehicles in each speed range for each class of vehicle,
- SPEED BY HOUR: showing the count of vehicles in each speed range for each hour of the day,
- FRONT AXLES: showing the count of all front axles recorded within different weight ranges for each vehicle class,
- SINGLE AXLES: showing the count of all single axles recorded within different weight ranges for each vehicle class,
- TANDEM AXLES: showing the count of all tandem axles recorded within different weight ranges for each vehicle class,
- TRIDEM AXLES: showing the count of all tridem axles recorded within different weight ranges for each vehicle class,
- QUADREM AXLES: showing the count of all quadrem axles recorded within different weight ranges for each vehicle class,
- GROSS VEHICLE WEIGHT: showing the count of vehicles in each Gross Vehicle Weight range for each vehicle class. Display the total GVW in a separate column,
- ERRORS: showing the hourly count of vehicle display errors reported by the system,
- TOTAL ESAL: showing the hourly summary of Equivalent Single Axle Loads for each vehicle class,
- LANE COUNT: showing the count of vehicles in each class for each lane at the weigh station,
- WEIGHT VIOLATION BY CLASS: showing for each vehicle class, the total vehicle count, the number of valid vehicles, the number of warning vehicles, the number of violating vehicles, what percentage of the total was violating, the number of single axle violations, and the number of tandem axle violations,
- WEIGHT VIOLATION BY HOUR: showing for each hour of the day, the total vehicle count, the number of valid vehicles, the number of warning vehicles, the number of violating vehicles, what percentage of total was violating, the number of single axle violations, the number of tandem axle violations and the number of GVW violations, and
- WEIGHT VIOLATION COUNT: showing for each hour of the day and each vehicle's class, the total vehicle count, the number of valid vehicles, the number of warning vehicles, the number of violating vehicles, what percentage of total were

violating, the number of single axle violations, the number of tandem axle violations and the number of GVW violations.

Program the roadside operations system to produce two specific reports that are based on data stored in the roadside operations system. These reports include:

- Number of vehicles traveling down each lane, and
- Listing of a carrier's vehicles passing the station during a specific period, include when the vehicle passed the station, whether it was given a bypass or report signal, and the reason a report signal was given.

e) Intra-State Credential Enforcement Screening

All of the Intra-State credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen:

- Direct a vehicle to report if the vehicle's Intra-state vehicle registration expired prior to a user-definable number of days ago,
- Direct a vehicle to report if the vehicle's measured GVW is greater than the vehicle's registered GVW plus 1000 lbs,
- Direct a vehicle to report if the vehicle is registered to use six axles and the WIMS detects fewer than six axles and the vehicle's measured GVW is greater than 73,280 lbs, and
- Direct a vehicle to report if the Intra-state enforcement registration is suspended.

Program the roadside operations system to display the registered weight of the vehicle at the operator workstation.

f) Single State Registration System (SSRS) Credential Enforcement Screening

All of the SSRS credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen:

- Direct a vehicle to report if the carrier has an MC (ICC) number in CVIEW and does not have an SSRS credential in State. When the MC or ICC numbers are eliminated, the same rule will apply with the USDOT number,
- Direct a vehicle to report if the SSRS credential is suspended, and
- Display the HazMat status in SSRS at the operator workstation to aid in operator inspections.

g) Exempt Credential Enforcement Screening

All of the exempt credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen:

- Direct a vehicle to report if the vehicle's Exempt credential is revoked, and
- Direct a vehicle to report if the vehicle's Exempt credential is cancelled.

h) HazMat Credential Enforcement Screening

All of the HazMat credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen:

- Direct a vehicle to report if the vehicle's HazMat credential is revoked,
- Direct a vehicle to report if the vehicle's HazMat credential is suspended,
- Direct a vehicle to report if the vehicle's HazMat status is expired,
- Use a separate random screening adjustment to decide whether to direct vehicles with HazMat credentials to report. This random screening is used to direct a percentage of vehicles to report when no other screening rule results in an inspection, and
- Display the HazMat permit number and type at the operator workstation to aid in operator inspections.

i) IRP Credential Enforcement Screening

All of the IRP credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen. IRP enforcement only applies to inter-state carriers.

- Direct a vehicle to report if the vehicle's IRP credential expired prior to a user-definable number of days ago,
- Direct a vehicle to report if the vehicle's IRP credential is suspended,
- Direct a vehicle to report if it is an out-of-state vehicle, the measured GVW is greater than 26,000 lbs. and it does not have an IRP credential,
- Direct a vehicle to report if the GVW measured by the WIM is greater than the IRP registered GVW plus 1000 lbs.,
- Direct a vehicle to report if the vehicle is registered to use six axles and the WIM detects fewer than six axles and the WIM measures a GVW greater than 73,280 lbs., and
- Direct a vehicle to report if the HVUT status is unsatisfactory.

j) IFTA Credential Enforcement Screening

All of the IFTA credential enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen. IFTA enforcement only applies to inter-state carriers.

- Direct a vehicle to report if the IFTA credential is suspended for the carrier,
- Display the reason for suspension of a carrier's IFTA credential at the operator workstation,
- Direct a vehicle to report if the IFTA credential for the carrier expired prior to a user-definable number of days ago, and
- Direct a vehicle to report if the carrier is an out-of-state carrier and no IFTA credentials are found for the carrier.

k) Safety Enforcement Screening

All of the safety enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen.

- Direct a vehicle to report if the SCE/ISS safety score is greater than an operator defined threshold for screening,

- Display the vehicle SAFESTAT score at the operator workstation,
- Exclude a vehicle from the random pull-in process if the vehicle has a current CVSA decal in the vehicle snapshot and the vehicle does not have a current HazMat credential,
- Direct a vehicle to report if the carrier is designated as currently OOS, and
- Direct a vehicle to report if the vehicle has been designated as OOS within the last user-definable number of days.

l) Oversize/Overweight Enforcement Screening

All of the oversize/overweight enforcement screening items identified below shall be capable of being enabled and disabled by the operator in the screening setup screen and the vehicle display screen.

Direct a vehicle to report if the vehicle has a current over-width permit and the WIM measured gross vehicle weight (GVW) is greater than the empty weight on the permit plus a user settable tolerance,

Direct a vehicle to report if the WIM measures a vehicle length greater than the length allowed in any current over-length permit for the vehicle,

Direct a vehicle to report if the over-height detection feature of the WIM is disabled and the vehicle has a current over-height permit and the WIM measured GVW is greater than the empty weight on the permit plus a user settable tolerance,

Direct a vehicle to report, regardless of any current over-height permits issued for the vehicle, if the WIM makes an over-height determination,

Direct a vehicle to report if the WIM measures a GVW that is equal to or greater than the GVW permitted in any current over-weight permits for the vehicle,

Direct a vehicle to report if the vehicle fails the bridge formula for legal sized loads and does not have a current oversize/overweight or overweight permit,

Treat vehicles with a current single trip or annual permit that have a WIM measured GVW less than the empty vehicle permit weight plus a user settable tolerance as if the vehicle does not have a permit. Specifically, the vehicle will be checked using "legal" height, weight, and length settings and will be directed to report if any legal settings are violated.

Direct a vehicle to report if the vehicle does not have a current single trip permit and it has a current annual permit with a height, width, length or weight category greater than the user specified maximums for reduced restrictions and a current route approval does not exist and the empty permit weight has been exceeded by more than a user settable tolerance, and

Direct a vehicle to report if the vehicle has a current annual permit and no current single trip permit and the vehicle violates any of the following:

- the WIM measured distance between any 2 axles is less than the minimum allowed for annual permits where the minimum is user settable,
- the WIM measured distance between the steering axle and the next axle is less than the minimum allowed for annual permits where the minimum is user settable,

- the WIM measured distance from the front axle to the rearmost axle is greater than the maximum allowed for annual permits where the maximum is user settable,
- the WIM measured spacing on any tridem is greater than the maximum allowed for annual permits where the maximum is user settable,
- the WIM measured spacing on any quadrem is greater than the maximum allowed for annual permits where the maximum is user settable,
- the WIM measured spacing on any tandem is greater than the maximum allowed for annual permits where the maximum is user settable,
    - the permit is an "overweight" or "oversize/overweight" permit and the number of axles detected by the WIM is less than the minimum number allowed for annual permits where the minimum is user settable, and
    - the permit is an "overweight" or "oversize/overweight" permit and the number of axles detected by the WIM is greater than the maximum number allowed for annual permits where the maximum is user settable;
    - Direct a vehicle to report if the vehicle has a current single trip permit or a current annual permit with an approved route that required actual axle spacings and axle group weights to be specified and the vehicle violates any of the following,
        - Axle spacing detected by the WIM is greater than the axle spacing on the permit plus a user specified tolerance,
        - Axle spacing detected by the WIM is less than the axle spacing on the permit minus a user specified tolerance, and
        - Axle group weights detected by the WIM are greater than the axle group weights specified on the permit;
    - Allow the weight tolerance for permits to be adjusted in a way similar to how the weight tolerance for non-permitted vehicles is adjusted in the existing system,
    - Direct a vehicle to report if the vehicle has a current single trip permit or a current annual permit and the weight distribution on the axles within any axle group is uneven and it is uneven by more than a user specified tolerance,
    - Allow a user to enter the maximum single axle weight that is allowed for each axle group (single, tandem, tridem, quadrem) in each of the annual permit axle load weight categories (A, B, C),
    - Direct a vehicle to report if the vehicle has a current annual permit and no current single trip permit and the WIM detected axle group weights exceed the maximum for the annual permit axle load weight category specified in the route approval or in the annual permit, if no route approval exists,
    - Allow a user to enter the maximum GVW that is allowed for a vehicle in each of the annual permit axle load weight categories (A, B, C) when the vehicle has 5 axles, 6 axles, 7 axles with 2 tridem groups, 7 axles with tandem and quad groups, or 8 axles, and

- Direct a vehicle to report if the vehicle has a current annual permit and no current single trip permit and the WIM detected GVW exceeds the maximum allowed for the vehicle's axle configuration in the annual permit axle load weight category specified in the route approval or in the annual permit, if no route approval exists.

(C) External Interface Requirements

Program the roadside operations system to support the receipt of carrier and vehicle snapshot data from the State CVIEW system.

Program the roadside operations system to continue normal operation while receiving and processing files from the state CVIEW system and to support the processing of data at a rate to be determined, but which may be as often as an update every 15 minutes.

(D) Operator Interface and System Controls

(1) General Operation

A system operator shall be able to view and control system operations via the workstations; two located in the scale house and one located in the static scale booth. Using a workstation, the operator will view vehicle data collected by each of the detectors and sensors in the system, view, and print reports, identify and respond to system alarms, view freeze-frame images of violating vehicles and control the pull-in multipliers. At a minimum, the operator display screens shall allow the system operator to view the following information:

(2) ALPR Data

Vehicle records for the screening system. Program the system to show data and images collected.

(3) Transponder Data

Vehicle records for the screening system. Program the system to show data and images collected.

(4) Vehicle Queue Data

Design the system to allow operators to view vehicle records for each of the queues at the weigh station (left lane static scales, right lane static scales, and ramp bypass queue. Program the system to show data collected by the mainline and in-station detectors and the piezoelectric quartz sensors.

(5) Individual Vehicle Data

Program the system to display all information on a specific vehicle collected by the new equipment installed on the Interstate as well as all ramp equipment. Have the system identify why a vehicle was not provided mainline bypass (i.e. no transponder, overweight, over-height, etc.). Program the system to allow operators to view snapshot photographs taken of vehicles via the ALPR's freeze-frame CCTV camera at the Advance Location and AVI reader. Program the system to allow operators to view all credential information (for transponder-equipped vehicles).

(6) Alarms

Program the system to allow operators to review alarms reported by the Advance Location and the Compliance Location and to allow operators to view snapshot photographs taken by the freeze-frame CCTV camera of violating vehicles at the Compliance Location.

(7) Back-Up Types

- Static Scale Queue > 4, increase weight threshold to 110% automatically. When < 3 weight threshold, return to original setting,
- Report Lane Loop on > 30 seconds, automatically bypass vehicles. Operator manually re-opens report lane when queue has shortened, and
- Ramp WIM Loop > 30 seconds, automatically close the station. Operator manually re-opens station when queue has shortened.

(8) Summary Data

Program the system to allow operators to review summary data for all lanes equipped with system devices. Have the summary data include total vehicle counts, vehicle classifications, vehicle speeds, gross vehicle weights (by category), axle weights, and system violations (by type including weight, length, over-height, and credentials).

(9) Periods of Inactivity

Design the workstation software interface such that following a user-specified period of inactivity (i.e., no keystrokes and no mouse movements) such that the operator workstation will lock out. An operator may regain access by 1) either striking any key or moving the mouse, and 2) entering a valid user ID, and 3) entering the appropriate password for the user. The user will then be immediately reconnected to the WIM system. Protracted delays and/or multiple steps, beyond those just described, to reconnect the operator workstation to the WIM system are unacceptable.

(E) System Reports

Design the software to provide all of the reports available from the existing system software and to provide the following additional reports for the new system components, as a minimum:

- Violations,
- ALPR record data
- Transponder data,
- Classification (by hour, by day of the month and by day of the week),
- Vehicle speed (by class and by hour),
- ESALs (Equivalent Single Axle Loads) by Hour,
- Weight violations (by hour and by class),
- Weight violations count,
- % of transponder-equipped vehicles,
- % of vehicles bypassed by the mainline equipment,
- % of vehicles bypassed by the in-station equipment,
- Truck count (by day of the month and by day of the week),
- Truck count by gross vehicle weight,
- Vehicle speeds (by class and by hour),
- System errors (errors reported by system diagnostics),
- Vehicle heights (by class and by hour), and
- Vehicle lengths.

(F) Database Queries

Design the software to provide an operator at any operator workstation the ability to perform data queries on any database item and combination of database items. Furnish the ability to view the results of database queries on the operator workstation screen and to print optionally the database queries on the laser printer in a format acceptable to the Department.

(G) System Updates

During the course of project construction, as system components are made operational and brought online for the weigh station, perform software updates. Continue to update the WIM software of the weigh station throughout the project and through to the end of the warranty period.

37.2. MATERIALS

Provide reproducible copies of all software on CD-ROM. Furnish all software pre-installed on workstation, roadside operations controllers, and WIM server hardware prior to installation. Provide source code for the portions of the software that must be changed in order to change the screening criteria.

WIM server, roadside operations controllers, and WIM electronics hardware used to run the software described in this Special Provision is accounted for in other specifications in this document.

Provide mockups for all operator screens and system reports prior to generating/developing the screens and reports. Make changes to the report formats and screen views based on the Department's comments.

37.3. MEASUREMENT AND PAYMENT

Central control software will be paid for at the contract lump sum price for central control software including the roadside operations and WIM software.

NCSHP will supply the necessary Oracle tools to compile screening criteria portion of software.

Payment will be made under:

Pay Item	Pay Unit
Central Control Software	Lump Sum

38. AUTOMATED LICENSE PLATE RECOGNITION (ALPR) SYSTEM

38.1. DESCRIPTION

Furnish, install, and integrate a license plate recognition system that will automatically detect the presence of commercial vehicles on the exit ramp at the I-85 northbound Weigh Station; capture an image containing the license plate; provide an overview image of the vehicle and automatically locate and identify the corresponding alphanumeric information and jurisdiction/location of issue.

Ensure the software is compatible with Windows 7 operating systems.

The ALPR system must be capable of producing an ALPR image and an overview image of the passing commercial vehicles.

Integrate the ALPR system with the screening software. Provide at least one reference from an accredited law enforcement agency currently using the proposed ALPR system.

Furnish an ALPR system that automatically captures, identifies, and looks up alphanumeric code, state of origin, and county of origin as available from the CVIEW database. Configure the system to identify and differentiate plates by jurisdiction from the following states (as a minimum):

1) North Carolina
2) South Carolina
3) Virginia
4) Florida
5) Georgia
6) Tennessee
7) Indiana
8) Pennsylvania
9) Illinois
10) Ohio
11) Texas
12) New Jersey

The system must provide effective license plate capture at night using IR illumination and no other external lighting source.

Furnish ALPRs that can identify and interpret a minimum of two license plates simultaneously in the field of view.

Furnish an ALPR system with a plate read rate better than 80% (all characters correctly read for 80% of readable license plates) at speeds up to 60 miles per hour.

Provide a system with an operator interface to include database remote query functionality for multiple ALPR state locations and multiple databases.

Automatically screen the PRISM status of the CMV carrier and vehicle to determine if a Federal out-of-service order has been issued against the carrier or if the vehicle has been targeted.

Automatically screen and retrieve the carrier safety information from the SAFER screening database.

Automatically screen against North Carolina's FuelTaCS database of targeted vehicles.

Automatically screen the NCIC database of vehicles that have been reported stolen.

Uniquely display each vehicle record associated with the screening components of the ALPR.

Maintain an operator-defined hot list of carriers regardless of their weight or safety credential status.

Include a carrier hot list with an active date range for each entry defining the period in which the entry is valid.

The system must provide the following reports in addition to the existing reports: targeted as Federal out-of-service by the PRISM file; targeted vehicles from the FuelTaCS file; vehicles reported stolen by NCIC.

38.2. MATERIAL

(A) Camera

Furnish one side fired overview and one overhead ALPR camera per lane as shown in the Plans that complies with the following:

- Dual lens camera incorporating high-resolution monochrome and color.
- Self-illuminating Infrared (IR) illumination utilizing driver safe non-visible light (no less than 800nm).
- Capable of being "pulsed" as needed.
- Provide documentation that the camera illumination is certified to be "eye safe" by the IR manufacturer.
- Enhanced low light resolution (4 MP or higher).
- Produces at a minimum, a single license plate image per vehicle with varying flash, shutter, and gain settings to ensure a high quality image regardless of weather or lighting conditions.
- Operates during typical rain and snow events.
- An overview camera with day/night capabilities is required. Image must be integrated with the ALPR image taken by the ALPR camera. Night overview images will be black and white. Daylight images will be in color.
- The camera is triggered by an embedded loop in the roadway.

(B) Mounting Bracket

Provide the camera-mounting brackets to be a horizontal arm when mounted on vertical pole, which meets the following requirements:

- Cable feed through hole,
- Designed to mount on a vertical pole,
- Maximum supported weight: 40 lbs.,
- Separation between center of camera housing and pole: 15 inches,
- Attachment to pole: Minimum of two (2) stainless steel bands, approximately five inches apart,
- Pan adjustment: Unlimited (360 degrees),

- Tilt adjustment: +/- 75 degrees, and
- Housing: All aluminum with polyester powder coat finish

(C) ALPR System Software

Integrate the ALPR System Software into the screening system. Furnish the ALPR system software meeting the following requirements:

- Provide variants of the Optical Character Recognition (OCR) engine that are designed specifically for NC and regional license plates.
- Utilizes internal camera controls to facilitate automated settings for optimum flash, gain and shutter configurations.
- Integrates into a wide variety of systems via TCP/IP Ethernet with socket and FTP protocols, as well as IP connectivity.
- Offer standard software JPEG compression.
- Captures a live, corresponding color overview image (B/W at night) of the vehicle and simultaneously displaying the captured license plate, along with the date and time stamp of the image and a percentage confidence rated for each license plate. The confidence level is defined as the percentage of time that an interpretation of that confidence will be correct. For example, an interpretation with a confidence of 95 percent should be correct 95 percent of the time.
- Provides a permanent record of all interpretations and captured images in a chronological order at a rate of up to 45 images per minute as determined by the operator. The operator can directly input whether the interpretation is correct while viewing the image. The system must keep a record of the operator inputs.
- The operator can directly input whether the License Plate interpretation is correct while viewing the image. Operator interface that allows reviewing and modifying license plate records associated with each vehicle record.
- Decode license plate numbers into a digital string and associate the captured image and license plate number into a single vehicle record file with the WS data.
- Provide a still image capture of each commercial vehicle for identification purposes; include the original image of the license plate number in the field of view.
- Attaches unique identifying information to each license plate number image capture in order to ensure data integrity and proper vehicle image association with other screening system data collected.
- Provides a system with an operator interface to include database remote query functionality for multiple ALPR station locations and multiple databases.

(D) Camera Housing

Furnish the camera housing to meet the following requirements:

- LPR camera enclosure must be rated IP-65 or higher.
- Equipped with tempered glass front window.
- Equipped with sunshield.
- Equipped with surge suppressors on all ungrounded conductors.

Include mounting hardware to match mounting bracket. Provide mounting hardware specifically for the vendor's ALPR.

(E) ALPR Cable

The overheight cable shall include conductors to carry power and data. The Contractor shall determine the number and type, and size the conductors according to the overheight detector furnished.

38.3. CONSTRUCTION METHODS

Comply with the manufacturer's recommendations for installation, conforming to the *Standard Specifications* and the following requirements:

- Install the overview camera on the metal pole supporting the overhead mast arm.
- Install the APLR camera on an overhead metal mast arm.
- Install cameras with a fixed focal point or target distance.
- Furnish all cabling and camera connectors from the same manufacturer as the ALPR system.

38.4. MEASUREMENT AND PAYMENT

ALPR system will be measured and paid as the complete ALPR system furnished, installed, integrated, and accepted. This payment will be for all equipment, software, and integration required for detecting and screening commercial vehicles.

No separate measurement will be made for the APLR cameras and overview cameras, database search engines, software, IR illumination, ALPR cables, connectors, attachment assemblies, condulets, grounding equipment, surge protectors, or any other equipment required to install the ALPR system as these will be considered incidental to furnishing and installing the ALPR system. Metal mast arm poles will be paid for separately.

Payment will be made under:

Pay Item	Pay Unit
ALPR System	Lump Sum

39. WEIGH STATION ELECTRONICS

39.1. DESCRIPTION

Design and install the WIM electronics, along with inductive loops, piezoelectric axle sensors, piezoelectric quartz sensors, over-height vehicle detector, and AVI reader to work as a single, integrated system in the creation of a vehicle record, and in the processing of commercial vehicles. The WIM electronics shall collect and process data and control various roadside devices. It shall include any vendor specific hardware and firmware to communicate with the various sensors and detectors and collected for transmission to either the roadside computer or a server. The data shall be transmitted over an Ethernet network on single mode fiber-optic cable to the scale house.

Furnish and install the WIM electronics with all necessary hardware and software in accordance with the Plans and Project Special Provisions.

39.2. MATERIALS

(A) General

Furnish the WIM Electronics with the interface, signal conditioning for the in-road sensors, an integral power supply within a single chassis, and integrate a roadside computer. Provide all material necessary for set-up and operation of the system, including all mounting hardware and cabling. Provide the system with the required software pre-loaded so that it will automatically execute when the system is powered up. Make the electronics modular in design to facilitate easy maintenance, troubleshooting and on-site servicing.

(B) Frame Grabber

Furnish a frame grabber card inserted in the roadside controller where necessary. When triggered by the roadside controller software, design it to capture a frame of the video coming from the ALPR overview camera, digitizing it and storing it in memory.

(C) Advance Location

Unless otherwise specified, provide and integrate the following:

- Roadside controller ,
- Frame grabber,
- Interfaces for piezoelectric sensors, inductive loops, over-height detector, piezoelectric quartz sensors, and AVI readers, and
- Uninterruptible power supply.

(D) Compliance Location

Unless otherwise specified, provide and integrate the following:

- Roadside controller ,
- Frame grabber,
- Interfaces for the piezoelectric sensors, inductive loops, over-height detector, piezoelectric quartz sensors, and AVI readers, and
- Uninterruptible power supply.

(E) Scale House

Unless otherwise specified, provide and integrate the following:

- Servers and workstations and printer,
- Roadside operations controller to interface with roadside devices,
- Two operator workstations for weighing operations and one workstation for CCTV monitoring,
- Interfaces for the scales, loops, sensors, signs, and manual control panel, and
- Uninterruptible power supply.

Interface the server and workstations to the central control system, which together shall contain the central database that maintains vehicle records and provides the bypass screening logic as defined in the section, "Central Control Software" receiving, transmit and process AVI credentials information from the North Carolina Statewide CVISN database with these systems as well.

39.3. CONSTRUCTION METHODS

Prior to installing the WIM electronics, submit and receive approval of a plan for installing the new equipment. In addition, successfully complete the pre-installation test at the Contractor's facility (see the section, "Testing and Acceptance") on the new equipment and software.

39.4. MEASUREMENT AND PAYMENT

Advance location WIM electronics will be paid at the contract lump sum price for advance location WIM electronics. Contract work includes the roadside operation controller, software, frame grabber, and interfaces for: piezoelectric axle sensors, piezoelectric quartz sensors, inductive loops, the over-height detector, and AVI readers. The work includes all materials, electrical conductors, integration, documentation, and testing. The work includes all WIM electronics required at the notification location.

Compliance location WIM electronics will be paid at the contract lump sum price for compliance location WIM electronics. Contract work includes the roadside operation controller, software, frame grabber, and interfaces for: piezoelectric axle sensors, piezoelectric quartz sensors, and AVI reader, inductive loops, uninterruptible power supply. The work includes all materials, electrical conductors, integration, documentation, and testing.

Scale house WIM electronics will be paid at the contract lump sum price for scale house WIM electronics. Contract work includes the interfaces for the roadside operation controller, inductive loops, signs, and manual control panel. The work includes all materials, electrical conductors, integration, documentation, and testing.

Payment will be made under:

Pay Item	Pay Unit
Advance Location WIM Electronics	Lump Sum
Compliance Location WIM Electronics	Lump Sum
Scale House WIM Electronics	Lump Sum

40. SUBMITTAL DATA AND DOCUMENTATION

40.1. DESCRIPTION

Provide project documentation for Department review and approval as described below.

40.2. SUBMITTALS

(A) General

The intent of this subsection of the Project Special Provisions is to provide the requirements for submittal data (i.e., shop drawings, catalogue cuts, manufacturers' literature, proposed changes to splice drawings, construction schedule, system design report, etc.) and the process by which submittal data will be reviewed.

Provide all submittal documentation in either 8½" x 11" or 11" x 17" format. No documentation smaller than 8½" x 11" will be accepted. No documentation larger than 11" x 17" will be accepted without the prior approval of the Engineer. All submittals will be reviewed and approved by the Department. Absence of comment will not grant approval.

(B) Qualified Products

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

The ITS & Signals Qualified Products List (QPL) is available on the North Carolina Department of Transportation's Website. Certain signal and communications equipment, material, and hardware shall be pre-approved on the QPL by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project. Consult the QPL Website to obtain pre-approval procedures.

(C) System Design Report

Prepare a System Design Report to describe the proposed network architecture and its configuration. Provide schematics to illustrate the network architecture and configuration, in addition to the written description. Provide a detailed description of the hardware and software to be installed. The report shall depict and describe the entire layout of the equipment and their connectivity. Provide a detailed listing of the hardware including brand and model numbers, functions and descriptions. Provide a detailed listing of the VLAN configuration and IP addresses.

Submit the report and obtain approval before providing material submittals for the following packages of items as described below: central video equipment, software, piezoelectric quartz sensors, piezoelectric axle sensors, bending plate scales, AVI antennas, AVI readers, computer hardware, and communications equipment. If the Contractor identifies a need to add equipment or components to the computer workstations or servers provided by the Engineer it must be identified in this report.

(D) Fiber-optic Splicing Drawings

Submit drawings that illustrate any proposed changes to the fiber-optic splicing details for Department review and approval at least 10 working days prior to beginning fiber-optic splicing. Do not perform any fiber-optic splicing until the Department approves the proposed changes.

(E) Submittal Requirements

Provide written certification to the Department that all Contractor-furnished material is in accordance with the contract. When requested by the Department, provide additional certifications from independent testing laboratories and sufficient data to verify item meets applicable specifications. Ensure additional certification states the testing laboratory is independent of the material manufacturer and neither the laboratory nor the manufacturer has a vested interest in the other.

The intent of submittals is to show completely the materials meet the requirements of the Plans and Project Special Provisions and how the Contractor intends to construct or configure the materials. The Contractor shall clearly demonstrate in the submittals that the desired materials shall meet or exceed the requirements of the Plans and Project Special Provisions. Each submittal shall be sufficiently complete and detailed for the Department to review and approve the submittal. If the Department deems the submittal insufficient in detail or completeness for review or approval, the submittal will be returned as rejected. Additional time will not be granted for re-submittal.

Before material submittal data begins, provide to the Department a list of all submittals with approximate dates of submission that the Contractor intends to make. It is incumbent upon the Contractor to schedule reviews in a timely manner that will not delay his schedule.

Certain groups of materials are related in function and operate as a subsystem together. To ensure individual and subsystem compliance with the project requirements materials shall be submitted as packages as follows:

Submittal Package	Description
System Design Report	See "System Design Report" subsection above.
Cabinets	Cabinets, Base Extenders, Cabinet Foundations
Fiber-optic Cable	Fiber-optic Cable, Drop Cables, Splice Enclosures, Interconnect Centers, Rack-mounted Splice Housing and Connector Housings, Splice Trays, Delineator Markers, Underground Cable Markers
CCTV Equipment*	Composite Video Cable, CCTV camera, CCTV cabinet
Video Equipment*	Encoders, frame grabbers
Communications Equipment*	Ethernet Edge Switches, Managed Ethernet Switch, (see "Communications Hardware" section of these Project Special Provisions for further requirements)
Field Infrastructure	Conduit, Junction Boxes, Electrical Service Equipment (Disconnects, Meter Bases, Combination Panels), Riser Seals, Conduit Sealing Bushings, Stainless Steel Banding Hardware, and Misc. Hardware, Lane Control

Submittal Package	Description
	Signals, signal heads, metal poles with mast arms, metal pole foundations, monotube gantry pole, pedestals (poles) and foundations for overheight detectors and freeze-frame video cameras, open/closed DMS panels,
Weighing Equipment*	Piezoelectric quartz sensors, piezoelectric axle sensors, inductive loops, overheight detectors, WIM electronics, roadside operations controller, and additional computer or server components
Truck Communication Infrastructure*	AVI antennas, AVI readers, ramp sorter signals.

* Indicates submittal packages that cannot be submitted for review until the System Design Report has been submitted and approved.

Identify all proprietary parts in Contractor-furnished material. The Department reserves the right to reject material that uses proprietary components not commercially available off-the-shelf products.

For Contractor-furnished material listed on the QPL, furnish submittals in the format defined by the QPL.

For Contractor-furnished material not on the QPL, furnish three copies of the equipment list including three copies of catalog cuts. Identify proposed material on catalog cuts by a reproducible means (highlighter pen does not transfer to copies). Ensure material lists contain material description, brand name, manufacturer's address and telephone number, stock number, size, identifying trademark or symbol, and other appropriate ratings. For submittals showing a variety of models and parts available from the manufacturer, clearly identify by circles, marking our other means the specific materials for which approval is requested.

Allocate 40 consecutive calendar days for the Department to review and respond to a submittal. Do not deviate from what is approved without approval by the Department. Do not fabricate or order material until receipt of the Department's approval. All submittals will be returned as either "Approved (as submitted)", "Approved as Noted" or "Rejected". The Contractor may proceed with fabrication or ordering for items marked "Approved". If an item is marked "Approved as Noted" without any stipulation for resubmittal, then the Contractor may proceed with fabrication or ordering. For any other notations, the Contractor shall revise the submittal, address comments and resubmit for approval.

40.3. DOCUMENTATION

(A) General

Provide all manuals and plan of record (i.e., "as-built") documentation. All as-built plans and documentation shall be reviewed and accepted by the Engineer prior to final acceptance of the project. All documentation, except as otherwise specifically approved by the Engineer, must meet the following requirements:

1. Provide final as-built plans on 11" x 17" paper along with a PDF of each as-built plan sheet. Provide draft as-built plans for Department review on 22" x 34" paper. No documentation for as-built plans smaller than 11" x 17" will be accepted.
2. Provide any documentation that exceeds the size of 11" x 17" paper in a reproducible format 22" x 34" in size.
3. For electrical schematics and cabinet wiring diagrams not bound into printed manuals, provide paper copies at least 22" x 34" in size.
4. No non-plan documentation smaller than 8.5" x 11" will be accepted.
5. Do not fold or crease reproducibles.

As a minimum, provide the documentation described in the paragraphs below.

(B) Plan of Record Documentation

Provide as-built drawings that depict any changes of components, measurement or layout of the Plans. Show all construction changes, with the final location and depth of conduits, wiring external to the cabinet, locations of splice closures, loop locations, and SMFO cable terminations, etc., in detail in a reproducible format. Submit as-built construction changes within 10 consecutive calendar days after the Observation Period begins. Note and date each change on the drawings. Failure to revise as-built documentation to reflect current work may result in withholding of payments until the as-built documentation is brought current. The submitted as-built documentation may be field-checked by the Engineer at his discretion. If the as-built documentation is found to have an unacceptable number of inaccuracies, the Engineer may withhold payment until the as-built plans are corrected. Include all field installation including the SMFO cable network installed on the drawings.

For underground conduit systems that house communications cable, furnish the Engineer with a plan of record drawing detailing the locations of the conduit system, including junction boxes and their corresponding GPS coordinates. For directionally-drilled underground conduit systems, identify the vertical location (i.e., depth) of the conduits along the run.

Store documentation for all roadside cabinet installations in a manila envelope placed in a weatherproof holder inside the cabinet drawer. Store all documentation furnished with the cabinets, including manuals, electrical schematic diagram, and cabinet wiring diagram inside the envelope in the weatherproof holder.

For CCTV camera assemblies, provide two copies of a parts list(s) that includes serial and model numbers of all Contractor-furnished equipment prior to final acceptance. All equipment and appurtenances shall be identified by name, model number, serial number, technical support, and warranty telephone numbers, and any other pertinent information required to facilitate equipment maintenance.

The Department will provide the Contractor one electronic copy of the Plans for his use in developing the as-built drawings. Modify the original electronic file such that all changes are marked with callout boxes or other method approved by the Engineer. Any other base maps that may be necessary for the Contractor to prepare the as-built drawings in accordance with these Project Special Provisions will be the Contractor's responsibility. Use CADD conventions that are consistent with those used on the original plans.

Within 10 consecutive calendar days after the Observation Period begins, furnish one reproducible copy of the draft as-built plans in hard copy format for review. Provide draft hard copy as-built drawings on 22"x 34" bond plan sheets.

Upon receipt of review comments from the Engineer, correct any errors and make all necessary revisions to the draft as-built plans prior to final acceptance of the project. Submit final as-built plans in electronic and hard copy format. Provide final hard copy as-built drawings on 11"x 17" bond plan sheets. Provide electronic plans in MicroStation (latest release in use by the Department) format. Provide the electronic files on CD or DVD.

(C) Manuals

Provide at least five hard copies along with one electronic copy (on CD or DVD) of the manuals described below:

- Operator's manuals that contain detailed operating instructions for each different type or model of equipment. Ensure that manuals contain instructions for possible modification to equipment.
- Maintenance procedures manuals that contain detailed preventative and corrective maintenance procedures and troubleshooting procedures for each different type of model of equipment.
- Installation, operations, and training manuals for all Contractor-provided software.

The manuals provided above shall be in addition to manuals provided with and stored inside each equipment cabinet.

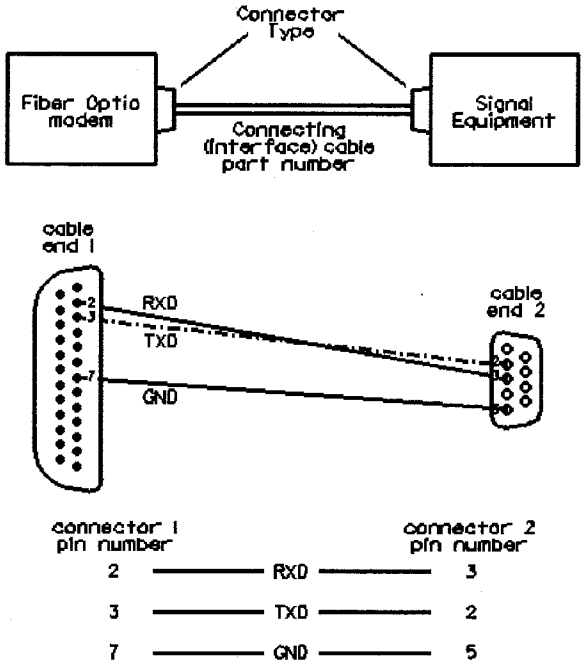
(D) Block Diagrams and Wiring Diagrams

Provide block diagrams with the material submittals for those items listed below.

- Field equipment, including ALPR system, and freeze-frame camera system
- equipment cabinets
- Roadside operations controller
- Piezoelectric quartz sensors
- Other system's boards/assemblies that help in understanding, troubleshooting, and repairing the system and/or system's components.

Provide detailed wiring diagrams that include interconnection (wired and wireless) of equipment with pin-out configurations, pin functions, and cable parts numbers. This includes configuration at each field equipment cabinet and scale house. Provide two copies of system connection diagrams showing system interconnection cables and associated terminations. Use naming convention approved by the Engineer and conforming to Belcore standards. Provide one electronic copy of the wiring diagrams in MicroStation format.

Example:



(E) Splice Diagrams

Prepare as-built splice diagrams that depict the communications cable plant as constructed. Depict the splices made at each splice enclosure by identifying spliced fiber and buffer tube. Ensure the splice diagram is in a similar format to those provided with the project Plans. Identify all expressed fibers, spare fibers, used fibers and capped fibers.

Original splice diagrams will be provided in electronic format in MicroStation format. Designate any changes to these diagrams by using a method approved by the Engineer. Furnish as-built splice diagrams in MicroStation format. Provide the electronic files on CD or DVD.

(F) Software Documentation

(1) Weigh Station Software

Furnish software manuals for the new weigh station CVISN-compatible system. For each screen, the manual shall explain the controls and parameters that are associated with the screen, including the acceptable range of parameter values; any default values that may exist; and a procedure for modifying these ranges and default values. Present these screens and messages in logical sequence.

Submit the software manual to the Department for approval. Provide five hard copy sets and an electronic copy. The manuals required by this Subsection are in addition to any material given to participants in the operator training course. The System Acceptance Test will not begin until the user's manual has been approved by the Department.

(2) Standard Software Packages

For each standard software package incorporated into the system or used to create software for that system, provide the manuals and other documentation that the software package's vendor

normally provides with the product. Deliver standard software packages on CD-ROM. Provide one set of documentation for each computer and server on which the software is installed.

Provide system software user's manuals that cover the proper use of all applications software furnished for all computers and servers. Ensure the user's manuals are written for use by personnel who have no understanding of the operation of a WIM system.

(G) Operating Procedures

Prepare a document that describes the proper operating procedures of the system. In addition to describing how an operator interacts with the system, detail the procedures by which the various WIM systems are powered up and down and the proper sequence for doing so. Describe in the procedures manual the operation of the system from the perspective of the operator sitting at the operator workstation in the scale house. Identify all of the screens and messages, including error messages, which may be seen by the operator. Present the procedures in a logical sequence.

Submit the operating procedures documentation to the Department for approval. Provide five hard copy sets and an electronic copy. The System Acceptance Test will not begin until the operating procedures documentation has been approved by the Department.

(H) Proprietary Parts

Provide a list of all proprietary, non-warranty electronic component parts, along with its associated cost, at which the vendor will supply for a two-year period after final project acceptance. Failure to supply this required proprietary part and price information may be grounds for rejection of the submitted item due to incomplete information. A part is considered a proprietary part if it is designed and manufactured exclusively for a specific application and is not commercially available for sale to the general public. In addition, any item that is sole source (e.g. available only from the vendor or from a single known manufacturer) is considered proprietary and should be identified along with the sole source. Identify and quote a price for parts that are no longer being manufactured and identify the item as one that is no longer manufactured.

(I) Use by NCDOT and Protection of Manufacturer's Proprietary Information

NCDOT will use the above documentation (schematics, drawings, software, firmware, manuals, etc.) exclusively for the following purposes: diagnosing and performing repairs on malfunctioning equipment, equipment circuit boards, and malfunctioning systems; operational test of repaired equipment, circuit boards, systems; and performing authorized upgrades to equipment, circuit boards, and software supplied under this contract. NCDOT will not use or copy devices or software for any purpose other than diagnosis, repair, and testing or to perform authorized firmware or software upgrades.

Upon notification by the manufacturer, the Department agrees not to divulge any proprietary or otherwise confidential information contained in the above required documentation. NCDOT agrees to protect and secure any proprietary documentation identified by the manufacturer as proprietary or confidential. Upon request by the manufacturer, NCDOT agrees to sign a binding non-disclosure agreement with the manufacturer or other business that is providing documentation it considers proprietary or otherwise confidential.

40.4. MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this section. Payment at the contract unit prices for the various items in the contract will be full compensation for all work covered by this section.

41. TRAINING

41.1. DESCRIPTION

Provide training for the installation, operation, and maintenance of:

- Managed Ethernet switch,
- Ethernet edge switches,
- Servers,
- Network configuration,
- Fiber-optic communications cable,
    - Fiber-optic interconnect centers,
    - Splice enclosures (aerial and underground)
    - Splice trays and other related fiber-optic equipment in accordance with the Plans and Project Special Provisions,
- CCTV field equipment,
- Digital video equipment,
- CCTV Software,
- Weigh Station hardware and software:
    - Weigh in motion electronics,
    - Roadside computers,
    - Cabinets,
    - Over-height detectors,
    - Piezoelectric quartz sensors,
    - Piezoelectric axle sensors
    - AVI Antenna/reader,
    - Freeze-frame camera,
    - Bending plate scales,
    - Inductive loop detectors,
    - Open/closed signs, and
    - Control software,
- UPS.

41.2. GENERAL

Prepare training outline, agenda, training manuals, training exercises, instructor resumes, and any other teaching aids and submit them for approval by the Department prior to conducting training. For each course, provide a training exercise to demonstrate through hands-on activities the subject matter covered in the course lecture or course section. For exercises requiring computers, furnish enough computers to have one computer per two students.

Provide all laptop computers, projectors, and projector screens needed for the training. Provide all audiovisual equipment needed for presentations and demonstrations, including video players. Furnish all power cords, extension cords, power strips and other cables required for the equipment used in the training.

Provide draft-training material to the Department for review and approval at least 60 days prior to the scheduled training. Provide adequate time for review and revision of the draft training materials. Furnish all audio-visual equipment, demonstration equipment, and "hands-on"

equipment in support of the envisioned training. Each training participant shall receive a copy of course materials including both comprehensive and presentation manuals. Assume there will be a maximum of 15 students in each class session. Provide two additional copies of these documents to the Department.

Utilize training personnel well versed in the subject matter and with extensive field experience dealing with real world problems. Utilize training personnel that have been certified by the respective manufacturers.

The Contractor shall provide the training facility. Provide the Department with a 30-day notification to carry out the training so that arrangements can be made for attendance. Coordinate a mutually agreeable date, time, and location with the Engineer. The Engineer shall approve the training schedule time and location. A "day" of training shall consist of 8 hours of training.

41.3. WEIGH STATION OPERATOR TRAINING

This training course shall train weigh station personnel to use all features and functions of the software and new hardware. Divide the training course into two parts. Conduct each part of the course twice. Provide each part of the course for up to fifteen (15) people. Provide course lengths and content as described below.

Include both classroom instruction and practical experience on the central equipment. Design the first part of the course to provide students with an introduction to the system and the theory of its operation. At a minimum, the first part of the course must include the components of the system, central software operation, and the configuration of the central and field equipment. The second part of the course shall provide each trainee with hand-on experience with the computer and WIM system and the video surveillance system. The course shall cover the operation of all software provided in this project. The course shall also cover the proper operating techniques and user maintenance procedures for each piece of equipment, including modification and/or fine-tuning of the system thresholds. Particular attention shall be paid to precautions that should be observed in operating or handling the equipment or materials.

41.4. TECHNICIAN TRAINING

Design the technician training courses to train technician-level personnel in the maintenance of Contractor-installed equipment. Extend the courses from the basic equipment operating theory to the detection and identification of malfunctions in the equipment through use of diagnostic programs and the Contractor-supplied test equipment. Include field level troubleshooting, as well as bench repair. Also, include the proper use of all test and maintenance equipment supplied in this Contract.

Provide each course for up to 15 people.

- The training shall cover all Department serviceable equipment with a separate course on each of the following categories of equipment:
- Sensors including the piezoelectric quartz sensors, piezoelectric axle sensors, bending plate scales, and over-height sensors. Provide course lengths and content as described below.
- Communication system, including fiber-optic cable and transceivers, Ethernet equipment, AVI equipment, and ramp sorting equipment. The emphasis shall be on troubleshooting. Provide course lengths and content as described below.

- CCTV system, including camera and housing maintenance, communication equipment, surge suppression, and the central equipment. Provide course lengths and content as described below.
- Threshold modification and fine tuning. Provide course lengths and content as described below.

Each training course shall consist of a presentation of the functional operation and programming of the equipment, followed by a "hands-on" workshop. A second presentation shall cover routine maintenance and troubleshooting procedures. This shall be followed by a "hands-on" workshop wherein personnel troubleshoot simulated faults to the component level. Finally, the trainees will be taken to the weigh station and given a tour, in which every cabinet (indoor and outdoor) will be opened and every component identified.

41.5. MATERIALS

Provide course lengths as follows:

Course	Type of Training	Total Students	No. of Sessions	Length (Hours)
Ethernet Communications and Networking*	Lecture and Hands-on Exercises	15	1	4
Fiber-Optic Communications	Lecture and Hands-on Exercises	15	1	4
CCTV Field Equipment*	Lecture and Hands-on Exercises	15	1	2
Digital Video Equipment*	Lecture and Hands-on Exercises	15	1	2
CCTV Central Software	Lecture and Hands-on Exercises	15	1	2
WIM Hardware*	Lecture and Hands-on Exercises	15	1	4
WIM Control Software*	Lecture and Hands-on Exercises	15	1	8
WIM Control Software*	Lecture and Hands-on Exercises	15	1	8

* Do not conduct any training on this topic until the System Design Report has been submitted for review and subsequently approved by the Department.

Provide specific training as described below.

(A) Ethernet Communications and Networking

Provide training using the test and repair equipment furnished for the project. The training session shall be presented by field service specialist(s) employed by the suppliers of the communications system components. Provide training for the Ethernet communications and networking for the following categories and for the minimum number of hours shown:

Course	Type of Training	Length (Hours)
Ethernet Communications and Networks		2
Terminology	Lecture	
Theory of design	Lecture	
Network configuration	Lecture	
VLANs	Lecture	
Equipment overview	Lecture	
Network maintenance	Lecture, Demonstration and Hands-on	
System backup, data archiving, routine procedures	Hands-on	
Troubleshooting procedures	Hands-on	
Testing	Hands-on	
System restart and recovery	Hands-on	
Question and answer session	Lecture	
Ethernet Switches (all types and configurations)		1
Introduction	Lecture	
Configuration and programming	Lecture and Hands-on	
Review of Maintenance Manual	Lecture and Hands-on	
Review of Operations Manual	Lecture and Hands-on	
Maintenance	Lecture, Demonstration and Hands-on	
Routine	Hands-on	
Troubleshooting procedures	Hands-on	
Testing	Hands-on	
System restart and recovery	Hands-on	
Question and answer session	Lecture	
Network Management Software		1
Introduction	Lecture	
Network Configuration (changes in network only)	Lecture and Hands-on	
Question and answer session.	Lecture	

(B) Fiber-Optic Cable

Provide training using the test and repair equipment furnished for the project. Provide training for the fiber-optic system for the following categories and for the minimum number of hours shown:

Course	Type of Training	Length (Hours)
Ethernet Switches – Optics		1.5
Safety	Lecture	
Introduction to Ethernet switch optics	Lecture	
Review of Maintenance Manual – optics	Lecture	
Review of Operations Manual - optics	Lecture	
Question and answer session	Lecture	
Fiber-Optic Cable System		2.5
Safety	Lecture	
Introduction to fiber-optics, theory, and principles	Lecture	
Fiber and cable types	Lecture and Hands-on	
National Electrical Code considerations	Lecture and Hands-on	
Plenum and riser type cable		
Outdoor cable, etc.		
Introduction to terminating hardware, end equipment, and applications	Lecture, Demonstration and Hands-on	
Connectors (ST, SC, LC, etc.)		
Splice enclosure, splice trays, and connector panels		
Cable placement techniques		
Question and answer session		
Cable handling and preparation (sheath removal, grip installation, etc.)	Lecture, Demonstration and Hands-on	
Splicing and terminating methods	Lecture, Demonstration and Hands-on	
Mechanical splicing using various techniques		
Fusion splicing		
Field termination of connector types		
Introduction to cable plant testing procedures	Lecture, Demonstration and Hands-on	
Proper usage of optical light generator and power meter		
Class project (build working system using cables/connectors made by attendees)	Lecture, Demonstration and Hands-on	
Question and answer session.		
Class project -- Testing and troubleshooting	Lecture, Demonstration and Hands-on	
Cable system maintenance and restoration	Lecture	

Course	Type of Training	Length (Hours)
Question and answer session.		

(C) CCTV Field Equipment

Provide CCTV field equipment training if the equipment supplied is not the exact same equipment as the City currently has. Provide training that includes operational theory and procedures of the field components of the CCTV system. This training shall be oriented towards the users and maintenance personnel of the system. The training session shall be presented by field service specialist(s) employed by the suppliers of the CCTV field components. This training session shall include exercises that should take one-half of the day. Provide training for the CCTV field equipment and the local CCTV camera software as described below:

Course	Type of Training	Length (Hours)
Operations	Lecture	1
Theory of operation	Lecture, Demonstration	
Local camera programming	Lecture, Demonstration and Hands-on	
Camera addresses		
Privacy zones		
Other features		
Maintenance	Lecture	1
Routine maintenance	Lecture, Demonstration and Hands-on	
Testing	Lecture, Demonstration and Hands-on	
Troubleshooting	Lecture, Demonstration and Hands-on	

(D) Digital Video Equipment

Provide digital video equipment training if the equipment supplies is not the exact same equipment as the City currently has. Provide training that includes operational theory and procedures of the central components of the CCTV system. This training shall be oriented towards users and maintenance personnel of the system. This training session shall include hands-on exercises that should take approximately one-half of the session. The training shall address the use of, but not limited to, the following devices: encoders, monitors, and the video server. Provide training for the digital video equipment as described below:

Course	Type of Training	Length (Hours)
Operations and theory of operations	Lecture	1
Programming	Lecture, Demonstration and Hands-on	1
Maintenance	Lecture	
Routine maintenance	Lecture, Demonstration and Hands-on	

Course	Type of Training	Length (Hours)
Testing	Lecture, Demonstration and Hands-on	
Troubleshooting	Lecture, Demonstration and Hands-on	

(E) CCTV Software

Provide CCTV central software training that includes operational theory and procedures of the central CCTV software. This training shall be oriented towards maintenance personnel of the system. This training session shall include hands-on exercises that should take one-half of the total session. Provide training for the CCTV central software as described below:

Course	Type of Training	Length (Hours)
Programming	Lecture, Demonstration and Hands-on	2
Database updates		
Adding and deleting devices		
Tours		
Macros		
Data backups		
Operator and access rights		
Alarms		
Operations	Lecture	
Theory of operation	Lecture, Demonstration	
Testing	Lecture, Demonstration and Hands-on	
Maintenance	Lecture	
Routine maintenance	Lecture, Demonstration and Hands-on	
Troubleshooting	Lecture, Demonstration and Hands-on	

(F) WIM Hardware

Provide three identical training sessions in the basic theory, operation, routine maintenance and troubleshooting of the over-height detectors, piezoelectric quartz sensors, piezoelectric axle sensors, AVI antenna/reader, ALPR, bending plate scales, inductive loop detectors, open/closed signs and other related equipment. Assume the attendees have no working knowledge of WIM equipment.

Provide training, both lecture (i.e., classroom instruction) and hands-on exercise in the use of the hardware. Provide one computer for every two students for the hands-on exercises.

The WIM hardware session shall include, but not be limited to, the following:

The lecture, demonstration, and hands-on class shall include the following sessions:

Course	Type of Training	Length (Hours)
Theory of operation	Lecture, Demonstration and Hands-on	2
Installation		
Calibration		
Testing,		
Operations	Lecture	2
Maintenance	Lecture	2
Routine maintenance	Lecture, Demonstration and Hands-on	
Troubleshooting	Lecture, Demonstration and Hands-on	

(G) WIM Control Software

Provide WIM control software training that includes operational theory and procedures of the central WIM control software. This training shall be oriented towards maintenance personnel of the system. This training session shall include hands-on exercises that should take one-half of the total session. Provide training for the WIM control software as described below:

Course	Type of Training	Length (Hours)
Programming	Lecture, Demonstration and Hands-on	8
Database updates		
Data backups		
Operator and access rights		
Alarms		
Operations	Lecture	
Theory of operation	Lecture, Demonstration	
Testing	Lecture, Demonstration and Hands-on	
Maintenance	Lecture	
Routine maintenance	Lecture, Demonstration and Hands-on	
Troubleshooting	Lecture, Demonstration and Hands-on	

41.6. MEASUREMENT AND PAYMENT

Training will be measured and paid for at the contract lump sum price for the work detailed in this section. No measurement will be made of instructors, materials, and other items required for the training as these will be considered incidental.

Payment will be made under:

Pay Item	Pay Unit
Training	Lump Sum

42. TESTING AND ACCEPTANCE

42.1. GENERAL

Conduct and complete successfully the following progressive series of tests before acceptance: field demonstration test prior to installation, installed standalone tests, system test of the network hardware, network management software and an operational test. Develop a comprehensive series of test plans for each device to determine the equipment was correctly installed and meets the requirements of materials, workmanship, performance, and functionality required in the plans and project special provisions. The test plans shall describe the functions to be tested, purpose of test, setup requirements, procedures to be followed, any inputs and expected outputs for each test, criteria for pass/fail and any required tools or test equipment. Any software testers shall be pre-approved by the Department.

Develop as part of the Test Plan a Traceability Matrix of all the individual subsystem functional requirements to be used to cross-reference each planned test to a specific contract requirement to be verified. This Test Evaluation/Traceability Matrix shall be used by the Engineer to crosscheck the functional requirements and the results.

A key element of test plans, where appropriate, is the introduction of forced errors into the functional test. The test plan shall check the actual result of the forced error against the anticipated result. Tests will be performed by the Contractor and witnessed by the Department. No deviation from the written test procedure shall be permitted without approval from the Engineer. Any changes to the approved test procedure to accommodate unforeseen events during the time of testing shall be documented in a copy of the master test procedure. Immediately following the conclusion of each test, the Department and the Contractor shall meet to agree on the results observed and recorded during the testing. This will form the basis for the conclusions reported in the test plan. All test results, notes, and observations shall be maintained in both electronic and hard copy. Maintain complete records of all test results during all stages of testing.

Test all equipment, cable, and software furnished and installed under this Contract and conduct all testing in the presence of the Department. The Department reserves the right to perform any inspections deemed necessary to assure that the equipment conforms to the requirements specified in the Project Special Provisions and Plans.

42.2. PREINSTALLATION TEST

The Contractor must conduct a test of the new equipment and software at a location near the project area in the presence of the Department. Demonstrate that all the equipment and software are working together in full compliance with the Project Special Provisions.

During the test, interconnect all the electronics and some of the sensors just as they will be interconnected at the Screening System, except that all the devices will be in the same room. Load all microprocessors with all of the software and configuration parameters that will be integrated at the Screening System.

At a minimum, test the following items:

- Roadside operations controllers and cabinets
- WIM server and workstations
- WIM electronics

- ALPR system with infrared illumination
- AVI reader system
- Freeze-frame camera equipment, including frame grabber
- CCTV cameras
- Overheight vehicle detectors
- Piezoelectric quartz sensors
- Piezoelectic axle sensors
- Inductive loops
- Lane control signals

42.3. INSTALLED SITE TESTS

Conduct an approved, standalone equipment installation test at the field site. Test all standalone functions of the field equipment using equipment installed as detailed in the plans, or as directed by the Engineer.

Complete approved test plan forms and turn them over to the Engineer for review as a basis for rejection or acceptance. Provide a minimum notice of 30 calendar days prior to all tests to permit the Engineer or his representative to observe each test.

If any unit fails to pass its stand-alone test, correct the unit or substitute another unit in its place, then repeat the test.

If a unit has been modified as a result of a standalone test failure, prepare a report describing the nature of the failure and the corrective action taken and deliver it to the Engineer prior to re-testing the unit. If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or an extension of the contract period.

Utilize vendor supplied device software to perform diagnostic tests of each device. The vendor supplied diagnostic software shall be provided to the Department before final acceptance. Test the following features of each competent as described below.

(A) Fiber-Optic Cable

Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the cable is installed and terminated. Provide written notification a minimum of ten days before beginning fiber-optic cable testing.

After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused fibers, to ensure the following:

- Fusion splice loss does not exceed 0.05 dB,
- Terminations and connections have a loss of 0.5 dB or less, and
- Reflection loss is 40 dB or greater for each connector.

Install a 1000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested.

If exceeded, remake splices until the loss falls below 0.05 dB. The Engineer will record each attempt for purposes of acceptance.

Test the fiber-optic cable at both 1310 and 1550 nm.

Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each fiber including engineering calculations demonstrating that OTDR test results meet or exceed the attenuation requirements and that optical properties of the cable have not been impaired. Clearly label each OTDR trace identifying a starting and ending point for all fibers being tested.

Provide engineering calculations and tests for fiber-optic cable that demonstrate the loss budget where the fiber originates and where the fiber meets an electronic device. The calculations shall summarize the optical losses versus the allowable losses for the communications equipment between each pair of communications hardware. Provide a summary section or spreadsheet with a labeled tabular summary showing each test segment with begin and end points and actual versus allowable losses. Label the manufacturer's make, model number, and software version of the OTDR used for testing.

Furnish one hard copy of each of the OTDR trace results and electronic copies of all trace results on a CD or DVD.

If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the cable have been impaired, take approved corrective action including replacement of complete segments of fiber-optic cable if required. Corrective action will be at no additional cost to the Department.

(B) Ethernet Communications System

Test any cable installed as part of this project per TIA 568 specifications for continuity, opens, shorts, split pairs, miss-wiring and reversed pairs. Test for DC resistance, impedance, and line capacitive loading. Correct any faults and retest. If retest fails, replace defective cable or connectors.

Once the Ethernet edge switches have been installed, conduct local field acceptance tests of the Ethernet edge switch field site according to the submitted test plan. Perform the following:

- Verify that physical construction has been completed as detailed in the Plans,
- Inspect the quality and tightness of ground and surge protector connections,
- Verify proper voltages for all power supplies and related power circuits,
- Connect devices to the power sources,
- Verify all connections, including correct installation of communication and power cables, and
- Perform testing on multicast routing functionality.

Repair or replace defective or failed equipment and retest.

Upon satisfactory completion of operational test, begin an Observation Period of 60 days prior to system acceptance.

(C) CCTV Field Equipment

Develop an operational test plan that demonstrates all requirements of the equipment and software. Submit for approval before conducting tests.

Notify the Department at least 14 calendar days prior to the proposed date for the tests. The Department shall have the right to witness such tests, or to designate an individual or entity to witness such tests.

Perform the following local field operational tests at the camera assembly field site in accordance with the test Plans. A laptop computer shall provide camera control and positioning. After completing the installation of the camera assembly, including the camera hardware, power supply, and connecting cables, the Contractor shall:

- Furnish all equipment, appliances, and labor necessary to test the installed cable and to perform the following tests before any connections are made,
- Verify that physical construction has been completed,
- Inspect the quality and tightness of ground and surge protector connections,
- Check the power supply voltages and outputs,
- Connect devices to the power sources,
- Perform continuity tests on the surveillance camera's stranded conductor element using a meter having a minimum input resistance of 20,000 ohms per volt and show that each conductor has a resistance of not more than 16 ohms per 984.3 feet of conductor;
- Measure the insulation resistance between the conductors, and between each conductor, ground, and shield using a megger. The resistance must be infinity. Perform all resistance testing after final termination and cable installation, but prior to the connection of any electronics or field devices; and
- Replace any cable that fails to meet these parameters, or if any testing reveals defects in the cable, and retest new cable as specified; and
- Verify installation of specified cables and connections between the camera, PTZ, camera control receiver, and cabinet,
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation,
- Set the camera control address,
- Verify the presence and quality of the video image in the field cabinet with a portable NTSC-approved monitor or laptop computer
- Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections, and the operation, preset positioning, and power on/off functions,
- Demonstrate the pan and tilt speeds and extent of movement to meet all applicable standards, specifications, and requirements,
- Verify proper voltage of all power supplies, and
- Interconnect the communication interface device with the communication network's assigned fiber-optic trunk cable and verify that there is a transmission LED illuminated.

Test the grounding system per ANSI/IEEE C62.41 and ANSI/IEEE C62.45 as applicable. Measure the ground impedance utilizing an instrument designed specifically to measure and document the ground impedance. Provide written test results of the ground impedance for each location to the engineer prior to backfilling the grounding electrode. The test results shall include the instrument model, date of instrument calibration, and local environmental conditions at the time of testing. Certify and sign the test results by the Contractor.

Repair or replace defective or failed equipment and retest.

(D) Digital Video Equipment

Test the components of the digital video equipment as follows:

- Check all ground, power, data, Ethernet and digital video connections,
- Run power up self test on each piece of equipment,
- Run all available vendor-supplied self-diagnostics.

(E) Weighing Subsystem Equipment

Test the components of the vehicle weighing subsystem as follows:

- Run power up self-test on each piece of equipment.
- Run all available vendor-supplied self-diagnostics.
- Calibrate and test the piezoelectric quartz sensors in accordance with "Piezoelectric Quartz Sensors" section of these Project Special Provisions.
- Calibrate and test the piezoelectric quartz sensors in accordance with "Piezoelectric Quartz Sensors" section of these Project Special Provisions.
- Test the ability for the system to read transponders, convert and lookup transponders for valid CVISN credentials.
- Test the ability for the entire weighing system including static and weigh-in motion to track commercial vehicles and identify violators who attempt to bypass scales.

Develop an operational test plan that demonstrates all requirements of the equipment and software. Submit for approval before conducting tests.

Notify the Department at least 14 calendar days prior to the proposed date for the tests. The Department shall have the right to witness such tests, or to designate an individual or entity to witness such tests.

42.4. SYSTEM TESTING

(A) General

Conduct tests as described below of the WIM, ramp sorting, and CCTV subsystems. Conduct approved device subsystem tests on the field equipment with the scale house equipment including, at a minimum, all remote communications hardware monitoring and control functions. These tests shall be a demonstration of overall system stability. During this test period, limit downtime due to mechanical, electrical, or other malfunctions to a maximum of eight hours. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours.

Conduct device and subsystem tests of any repaired or replaced equipment.

Display the event log from the WIM, ramp sorting, and CCTV software for a minimum of seven days. Complete approved data forms and turn them over to the Engineer for review, and as a basis for rejection or acceptance.

The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If a component has been modified as a result of a test failure, prepare a report and deliver it to the Engineer prior to retesting.

(B) CCTV Subsystem

After completing the integration of the CCTV cameras into the CCTV subsystem software, conduct a minimum of a seven-day test of the CCTV subsystem hardware and software. This will include that portion of the communications network serving the CCTV subsystem. The

Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by the Department there are hardware or software failures that are the responsibility of the Contractor, the Contractor shall make repairs or replacements to the satisfaction of the Department.

Test the following features of each competent as described below.

(1) CCTV Field Equipment

The following items, not otherwise required to be tested elsewhere, shall be tested for each CCTV site from the scale house:

- Power-up self-tests,
- Iris control,
- Preset functions,
- Presence and quality of the video image,
- Preset positioning, and power on/off functions,
- Camera and controller access and security from all laptops and workstations,
- Disconnect camera and take local control and reconnect camera at local cabinet to the communications and verify scale house control is regained,
- Confirm ability to change camera ID,
- Verify unique camera identifier and icons on GUI,
- Viewing of camera image on each monitor.

(2) Digital Video Equipment

Verify that all CCTV images can be displayed correctly on each monitor using the CCTV central software.

(3) CCTV Central Software

Thoroughly test all functions of the software from the scale house to ensure correct operation. Test the components of the CCTV central equipment from scale house as follows:

- Use the GUI interface to select and view each camera,
- Use and the GUI interface to test the ability to control the pan-tilt-zoom and iris settings of each camera,
- Use the GUI interface and test the ability to select and place any camera on any monitor,
- Use the image capture software to test the ability to capture video images.

(C) Weighing Subsystem

After completing the integration of the vehicle Weigh-In-Motion (WIM) subsystem and static weighing system into the Roadside operations controller (ROC) system, conduct a minimum of a seven-day test of the WIM subsystem hardware and software. This will include that portion of the communications network serving the WIM subsystem. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by the Department there are hardware or software failures that are the responsibility of the Contractor, the Contractor shall make repairs or replacements to the satisfaction of the Department.

Test the following features of each component as described below.

(1) Piezoelectric Axle WIM

The following items, not otherwise required to be tested elsewhere, shall be tested for each piezoelectric axle WIM scale from the scale house:

- Provide notification in the scale house of a truck crossing over the piezoelectric axle WIM scale,

(2) Piezoelectric Quartz WIM

The following items, not otherwise required to be tested elsewhere, shall be tested for each piezoelectric quartz WIM scale from the scale house:

- Provide notification in the scale house of a truck crossing over the piezoelectric quartz WIM scales,
- Piezoelectric quartz WIM scales send measured weight information to the AVI system,

(3) Ramp Sorting Subsystem

After completion of the integration of the ramp sorting subsystem into the ROC system, conduct a minimum of a seven-day test of the ramp sorting subsystem hardware and software. This will include that portion of the communications network serving the ramp sorting subsystem. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by the Department that there are failures that are the responsibility of the Contractor, the Contractor shall make repairs or replacements to the satisfaction of the Department.

Test the following features of each component as described below.

(4) Lane Control Signal Upstream Location

The following items, not otherwise required to be tested elsewhere, shall be tested for the Lane Control Signal One from the scale house:

- Power-up self-tests,
- Automatic sorting of trucks to the static scales ramp or to the bypass ramp.

(5) Lane Control Signal Downstream Location

The following items, not otherwise required to be tested elsewhere, shall be tested for the Lane Control Signal Two from the scale house:

- Power-up self-tests,
- Manual sorting of trucks to the inboard or outboard static scales.

42.5. OBSERVATION PERIOD

After all equipment and software comprising the system has been accepted, satisfactory completion of the system acceptance test, and after the training is complete, a 60-day observation period begins. This observation period shall serve to evaluate full operation of the system under normal conditions. The Department will be responsible for operating the system during this period. The goal of the observation period is to demonstrate that the system has been properly installed and integrated, performs properly, and complies with the Contract Documents.

The following conditions apply to the observation period:

- During the entire observation period, the system shall monitor all the vehicle detectors and sensors (both mainline and ramp devices), WIM scales, ramp sorting system and CCTV cameras, static weighing system, and perform all the functions described in these Project Special Provisions,
- If any hardware item provided under this Contract fails (with the exception of expendable items such as printer cartridges), repair the item at the Contractor's expense, and then the observation period for the failed item begins again for the full 60-day duration,
- During the observation period, have personnel responding to the problem within two (2) hours after being notified of a problem by the Department. Within one day, have personnel on-site, with replacement equipment, addressing problems encountered with the central computers, operator workstations, field devices, and communications network at the earliest possible time,
- If any other problem is discovered, such as intermittent communication or erroneous computations, the observation period will be suspended until the Contractor fixes the problem at his expense. Once the problem has been eliminated, the observation period will resume. If the problem was one that affected the entire system, rather than just one field device, the observation period will not resume until the system has performed properly for at least 72 hours. During this 72-hour period, demonstrate that any corrections or modifications made are valid, that the problems which restricted system operation have been corrected, and no new problems have resulted from the changes,
- Total system "down time" may not exceed 30 hours during the entire period. Down time includes the time of suspension of the observation period as described in the previous paragraph. Down time is a condition caused by failure of the central equipment, system software, field equipment or communication system, which causes the system to cease normal operation. If total system "down time" exceeds 30 hours, a full duration of the observation period shall begin again, and
- Terminate the observation period if 10% or more of the total quantity of any individual hardware item fails. Commence a full observation period for that hardware item upon the repair of all failed hardware items.

Upon successful completion of the observation period, the Department will accept the system, providing that all errors and omissions in Contractor-supplied documentation have been fixed and all other requirements of the Contract Documents have been met. Final acceptance will be in writing from the Department.

42.6. MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this section. Payment at the contract unit prices for the various items in the contract will be full compensation for all work covered by this section.

42.7. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and the WIM, ramp sorting, and CCTV subsystems have been operated continuously and successfully for the 60-day Observation Period.

- Final acceptance shall not occur until:
- All field demonstration, installed site, system, and operational tests have been satisfactorily completed;
- All punch-list discrepancies have been rectified;
- All documentation has been delivered and accepted; and
- All required training has been completed.

43. SYSTEM WARRANTY

43.1. DESCRIPTION

(A) General

Unconditionally warrant the performance of all systems and subsystems installed under this contract, including all equipment, hardware, and software for a period of one (1) year from the successful completion of the 60-day observation period.

Provide the necessary labor, parts, materials, tools, test equipment, and facilities required to address any warranty issues related to the system after it is installed. Consider this warranty period to be part of the work required to be completed by the final completion date of the project.

(1) Period of Performance

The period of performance for the Warranty shall be one (1) year from the successful completion of the 60-day observation period.

The warranty coverage will be renewable on an annual basis for an additional three (3) years by mutual consent of both parties at the lump sum bid price for "System Warranty". This will be considered the annual payment. The additional three (3) year warranty payment will not be a part of this contract.

(2) Scope of Warranty

Ensure the components of all systems are in good working condition and take appropriate action to remedy performance issues. Good working condition is defined under this project as equipment meeting the system specifications for acceptance, accuracy, and tolerances as defined in these Project Special Provisions.

Provide scheduled diagnosis and repair service and/or respond to repair malfunctioning equipment as outlined below:

- Complete scheduled preventative maintenance, diagnostic testing, and repair (if needed) at the six (6) month interval. Preventative maintenance shall be completed in accordance with equipment manufacturer's recommendations and standard practices. Provide routine checks on all major systems, system components, and ancillary equipment and take any corrective action to ensure proper long-term operation. The maintenance shall include, but not be limited to the following activities:
- Test signal level and lead-in cable of piezoelectric quartz sensors and loops. Repair or replace as required.
- Verify all loop and sensor performance and reliability. Adjust calibration on devices to meet the specifications defined herein for each device. Repair or replace equipment as required to meet specifications.
- Check installation of grout and sealant for loops and sensors. Repair or replace as required.
- Perform visual inspection of detector housings and repair or replace as required.
- Check the calibration of and clean (if needed) the transponder antenna.
- Clean the interior and exterior of WIM electronics, power supplies, roadside operations controllers, and communications equipment in the equipment cabinet. Repair or replace as required.

- Check condition of all WIM cables and connectors, terminal strips, and back-up batteries. Repair or replace as required.
- Perform visual inspection of the equipment cabinet. Repair or replace as required.
- Test and visually inspect equipment cabinet ventilation fan and filter, thermostat, light and fused switch. Repair or replace as required.
- Test and verify control and sequence of operation of interface components.
- Test and verify all components of the ALPR system. Adjust, repair, or replace as required.
- Calibrate the piezoelectric quartz sensors at the six (6) month interval or according to manufacturer's recommendations. Ensure the calibration includes verifying system and interface operations. Vehicles to be used for calibrating the sensors will be provided by the Department.
- Provide emergency repair services, on an as needed basis. The response time for emergency repair service shall be as follows:
    - 24 hours to acknowledge request
    - 48 hours to respond to request
    - 7 days to repair equipment and return system functionality. The repaired system shall function to the specifications defined in these Project Special Provisions for acceptance, accuracy, and tolerances. Document all activities performed under the warranty agreement, both preventative and emergency maintenance, in an electronic form that facilitates sorting the records by time period and/or device type. Submit a proposed format for this database for the Department's approval. Include, as a minimum:
    - Date and time of scheduled preventative maintenance
    - All preventative maintenance activities completed
    - All parts repaired or replaced during preventative maintenance
    - Technician completing preventative maintenance work
    - Repair history for all systems and subsystems
    - Date and time of emergency maintenance request
    - Date and time of technician on site to respond to emergency maintenance request
    - Description of defective equipment or malfunctioning operations during emergency maintenance request
    - Technician responding to emergency maintenance request
    - Corrective actions taken during emergency maintenance request
    - Date and time that operations restored after emergency maintenance request
    - Model and serial number of any equipment repaired and replaced during emergency maintenance request.

Provide both electronic and hardcopy records of the updated database within ten (10) days of each maintenance activity.

Document all itemized material, equipment, and labor costs incurred to maintain the screening system during the warranty period. The cost records shall differentiate between preventative and emergency maintenance costs. Provide these records to the Department on a semi-annual basis within fifteen (15) days after the end of the six-month period. These records will not be used as a basis of payments to the Contractor. Ensure that these cost records are

complete and accurate. The Department may perform an audit to verify the accuracy of the cost records.

Provide software upgrades for all new software revisions completed during the warranty period at no additional cost to the Department. Identify a cutover procedure for all software upgrades, which ensures that there is no interruption of service or failure of any operation as a result of upgrading the software. Also develop a contingency plan to re-install older versions of software, by the Contractor (at no additional cost to the Department), if any operation fails or any system degradation is encountered as a result of a software upgrade.

(B) Warranty Evaluation

One (1) month prior to the end of the warranty period, the Department will inspect the system thoroughly for potential system defects. This inspection will be done by the Department's personnel or representative. Assist the Department's personnel or representative during this inspection. Two (2) weeks prior to the inspection, provide a summary report of all preventative and emergency maintenance records. This report shall document and certify that all components have been maintained fully in accordance with the Project Special Provisions and manufacturer recommendations and that all manufacturer warranties that extend beyond the Contractor's warranty have been in no way compromised.

Following the inspection, the Department will determine if there are any unresolved defects with equipment hardware or software. The Department will provide a punch list to the Contractor for the replacement or repair of defective components or repairs to system software. Replace or repair equipment and software identified in the punch list within thirty days of receipt of the punch list. Also, replace any components whose manufacturer warranty has been voided or compromised by any action/inaction on the part of the Contractor. Document all repairs or replacements completed, providing the documentation to the Department prior to the end of the warranty period. .

(C) Correction of Work

Re-execute any work that fails to conform to the requirements of the Contract and that appears during the process of the work. Remedy any defects due to faulty materials or workmanship, which appear within the warranty period. The provisions of this article apply to work done by subcontractors as well as direct employees of the Contractor.

(D) Traffic Control

Provide traffic control for all maintenance activities requiring lane closures. Traffic control activities shall be in accordance with NCDOT standards. When lane closures are required for preventative maintenance, document the proposed traffic control plan and coordinate lane closure activities with the Department thirty (30) days prior to the preventative maintenance activities. When lane closures are required for emergency maintenance, coordinate lane closure activities with the Department as soon as practicable.

43.2. MATERIALS

All replacement materials and equipment provided under the warranty shall meet or exceed the requirements as defined in the Plans and the Project Special Provisions. If during the warranty period a part or component of a system or subsystem is no longer available to the Contractor, obtain equipment, which ensures that the systems and subsystems meet or exceed the specifications and functionality as defined in these Project Special Provisions.

Provide all tools, test equipment, and other equipment necessary in the maintenance, repair, and replacement of all components furnished under this contract during the warranty period.

43.3. CONSTRUCTION METHODS

In replacing equipment under the system warranty, meet or exceed the construction requirements for each component as defined in the Plans and Project Special Provisions.

43.4. MEASUREMENT AND PAYMENT

System Warranty will be measured and paid for at the contract lump sum price for system warranty.

No measurement will be made for providing labor, parts, materials, shipping, vehicles, tools, test equipment, traffic control, documentation and facilities as these will be considered incidental to furnishing the System Warranty.

Payment will be made under:

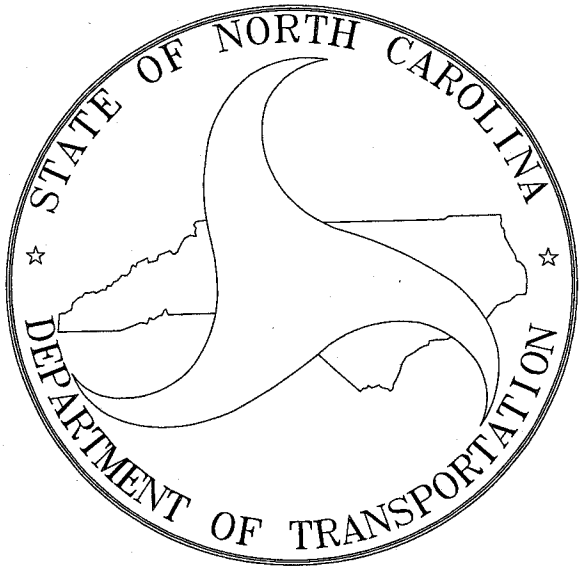
Pay Item	Pay Unit
System Warranty	Lump Sum

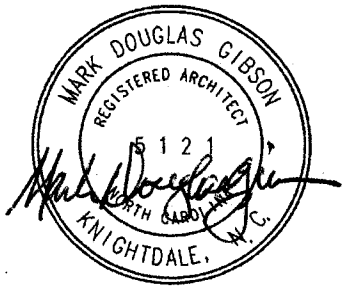
SPECIFICATIONS FOR: J 386

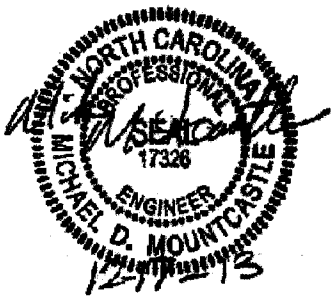
I-85 GASTON COUNTY WEIGH STATION BUILDINGS

GASTON COUNTY, NORTH CAROLINA

TIP No. I-4928
Project No. WBS 41188.3.1







NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Architect / Engineer:

FACILITIES DESIGN UNIT
FACILITIES MANAGEMENT DIVISION, NCDOT
1 SOUTH WILMINGTON STREET
RALEIGH, NORTH CAROLINA 27601

December 20, 2013

PROJECT:	**I-85 GASTON COUNTY WEIGH STATION** NC Department of Transportation Gaston County, NC
PROJECT NO.:	**411883.3.1**
OWNER:	NC Department of Transportation
ARCHITECT:	Facilities Design, NCDOT Raleigh, NC (919) 707-4550 Mark D. Gibson AIA, Architect
ENGINEERS:	
STRUCTURAL:	Facilities Design, NCDOT Raleigh, NC (919) 707-4547 Michael D. Mountcastle, PE
PLUMBING, MECHANICAL, & ELECTRICAL:	Burke Design Group, PA Raleigh, NC (919) 771-1916 Ben Burke, PE

New 2-14-14

BURKE DESIGN GROUP, PA
CONSULTING ENGINEERS

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387-A

Date: 02/12/14

Project: I-4928: I-85 NBL Weigh Station
Gaston County NC

RE: Addendum # 2
Building Utilities

2/12/14

1) The contractor shall provide a separate 4" PVC sewer line from the Scale Building and Inspection Building to an existing manhole on site. See plumbing plans for locations of sewer lines leaving the building. The manhole is due west from the building locations. The elevation of the top of the man-hole is 730.07'. The manhole is located approximately 400 feet from the Scale Building and 480 feet from the Inspection Building. The lines shall be installed for gravity flow to the manhole. Provide clean-outs every 100 feet. Provide traffic rated cast-iron covers in all paved areas. Provide cast-iron covers with pre-cast concrete covers in all grassy areas.

2) The water supply to both buildings shall be from a new well. The contractor shall provide an allowance, as listed below, for the well, well pump, fiberglass pre-fabricated well house, etc. as required for a complete operating system. The system shall be capable of supplying 50 gpm. The minimum well pump size shall be 5 hp, 208 volt, 3 phase. The contractor shall provide water supply piping from the well location to both the buildings. See plumbing plans for water service sizes. Provide power to the well pump location from the Scale Building's main distribution panel. Provide a new breaker and wire to the well location. The wire shall be sized to maintain a maximum of 3% voltage drop. Provide an additional 120 volt, 20 amp circuit to the well house for heat tracing.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner is: North Carolina Department of Transportation, 1 S. Wilmington St., Raleigh, NC.
B. Section Includes:
   1. Project description.
   2. Access to the site.
   3. Contractor's use of the premises.
   4. Coordination requirements.
   5. Pre-construction meeting.

1.02 PROJECT DESCRIPTION

A. The project consists of a new Weigh Station building of 3,925 gross square feet, a new Weigh Station booth of 159 gross square feet, and an Inspection Building of 3,060 square feet.
   1. At I-85 off of the Northbound lane (NBL) southwest of Gastonia, NC, in Gaston County, NC.
   2. As shown in contract documents for the Gaston County I-85 Weigh Station building prepared by Facilities Design, NCDOT.
      a. Dated December 20, 2013.
B. The Work consists of:
   1. A one story office building with slab-on-grade, wood framing and wood trusses w/ masonry foundations, brick veneer, metal roofing panels; unprotected construction; and a similar booth.
   2. A one story pre-engineered metal building with slab-on-grade and a concrete pit, masonry wainscot walls, metal wall and roofing panels.
   2. Concrete entrance sidewalks (see Roadway Design Specifications).
   3. Building and immediate site rough and finish grading of all disturbed areas (see Roadway Design Specifications).
   4. The General Contractor is responsible for all **layout and surveying** of adjacent sidewalks, utilities, Weigh Station building, Weigh Station booth, and Inspection building.

1.03 ACCESS TO THE SITE AND USE OF THE PREMISES

A. The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is an outdoor space sufficient for storage trailers and access to the construction area from the exit ramps on the NBL of I-85 having full use of building site.
B. Exit ramps, drives and parking spaces shall remain open for the Contractor's use for the construction site.
C. The Contractor shall provide temporary restroom facilities at the construction site for the entire construction period.
D. The Contractor shall provide a construction/office trailer at the Northbound Lane construction site, with heating and air conditioning, large enough for his office telephone and fax, layout space for the construction drawings (as-built set and shop drawings) with seating area to hold 12 people for monthly meetings, and for his secured storage of small tools and materials.
E. Signs: Do not install, or allow to be installed, signs other than specified sign(s) and signs identifying the principal entities involved in the project. NCDOT will provide "Closed" signs at the highway and barrels for closing off the entry/exit lanes.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRECONSTRUCTION MEETING

A. A pre-construction meeting will be held at a time and place designated by the Engineer, for the purpose of identifying responsibilities of the Owner's and the Architect/Engineer's personnel and explanation of administrative procedures.

3.02 SECURITY PROCEDURES

A. Provide secure storage for materials for which the Owner has made payment and which are stored on site.
B. Secure completed work as required to prevent loss.

3.03 COORDINATION

A. If necessary, inform each party involved, in writing, of procedures required for coordination; include requirements for giving notice, submitting reports, and attending meetings.
   1. Inform the Owner when coordination of his work is required.
B. See other requirements in other portions of the contract documents.
C. Conduct meetings for the specific purpose of coordination, at least once a month.
   1. Attendees shall include:
      a. Contractor.
      b. Subcontractors currently working at the site.
      c. Engineer and Architect.

END OF SECTION 01010

SECTION 01026 - PAYMENT AND COMPLETION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Schedule of values.
   2. Payment procedures.
   3. Completion procedures.
B. Related Requirements Specified Elsewhere in the Project Manual: Overhead and profit distribution.

1.02 CONTRACT CONDITIONS

A. See the conditions of the contract for additional requirements.
B. Progress payments will be made on or about the 25th of each month.
C. The Architect/Engineer will act upon the Contractor's application for payment within 5 days after receipt.
D. The Owner will act upon the application for payment within 15 days after receipt.
E. No payment will be made for materials or equipment stored off site unless specifically approved in advance, in writing by the owner. Submit copy of the owner's agreement to pay for such materials and equipment with the application for payment covering such materials and equipment.
F. Payments may be withheld if the contractor fails to make dated submittals within the time periods specified.

1.03 DEFINITIONS

A. Final Completion: The stage at which all incomplete and incorrect work has been completed or corrected in accordance with the contract documents.
B. List of Incomplete Work: A comprehensive list of items to be completed or corrected, prepared by the Designer/Owner/Contractor for the purpose of obtaining certification of substantial completion. This list is also referred to as a "Pre-Final and Final Punch List."
C. Schedule of Values: A detailed breakdown of the contract sum into individual cost items, which will serve as the basis for evaluation of applications for progress payments during construction.
D. Substantial Completion: The time at which the work, or a portion of the work which the owner agrees to accept separately, is sufficiently complete in accordance with the contract documents so that the owner can occupy or use the work for its intended purpose.
E. Time and Material Work: Work which will be paid for on the basis of the actual cost of the work, including materials, labor, equipment, and other costs as defined elsewhere, as documented by detailed records. This basis is also referred to using the terms "cost-plus," "cost of the work," "force account," and similar terms.

1.04 SUBMITTALS

A. Schedule of Values: First application for payment will not be reviewed without schedule of values.
   1. Submit in size not larger than 8-1/2 by 11 inches.
   2. Submit 5 copies,
   3. Identify with:
      a. Project name, Project number, Architect's name, Owner's name, Contractor's name and address, and Submittal date.
B. Applications for Progress Payments: Submit sufficiently in advance of date established for the progress payment to allow for the processing indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF VALUES

A. Prepare a schedule of values prior to the first application for payment.
B. Schedule of Values: Break costs down into line items which will be comparable with line items in applications for payment.
   1. Coordinate line items in the schedule of values with portions of the contract documents which identify units or subdivisions of work; provide cross-referencing if necessary to clarify.
      a. Specifically, correlate with the project manual table of contents.
   2. Divide major subcontracts into individual cost items.
   3. Where applications for payment are likely to include products purchased or fabricated but not yet installed, provide individual line items for material cost, installation cost, and other applicable phases of completion.
   4. Include the following information for each line item, using AIA G703, Continuation Sheet.
      a. Item name.
      b. Applicable specification section.
      c. Dollar value, rounded off to the nearest whole dollar (with the total equal to the contract sum).
      d. Proportion of the contract sum represented by this item, to the nearest one-hundredth percent (with the total adjusted to 100 percent).
   5. Provide the following supporting data for each line item:
      a. Subcontractor's name.
      b. Manufacturer or fabricator's name.
      c. Supplier's name.
C. Submit schedule of values not later than 10 business days prior to submittal of first application for payment.
D. The Architect/Engineer will notify the contractor if schedule is not satisfactory; revise and resubmit acceptable schedule.
E. Submit a revised schedule of values when modifications change the contract sum or change individual line items.
   1. Make each modification a new line item.
   2. Show the following information for each line item:
      a. All information required for original submittal.
      b. Identification of modifications which have affected its value.
   3. Submit prior to next application for payment.

3.02 APPLICATIONS FOR PAYMENT

A. Application for Payment Forms: Use AIA original current editions of G702, Application and Certificate for Payment, and AIA G703, Continuation Sheet.
B. Preparation of Applications for Payment: Complete form entirely.
   1. Make current application consistent with previous applications, certificates for payment, and payments made.
   2. Base application on current schedule of values and contractor's construction schedule.
   3. Include amounts of modifications issued before the end of the construction period covered by the application.
   4. Include signature by person authorized by the contractor to sign legal documents.
   5. Notarize each copy.
   6. Submit in 5 copies.
   7. Attach revised schedule of values, if changes have occurred, unless application forms already show entire schedule of values.
   8. Attach copy of the owner's agreement to pay for materials and equipment stored off site, and any other supporting documentation required by the owner or the contract documents.
C. Provide the following information with every application for payment which involves work completed on a time and material basis:
   1. Detailed records of work done, including:
      a. Dates and times work was performed, and by whom.
      b. Time records and wage rates paid.
      c. Invoices and receipts for products.
   2. Provide similar detailed records for subcontracts.
D. Transmit application for payment with a transmittal form itemizing supporting documents attached.
   1. Transmit to the Architect/Engineer.

3.03 FIRST PAYMENT PROCEDURE

A. The first application for payment will not be reviewed until the following submittals have been received:
   1. Certificates of insurance.
   2. Performance and payment bonds.
   3. Schedule of values.
   4. List of subcontractors, principal suppliers, and fabricators.
   5. Contractor's construction schedule. Monthly Progress Schedules are required, see Section 01200.
   6. Names of the contractor's principal staff assigned to the project.
   7. All submittals specified to occur prior to first application for payment or prior to first payment.

3.04 SUBSTANTIAL COMPLETION PROCEDURES

A. The architect will perform a Pre-Final Inspection with the contractor two weeks before substantial completion inspection, upon request of the contractor. Plumbing, Mechanical, & Electrical subcontractors shall be present for all Final Inspections.
B. The architect will perform a Final Inspection with the contractor for substantial completion and verification that the Pre-Final Inspection punch list is complete, upon request of the contractor.
   1. Only one certificate of substantial completion will be issued, for the entire project.
C. Submit the following with application for payment following substantial completion:
   1. Certificate of Substantial Completion; use AIA original current editions of G704.
   4. Final Inspection list of incomplete work.
   5. Other data required by the contract documents.

3.05 FINAL COMPLETION PROCEDURES

A. Request for Final Inspection and final application for payment may coincide.
B. The architect/engineer will perform inspection for final completion, upon request of the contractor.
   1. Submit the following with request for inspection:
      a. Previous inspection lists indicating completion of all items.
      b. If any items cannot be completed, obtain prior approval of such delay.
C. Do not submit request for Final Inspection until the following activities have been completed:
   1. Completion of all work, Pre-Final Inspection Punch List, except those items agreed upon by the owner.
   2. Final cleaning.
   3. All activities specified to occur between substantial completion and final completion.
D. Do not submit request for final inspection until the following submittals have been completed:
   1. Startup reports; HVAC balance and test reports.
   2. Operation and maintenance data. Demonstration reports. Instruction reports.
   3. Water bacterial test report of new domestic water supply.
   4. Final Electrical Inspection and certification by the State Construction Office electrical inspector.
   5. Project record documents, record drawings or as-built drawings.
   6. All other outstanding specified submittals.
E. Submit the following with the final application for payment:
   1. Certified copy of the previous list of items to be completed or corrected, stating that each has been completed or otherwise resolved for acceptance.
   2. Contractor's Affidavit of Payment of Debts and Claims; use AIA original current editions of G706
   3. Contractor's Affidavit of Release of Liens; use AIA original current editions of G706A.
   4. Consent of surety to final payment; use AIA original current editions of G707.
   5. Final liquidated damages statement.
   6. Certification that financial obligations to governing authorities and public utilities have been fulfilled.
   7. Description of unsettled claims.
   8. Other data required by the contract documents.

END OF SECTION 01026

SECTION 01200 - PROGRESS DOCUMENTATION AND PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Progress documentation requirements:
      a. Contractor's construction schedule.
   2. Progress procedures:
      a. Progress meetings.

B. Contract time is indicated elsewhere.

1.02 SUBMITTALS

A. Contractor's Construction Schedule.
   1. Submit within 14 days after execution of contract.
   2. Submit revised schedule with application for payment to Highway Division 12 Resident Engineer.

1.03 FORM OF SUBMITTALS

A. Schedules - General:
   1. Provide legend of symbols and abbreviations for each schedule.
   2. Use the same terminology as that used in the contract documents.
   3. When transparencies are submitted, use only media which will not fade or lose contrast over time.

B. Bar Charts:
   1. Provide individual horizontal bars representing the duration of each major activity.
   2. Coordinate each element on the schedule with other construction activities.
   3. Show activities in proper sequence.
   4. Show percentage of completion of each activity.
   5. Include cost bar at top of chart, showing estimated and actual costs of work performed at the date of each application for payment.
   6. Use vertical lines to mark the time scale at not more than one week intervals.
   7. Prepare on reproducible transparency.
   8. Use sheets of sufficient number and width to show the full schedule clearly.

1.04 COORDINATION

A. In preparation of schedules, take into account the time allowed or required for the Architect/Engineer's administrative procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Prepare and submit a construction schedule.

B. Provide construction schedule in the form of bar charts:
   1. Where related activities must be performed in sequence, show relationship graphically.
   2. Indicate activities separately for:
      a. Each separate building.
   3. Incorporate the submittal schedule specified elsewhere.
   4. Show dates of:
      a. Each activity that influences the construction time.
      b. Ordering dates for products requiring long lead time.
      c. All submittals required.
      d. Completion of structure.
      e. Completion of permanent enclosure.
      f. Instruction of the owner's personnel in operation and maintenance of equipment and systems.
      g. Substantial and final completion, with time frames for the Architect/Engineer's completion procedures.

5. In developing the schedule, take into account:
   a. Work by owner.
   b. Need for temporary heating, ventilating, or air-conditioning.

C. The Architect/Engineer will notify the contractor if schedule is not satisfactory; revise and resubmit.
   1. Resubmit within 5 business days.

D. Make and distribute copies of schedule to the Architect/Engineer, to subcontractors, and to other entities whose work will be influenced by schedule dates.
   1. Hang a copy of the schedule up in each field office or meeting room.

E. Update the schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which applications for payment are made.
   1. Indicate changes made since last issue; show actual dates for activities completed.
   2. Submit updated schedule with application for payment.
   3. Issue updated schedule with report of meeting at which revisions are made.
   4. Issue updated schedule in same manner as original schedule.

3.02 PROGRESS MEETINGS

A. Schedule and conduct periodic progress meetings during construction period.
   1. Have meetings once a month.
   2. Notify the Architect/Engineer at least one week in advance of date of meeting.

B. The following are required to attend:
   1. Project superintendent.
   2. Major subcontractors and suppliers.
   3. Others who have an interest in the agenda.
   4. State inspectors.

C. Prepare and distribute agenda prior to meetings; cover the following topics when applicable:
   1. Review minutes of previous meeting.
   2. Status of submittals and impending submittals.
   3. Actual progress of activities in relation to the schedule.
   4. Actual and anticipated delays, their impact on the schedule, and corrective actions taken or proposed.
   5. Actual and potential problems.
   6. Status of change order work.
   7. Status of corrective work ordered by the Architect/Engineer.
   8. Progress expected to be made during the next period.

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Preparing and processing of submittals for review and action.
   2. Preparing and processing of informational submittals.
B. Submit the following for the Architect/Engineer's review and action:
   1. Shop drawings.
   2. Product data.
   3. Samples.
   4. Warranties.
C. Submit the following as informational submittals:
   1. Reports.
D. Specific submittals are described in individual sections.
E. Do not commence work which requires review of any submittals until receipt of returned submittals with an acceptable action.
F. Submit all submittals to the Architect/Engineer.
G. Related Sections: The following are specified elsewhere in Division 1:
   1. Progress of work submittals:
      a. Contractor's construction schedules.
   2. Quality control submittals:
      a. Test reports.

1.02 DEFINITIONS

A. "Shop drawings" are drawings and other data prepared, by the entity who is to do the work, specifically to show a portion of the work.
   1. Shop drawings also include:
      a. Product data specifically prepared for this project.
      b. Shop or plant inspection and test reports, when made on specific materials, products, or systems to be incorporated into the work.
B. "Product data submittals" are standard printed data which show or otherwise describe a product or system, or some other portion of the work.
C. "Samples" are actual examples of the products or work to be installed.
D. Informational Submittals: Submittals identified in the contract documents as to be submitted for info rmation only.

1.03 FORM OF SUBMITTALS

A. Sheets Larger Than 8-1/2 by 14 Inches:
   1. Maximum sheet size: 24 by 36 inches.
      a. Exception: Full size pattern or template drawings.
   2. Number of copies:
      a. Submittals for review:
         1. One correctable reproducible print, not folded and 6 copies of blue- or black-line print(s).
         2. Reproducible will be returned.
B. Small Sheets or Pages:
   1. Minimum sheet size: 8-1/2 by 11 inches.
   2. Maximum sheet size for opaque copies: 8-1/2 by 14 inches.
   3. Number of copies:
      a. Transparencies: Same as for larger sheets.
      b. Opaque copies: 6 copies.
   4. For review: 6 copies.
      a. 4 copies will be retained.
C. Samples: 2 sets of each.
   1. 1 set will be returned.

D. If additional sets are needed by other entities involved in work represented by the samples, submit with original submittal.
E. Copies in excess of the number requested will not be returned.

1.04 COORDINATION OF SUBMITTALS

A. Coordinate submittals and activities that must be performed in sequence, so that the Architect/Engineer has enough information to properly review the submittals.
B. Coordinate submittals of different types for the same product or system so that the Architect/Engineer has enough information to properly review each submittal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TIMING OF SUBMITTALS

A. Transmit each submittal at or before the time indicated on the approved schedule of submittals.
   1. Prepare and submit for approval a schedule showing the required dates of submittal of all submittals.
   2. Organize the schedule by the applicable specification section number.
   3. Incorporate the contractor's construction schedule specified elsewhere.
   4. Submit within 10 business days after commencement of the work.
   5. Revise and resubmit the schedule for approval when requested.
B. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the contractor in this respect will not be considered as grounds for an extension of the contract time.
C. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly.
D. If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.

3.02 SUBMITTAL PROCEDURES - GENERAL

A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.
B. Notify the Architect/Engineer, in writing and at time of submittal, of all points upon which the submittal does not conform to the requirements of the contract documents, if any.
C. Preparation of Submittals:
   1. Label each copy of each submittal, with the following information:
      a. Project name.
      b. Date of submittal.
      c. Contractor's name and address.
      d. Architect/Engineer 's name and address.
      e. Subcontractor's name and address.
      f. Other necessary identifying information.
   2. Pack submittals suitably for shipment.
   3. Submittals to receive Architect/Engineer 's action marking:

   Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.
D. Transmittal of Submittals:
   1. Submittals will be accepted from the contractor only. Submittals received from other entities will be returned without review or action.
   2. Submittals received without a transmittal form will be returned without review or action.
   3. Transmittal form: Similar to AIA G810.
   4. Fill out a separate transmittal form for each submittal; also include the following:
      a. Other relevant information.
      b. Requests for additional information.

3.03 SHOP DRAWINGS

A. Content: Include the following information:
   1. Dimensions, at accurate scale.
   2. All field measurements that have been taken, at accurate scale.

3. Names of specific products and materials used.
4. Coordination requirements; show relationship to adjacent or critical work.
5. Name of preparing firm.

B. Preparation:
1. Identify as indicated for all submittals.
2. Space for Architect/Engineer 's action marking shall be adjacent to the title block.

3.04 PRODUCT DATA

A. When product data submittals are prepared specifically for this project (in the absence of standard printed information) submit such information as shop drawings and not as product data submittals.

B. Content:
1. Submit manufacturer's standard printed data sheets.
2. Show compliance with properties specified.
3. Show compliance with the specific standards referenced.
4. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
5. Identify dimensions which have been verified by field measurement.
6. Show special coordination requirements for the product.

3.05 SAMPLES

A. Samples:
1. Provide samples that are the same as proposed product.
2. Where unavoidable variations must be expected, submit "range" samples, minimum of 3 units, and describe or identify variations among units of each set.

B. Preparation:
1. Attach a description to each sample.
2. Attach name of manufacturer or source to each sample.

C. Keep final sample set(s) at the project site, available for use during progress of the work.

3.06 REVIEW OF SUBMITTALS

A. Submittals for approval will be reviewed, marked with appropriate action, and returned.

B. Informational submittals: Submittals will be reviewed.
1. "X" action: No action taken.
2. "Not Approved" action: Revise the submittal or prepare a new submittal complying with the comments made.
3. A copy will be returned if submittal is unsatisfactory.

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

A. Submittals will be returned to the contractor by mail.

B. Perform resubmittals in the same manner as original submittals; indicate all changes other than those requested by the Architect/Engineer.

C. Distribution:
1. Make extra copies for operation and maintenance data submittals, as required.

END OF SECTION 01300

DIVISION 2 - SITE WORK

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Earth moving and excavation.
   2. Grading.
   3. Backfilling.
   4. Filling.
   5. Compacting.

1.02 SUBMITTALS

A. Test Reports: NCDOT testing laboratory will submit the following reports directly to the Architect/Engineer and shall copy the contractor:
   1. Analysis of soil materials, whether procured on or off site, and including fill, backfill, and borrow materials.
   2. Verification of each footing subgrade.
   3. Moisture-density relationship test reports.
   4. Compressive strength or bearing test reports.

1.03 QUALITY ASSURANCE

A. Testing Laboratory Services:
   1. The Owner, NCDOT, Division 12, will provide services to classify new structural fill soil materials, to recommend and to classify proposed borrow materials when necessary, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing.

1.04 SITE CONDITIONS

A. Traffic: The construction site will be open to the contractor for use at all times.
B. Site Utilities:
   1. Advise utility companies of excavation activities before starting excavations. Locate and identify underground utilities passing through work area before starting work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Friable clay loam surface soil.
B. Satisfactory Topsoil: Fertile agricultural soil, typical for locality, capable of sustaining vigorous plant growth; free of subsoil, rocks larger than 2 inches in diameter, clay, toxic matter, plants, weeds, and roots.
C. Any structural fill or backfill placed at the site shall utilize a low plasticity soil (liquid limit less than 50, plasticity index less than 25) free of organic material or debris. All fill shall be placed in 8 to 10 inch loose lifts and shall be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D 698). The soils shall be aerated or moistened as necessary to maintain the moisture content within 3 percentage points of optimum moisture content.
D. Capillary Water Barrier: Clean, crushed rock or gravel or uncrushed gravel; 100 percent passing a 1-1/2-inch sieve; not more than 2 percent passing a No. 4 sieve.
E. Subbase Material: Well-graded, clean, sound, durable particles of crushed stone, crushed blast furnace slag, or crushed gravel, and screenings. Obtain the Engineer's approval of source, quality, and gradation.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection: Provide markers indicating limits of work and clear identification of items and areas requiring protection.

B. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.

3.02 PROTECTION OF TREES

A. Provide temporary guards to protect trees and vegetation to remain. Place guards so as to prevent all forms of vehicular traffic or parking within drip lines.
B. Promptly repair any damaged trees to prevent death or loss of vigor.

3.03 CLEARING AND GRUBBING

A. Remove dredge material from site and replace with approved structural fill per Roadway's requirement before excavating for the building footings.

3.04 DEWATERING

A. Do not allow surface or ground water to flow into or accumulate in excavations.

3.05 EXCAVATION

A. General: Excavation includes the removal of any materials necessary to achieve the required subgrade elevations and includes reuse or disposal of such materials.
B. Excavation for Structures:
   1. Excavate beyond footings and foundations so as to allow proper construction and inspection of concrete formwork and other materials. Excavate to the required elevation.
C. Excavation for Footings and Foundations:
   1. Delay excavation to final grade and final compaction until just before concrete will be placed.

3.06 STORAGE

A. Stockpile materials to be used for filling and backfilling, including excavated materials classified as satisfactory soil materials, at locations indicated or as directed. Stockpile in a manner to freely drain surface water; cover if necessary to prevent wind-blown dust.

3.07 BACKFILLING

A. Installation: Place approved soil materials in layers to required elevations.
B. Installation: Place satisfactory soil materials in layers to required subgrade elevations.

3.08 FILLING

A. Preparation: Verify that area has been stripped of vegetation including roots below grade. Remove and dispose of any unsatisfactory soils.
   1. When filling slopes steeper than 1 in 4 rise, plow, step, or break up surfaces to promote bond of new to existing material.
B. Installation: Place fill materials to required elevations in lifts of required depth. Provide fill materials beneath each area as indicated.
   2. Building slabs: Capillary water barrier material.

3.09 BUILDING SLAB AREAS

A. Place fill or backfill lifts such that compaction true to grade and level is accomplished with a minimum of surface disturbance and segregation or degradation of materials. Maintain grade control and cross section by means of line and grade stakes. Maintain moisture content within prescribed limits during placing and compacting.
   1. Capillary water barrier: Under slabs on grade, place capillary water barrier material directly on subgrade, shape surface to within the required tolerances and compact.

3.10 COMPACTION

A. Place material simultaneously on opposite sides of walls, small structures, utility lines, etc. to avoid displacement or overstressing.
B. In-Place Density Requirements: Compact soil to not less than the values given below, expressed as a percentage of maximum density at optimum moisture content.
   1. Exterior steps and ramps: Top 8 inches of subgrade and subsequent lifts: 95 percent.
   2. Building slabs and structures: Top 12 inches of subgrade and subsequent lifts: 95 percent.

3.11 GRADING

A. General: Smooth grade to a uniform surface that complies with compaction requirements and required lines, grades, and cross sections and is free from irregular surface changes.

3.12 FIELD QUALITY CONTROL

A. Testing Laboratory Services: Provide timely notice to testing laboratory. Do not proceed with construction until testing of each subgrade and lift of fill or backfill has been performed and required inspections and approvals have been obtained.
B. Maximum Density at Optimum Moisture Content: Determine in accordance with ASTM D 698.
   1. For each subgrade, fill, and backfill material, perform one moisture-density relationship test for each 1500 cubic yards, or fraction thereof, of material used.
C. If testing service reports indicate that subgrade or fills are below specified density, scarify or remove and replace to the required depth, recompact, and retest at no cost to the owner.

3.13 MAINTENANCE

A. Completed Areas: Protect from damage by pedestrian or vehicular traffic, freezing, erosion, and contamination with foreign materials.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Stockpile any excess satisfactory topsoil in locations on site as directed by the Engineer.
B. Stockpile or spread any excess satisfactory soil in location on site as directed by the Engineer.
C. Remove any unsatisfactory soil, trash, debris, and other materials not required for use on the project and legally dispose of it off the owner's property.
D. On-site burning is not permitted.

END OF SECTION 02200

SECTION 02280 - SOIL TREATMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Subterranean termite prevention treatment of soil areas scheduled to receive new construction.
   2. Subterranean termite prevention treatment of existing exterior side of existing foundations to remain.

1.02 SUBMITTALS

A. Product Data: Submit product label or accompanying labeling in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act.
B. Quality Control Submittals:
   1. Certificates: Evidence of installer's authorization to apply products under applicable state and local law.
   2. Manufacturer's instructions: Submit manufacturer's directions for use.
C. Contract Closeout Submittals:
   1. Project record documents:
      a. Submit a certificate signed by installer and contractor stating that treatment has been applied in accordance with applicable governing regulations and in accordance with this specification.
      b. Incorporate into the certificate or attach thereto a plan drawing indicating actual application locations and, for each location, noting methods and rates of application and including typical sections or details where necessary for clarity.
   2. Warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Licensed to install specified products in the state in which the project is located and in the local jurisdiction.
   2. A company installing products of this section and whose installations have performed in a satisfactory manner under comparable conditions for a period of 5 years.
B. Regulatory Requirements:
   1. Comply with applicable pesticide regulations of the state in which the project is located.
   2. Comply with applicable local pesticide regulations.

1.04 WARRANTY

A. Special Warranty:
   1. Submit manufacturer's warranty against infestation of treated areas.
   2. Warranty shall not reduce or otherwise limit any other rights to correction which the owner may have under the contract documents.
   3. Warranty period: **5 years.**
B. Correction during the warranty period shall include not less than the following:
   1. Retreatment of areas in which evidence of infestation is discovered.

PART 2 PRODUCTS

2.01 TERMITICIDE

A. Registered with the United States Environmental Protection Agency (EPA) for use as a termiticide under conditions of use prevailing at the project site.

B. Registered with the applicable authorities in the state in which the project is located and with local governing authorities, as applicable for use as a termiticide under conditions of use prevailing at the project site.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply termiticide in strict accordance with manufacturer's instructions; treat new entire slab area and perimeter new and existing foundations.
B. Apply termiticide at the maximum recommended application rates for the respective areas to be treated and methods of treatment used.
C. Treat the entire structure. Do not leave any portion untreated.
D. Schedule treatment of new construction to occur when treatment may be applied directly to the soils and surfaces to be treated, and prior to their concealment with subsequent construction.

3.02 CLEANING

A. Do not allow contamination of surfaces not intended to be treated. Follow manufacturer's instructions to completely remove chemical from surfaces should contamination occur.
B. Remove from beneath the structure any cellulosic material, wood that is not pressure-preservative treated, and debris. Do not allow non-pressure-preservative treated wood to contact with or remain proximate to soil.

END OF SECTION 02280

SECTION 02712 - SUBDRAINAGE SYSTEMS FOR STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Subdrainage systems of the following types: Downspout drains; foundation drains where shown.
B. Related Sections: Earthwork: Elsewhere in Division 2 and Landscape Section at the end of the specification.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature and installation instructions for the following:
   1. Drainage piping.
   2. Piping accessories.

PART 2 - PRODUCTS

2.01 DRAINAGE PIPE

A. Piping System 1:
   1. Standard (solid) pipe: Polyethylene pipe; ASTM F 405 or ASTM F 667, as applicable for pipe size.
   2. Application: Gutter and downspout drainage.
B. Piping System 2:
   1. Perforated, polyethylene (PE) pipe: ASTM F 405 corrugated.
   2. Application: Foundation drainage.
C. Provide fittings and accessories of same material as pipe or compatible material for intersections, bends, transitions, and the like; provide black plastic downspout boots or downspout adapters; equal to Plastic Trends, Royal Pipe Systems, USPlastic, Flex-Drain or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Engineering Layout: Establish lines, grades, and locations of piping and accessories.
   1. Maintain grade stakes, batter boards, and the like, to permit rapid checking of grades and lines as work progresses.

3.02 INSTALLATION - GENERAL

A. Earthwork and Trenching: Perform required excavation, backfilling, and compacting in accordance with requirements of other Division 2 sections as applicable.
B. Piping Installation:
   1. General: Install piping in accordance with governing authorities, except where more stringent requirements are indicated.
   2. Inspect piping before installation to detect apparent defects. Mark defective materials and promptly remove from site.
   3. Lay piping, beginning at low point of system, true to line and grade indicated and with unbroken continuity of invert.
   4. Polyethylene pipe: Install in accordance with ASTM F 449.
   5. Joint adapters: Make joints between different types of pipe or different diameters of the same type of pipe with standard manufactured adapters intended for that purpose.
C. Filling and Backfilling:
   1. Place and compact fill or backfill in uniform layers, and achieve required compaction.
   2. Take care when backfilling to avoid damaging or dislodging drainage system components.
   3. Provide crushed stone backfill over perforated pipe; stone shall be larger than perforations to prevent clogging of pipe.

3.04 FIELD QUALITY CONTROL

A. Piping: After installation of piping and placement of initial backfill, test piping for crushing and obstructions.

1. Pull a mandrel with diameter of 90 percent of the pipe diameter through the pipe.
2. Locate and replace damaged pipe or remove obstructions and retest until mandrel passes entire length of pipe.

END OF SECTION 02712

DIVISION 3 - CONCRETE

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SECTION 03310 - STRUCTURAL CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cast-in-place concrete and concrete curing.
   1. Sidewalks, see Roadway Design concrete section.
   2. Foundations, footings, and slabs.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data / Mix Design to the Resident Engineer:
   1. Concrete mix, reinforcing, admixtures and curing compound.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
   1. Sidewalks, curb ramps, steps, curb & gutters, and parking lot paving shall comply with **NCDOT Standard Specifications** dated January 2012, Divisions 7 and 8; Sections 710, 844, 846 and 848; Class "A" concrete for Portland Cement Production and Delivery.
   2. ACI 301 & ACI 318.

B. Testing Agency Services:
   1. NCDOT's testing agency will conduct tests and perform other services specified for quality control during construction.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, and as follows:
   1. Type I, except where other type is specifically permitted or required.
      a. Type I may be replaced by Type III (high early strength) for concrete placed during cold weather.

B. Water: Potable.

C. Aggregates: Normal weight concrete: ASTM C 33.

D. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.

E. Air-Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.

F. Water-Reducing Admixture: ASTM C 494, Type A.

2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Formwork:
   1. Facing Materials: Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
   2. Formwork Accessories:
      a. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
      b. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.

B. Reinforcing Materials:
   1. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise
      a. indicated: ASTM A 615, Grade 60.
   2. Welded Wire Fabric: ASTM A 185, cold-drawn steel, plain.
   3. Tie wire: Black annealed type, 16-1/2 gage or heavier.
   4. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."

C. Vapor Retarder: Membrane for installation beneath slabs on grade, resistant to decay when tested in accordance with ASTM E 1745, and as follows:
   1. 10 mils thick, multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene sheet is prohibited.
D. Moisture-Retaining Cover: ASTM C 171, and as follows:
   1. Polyethylene film.
E. Liquid Curing Compounds: Comply with ASTM C 309, Type 1 and compatible with flooring.

2.03 CONCRETE MIX DESIGN

A. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.
B. Specified Compressive Strength f'c at 28 Days for Locations as Indicated on Drawings:
   1. Footings: 3000 psi.
   2. Slabs, walls, and ramps: 4000 psi.
C. Admixtures:
   1. Air-entraining admixture: Use in mixes for exterior exposed concrete unless otherwise specifically indicated. Add at rate to achieve total air content in accordance with Table 1.4.3 of ACI 201.2. For concrete not exposed to exterior, add at rate to achieve total air content between 2 percent and 4 percent.
      a. Do not use in slabs-on-grade scheduled to receive topping, unless manufacturer of topping recommends use over air-entrained concrete.
   2. Water-reducing admixture: Add as required for placement and workability.
   3. Do not use admixtures not specified or approved.

PART 3 - EXECUTION

3.01 VAPOR RETARDER INSTALLATION

A. General: Place vapor retarder sheet over prepared base material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape.

3.02 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the Engineer.
   1. Keyways: Provide keyways not less than 1-1/2 inches deep.
   2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
B. Control Joints: Construct contraction joints in slabs poured on grade to form panels of sizes indicated on drawings, but not more than 15 feet apart in either direction.
   1. Saw cuts: Form control joints by means of saw cuts one-fourth slab depth.

3.03 CONCRETE PLACEMENT

A. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
   1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.
B. Placement - General: Comply with requirements of ACI 304 and as follows:
   1. Schedule continuous placement of concrete to prevent the formation of cold joints.
   2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
   3. Deposit concrete as close as possible to its final location, to avoid segregation.
C. Tolerances shall comply with ACI 117. Use class A for exposed surfaces and Class C otherwise.
D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
   1. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
   2. Do not use vibrators to move concrete laterally.

E. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
   1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to Engineer.
   2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

3.04 REPAIR OF SURFACE DEFECTS

A. Repair tie holes and surface defects including readily visible voids, bug holes, and honeycombs immediately after form removal.
B. Repair defects in accordance with Section 5.3.7 of ACI 301-05.
C. Remove stains, rust, efflorescence, and surface deposits considered objectionable by Architect or Owner.

3.05 FINISHING FORMED SURFACES

A. Unspecified Finish: Where a specific finish is not specified, apply the following finishes.
   1. Rough Form Finish on concrete surfaces not exposed to public view.
   2. Smooth Rubbed Finish on concrete surfaces exposed to public view.
B. Rough Form Finish: Patch tie holes and defects. Chip or rub off fins exceeding ¼" in height. Leave surfaces with the texture imparted by the forms.
C. Smooth Form Finish: Patch tie holes and defects. Remove all fins completely. Rubbing is not required except as needed to provide a smooth surface.
D. Smooth Rubbed Finish: Patch tie holes and defects. Produce finish on newly hardened concrete no later than the day following form removal. Wet the surface and rub it with carborundum brick or other abrasive until uniform color and texture are produced. Use no cement grout other than cement paste drawn from the concrete itself by the rubbing process.
   1. Optional Grout Cleaned Finish may be provided in accordance with Section 5.3.3.4.b of ACI 301-05.

3.06 FINISHING SLABS

A. Finishing Operations - General:
   1. Do not directly apply water to slab surface or dust with cement.
   2. Use hand or powered equipment only as recommended in ACI 302.1R.
   3. Screeding: Strikeoff to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
   4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
   5. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.
   6. Troweling: Trowel immediately following final floating. Apply first troweling with power trowel except in confined areas, and apply subsequent trowelings with hand trowels. Wait between trowelings to allow concrete to harden. Do not over trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over it. Consolidate concrete surface by final troweling operation. Completed surface shall be free of trowel marks, uniform in texture and appearance, and within surface tolerance specified.
      a. Grind smooth surface defects which would telegraph through final floor covering system.
B. Coordinate appearance and texture of required final finishes with the Engineer before application.
C. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16 inch deep, without tearing surface.
D. Trowel Finish: As specified above.
E. Trowel and Fine Broom Finish: Follow trowel finishing operation immediately with fine brooming to achieve slightly scarified surface.
F. Slab Surface Tolerances:
   1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
   2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straightedge.
   3. Troweled finishes: Achieve level surface plane so that depressions between high spots do not exceed the following dimension, using a 10-foot straightedge:
      a. 1/8 inch.

G. Slab Finish Schedule: Apply finishes in the following typical locations and as otherwise shown on the drawings:
   1. Trowel finish:
      a. Exposed interior floors not otherwise scheduled.
      b. Surfaces to receive resilient tile.
   2. Trowel and fine broom: Surfaces to receive thinset tile.

3.07 CONCRETE CURING AND PROTECTION

A. General:
   1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
   2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.
B. Curing Period:
   1. Not less than 7 days for standard cements and mixes.
   2. Not less than 4 days for high early strength concrete using Type III cement.
C. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
D. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared, but before surface is dry.
   2. Keep continuously moist for not less than 3 days by uninterrupted use of any of the following:
      a. Water ponding.
      b. Water-saturated sand.
      c. Water-fog spray.
      d. Saturated burlap: Provide 4-inch minimum overlap at joints.
   3. Begin final curing procedures immediately following initial curing and before concrete has dried.
   4. Continue final curing to end of curing period.
E. Avoid rapid drying at end of curing period.

3.08 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Composite Sampling, and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.
B. Slump: ASTM C 143. One test per batch.
   1. Modify sampling to comply with ASTM C 94.
C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.
D. Compressive Strength Tests: ASTM C 39.
   1. Testing for acceptance of potential strength of as-delivered concrete:
      a. Obtain samples on a statistically sound, random basis.
      b. Minimum frequency:
         1. One set per 100 cubic yards or fraction thereof for each day's pour of each concrete class.
         2. One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.

END OF SECTION 03310

DIVISION 4 - MASONRY

SECTION 04220 – BRICK & CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Brick, and concrete masonry units foundation and brick veneer walls.
   2. Mortar and grout, reinforcement, anchorage, and accessories.

PART 2 - PRODUCTS

2.01 BRICK MASONRY UNITS

A. Modular Facing Brick: ASTM C 216.
   1. Basis of Design: Cherokee Brick and Tile Company " M/S Velour Light Gray".
   2. Acceptable Manufacturers:
      a. Cherokee Brick and Tile, Macon, GA
      b. Triangle Brick, Durham, NC
      c. Cunningham Brick, Lexington, NC
      d. Statesville Brick, Statesville, NC
      e. Other manufacturers as approved.
   3. Submit samples.

2.02 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards for types required to match existing, and as follows:
   1. Size: Standard units with nominal dimensions of 16" long, 8" high, and 8" thick.
   2. Special shapes: Provide special block types where required for corners, control joints, headers, lintels, and other special conditions, whether or not specifically indicated on the drawings as special.
      a. Outside corners: Square-edged units except where otherwise indicated.
   3. Hollow load-bearing units: ASTM C 90, and as follows:
      a. Standard weight.
      b. Exposed faces: Manufacturer's standard color and texture.

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I.
B. Hydrated Lime: ASTM C 207, Type S.
C. Aggregate for Mortar: ASTM C 144.
D. Water: Potable.
E. Colored Mortar at brick: As selected by Architect from manufacturer's full range of colors.

2.04 REINFORCEMENT AND ANCHORAGE

A. Joint Reinforcement and Anchorage Materials: Comply with the following general requirements for materials required in joint reinforcement and anchorage devices:
   1. Steel wire: ASTM A 82.
      a. Hot-dip galvanizing (after fabrication): ASTM A 153, Class B-2.
         1. Use: Exterior locations or in contact with earth.
   2. Hot-dip galvanized steel sheet: ASTM A 635 or ASTM A 366; galvanizing in compliance with ASTM A 153, Class B.
      a. Use: Anchors and miscellaneous sheet metal in masonry accessories at exterior exposures.
B. Joint Reinforcement: Welded-wire units prefabricated into straight lengths of not less than 10 feet, with deformed continuous side rods and plain cross rods.
   1. Width: Approximately two inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and ½ inch elsewhere.
   2. Wire sizes:
      a. Side rod diameter: 0.1483 inch.
      b. Cross rod diameter: 0.1483 inch.

3. Configuration:
   a. Applications of single unit width: Ladder design, cross rods at not more than 16 inches on center.
   b. Corners: Prefabricated L- and T-shaped units.

C. Reinforcing Bars: Provide deformed bars complying with the following: ASTM A615, Grade 60.

2.05 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond Breaker Strips: ASTM D 226, Type I; No. 15 asphalt felt.
B. Sealant and Backer Rod: As specified in Division 7.
C. Masonry Veneer Anchors at Wood Studs: Adjustable, 2-piece assemblies, for attachment over sheathing to wood studs, allowing vertical and horizontal movement and capable of withstanding a 100-lb load in tension or compression without deforming.
D. Flexible Sheet Flashing: Perm-A-Barrier Wall Flashing by W. R. Grace & Company or Keystone Flashing Co. or Polyguard Products Inc. or approved equal, 40 mil thick x 18" wide rolls.
E. Metal Flashing: where shown or required; galvanized; not less than 24 gage.

2.06 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
   1. Limit cementitious materials to lime and portland cement.
   2. Masonry below grade and in contact with earth: Type S.
   3. Locations indicated on the drawings: Type S.
   4. Applications as follows: Type N.
      a. Exterior, above-grade veneer.
      b. Locations for which another mortar type has not been specifically indicated.

PART 3 - EXECUTION

3.01 INSTALLATION PROCEDURES

A. Comply with manufacturer's installation instructions for the stone veneer selected with a stacked appearance.
B. Concrete Masonry Units: Do not wet concrete masonry units prior to laying.
C. Cutting: Where cutting is required, use power saws to provide clean, sharp, unchipped edges.
   1. Do not use wet cutting techniques with concrete unit masonry.

3.02 MASONRY CONSTRUCTION - GENERAL

A. Pattern Bond: Lay exposed masonry in running bond except where other bonds are indicated at special features.
   1. Lay concealed masonry in running bond, or lap units at least 2 inches.
B. Expansion and Control Joints: Build in movement joints where indicated, installing accessory items as masonry is constructed.

3.03 LAYING MASONRY UNITS

A. Hollow Masonry Units: Install so that face shells are solidly mortared, horizontally and vertically. Bed webs solidly in mortar at starting course.
B. Joints: Make mortar joints visually and dimensionally consistent.
   1. Except as otherwise indicated, maintain mortar joint widths of 3/8 inch.
C. Exposed Joints: Using concave jointer slightly larger than joint width, tool exposed joints before mortar has assumed final set.

3.04 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS

A. General: Provide continuous horizontal joint reinforcement for specific single-wythe masonry walls indicated. Lap reinforcing a minimum of 6 inches.
B. Vertical Spacing: Not more than 16 inches on center.

3.05 CLEANING AND PROTECTION

A. Clean masonry after mortar is thoroughly set and cured.
   1. Scrape off adhered mortar particles by hand, using non-metallic tools.
   2. Comply with directions of concrete unit masonry manufacturer and NCMA Tek Bulletin No. 45 for cleaning CMU.

B. Protection: Institute protective measures as required to ensure that unit masonry work will be clean and undamaged at substantial completion.

END OF SECTION 04220

DIVISION 5 - METALS
SECTION 05500 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe railings and guard rails

B. Cast-in stair nosings

C. Pipe bollards

C. Other shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04200 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 09900 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

I. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.

J. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012e1.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

N. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society; 2008.

O. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

Q. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.

E. Bolts, Nuts, and Washers: Stainless steel.

F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Guards and railings as shown: Schedule 40 pipe, fully welded, ground smooth, prime paint finish.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

D. Lintels: As detailed; prime paint finish.

E. Stair nosings: Cast angles with non-slip surface; anchor studs for permanent installation.

2.05 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.06 FINISHES - ALUMINUM

A. Interior Aluminum Surfaces: Class I natural anodized.

B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

D. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch.

C. Maximum Out-of-Position: 1/8 inch.

END OF SECTION

SECTION 05510 - METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum grating walkways.

B. Structural aluminum stair framing and supports.

C. Aluminum grate treads.

D. Tubular Aluminum Handrails.

1.02 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2010.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

I. NAAMM AMP 510 - Metal Stairs Manual; The National Association of Architectural Metal Manufacturers; 1992, Fifth Edition.

J. NAAMM MBG 531 - Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers; 2009.

K. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2009 (ANSI/NAAMM MBG 532).

L. Aluminum Association Specifications and Guidelines for Aluminum Structures.

M. ANSI/AWS D1.2-08 GMAW for aluminum welding.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data;

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of North Carolina or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Products of the manufacturers listed or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable.
   1. Sapa Extrusions, LLC, 1-800-648-3696;
   2. Karnel Inc., 1-800-517-1396;
   3. Ridge Metal Works, 1-513-681-5500.

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, and railings, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Structural Design: Provide complete stair and railing assemblies complying with the North Carolina Building Code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, and ground smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where otherwise required structurally; provide all anchors and fasteners required.

2.03 STAIR COMPONENT DESIGN REQUIREMENTS

A. Stair stringers and treads:

1. Design stair assembly for a uniform load of 100 lb per square foot and a concentrated load of 300 lb per 4 square inches, or a single concentrated 1000 pound load without permanent deformation.

2. Design treads a single concentrated 1000 pound load without permanent deformation.

B. Walkway:

1. Design for a uniform load of 100 lb per square foot and a concentrated load of 300 lb per 4 square inches.

C. Handrails:

1. Design to resist a concentrated load of 200 lb applied at any point and in any direction at the top of the rail.

2. Design to resist load of 50 lb per lineal foot applied in any direction.

2.04 METAL STAIRS WITH GRATING TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Open.

C. Treads and Walkway: Aluminum bar grating.
   1. Grating Type: Welded.
   2. Bearing Bar Depth: As required for loading required.
   3. Top Surface: Non-slip finish: abrasive.
   4. Nosing: Abrasive-coated plate.
   5. Nosing Width: 1-1/4 inch, minimum.
   6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Extruded aluminum channels.
   1. Stringer Depth: 12 inches.
   2. End Closure: Same material as stringer flanges.

E. Railings: I ¼" interior diameter Schedule 40 aluminum pipe railings.

2.05 PREFABRICATED STAIRS

A. Prefabricated Stairs: Welded or bolted unit, factory fabricated to greatest degree practical and in the largest components possible.
   1. Design Requirements: Comply with structural design criteria stated elsewhere in this section, the applicable requirements of ASTM E985.
      a. Comply with applicable sections of the North Carolina Building Code.
   2. Materials: Manufacturer's standard aluminum tubes, plates, bars, shapes, sheets, wire and mesh complying with the requirements of the MATERIALS article of this section.
      a. Rails: Manufacturer's standard rails.
         1) Handrails: 34 inches to 36 inches above stair nosing to top of rail.
      b. Treads: Manufacturer's standard aluminum grate.
      c. Finish: mill finish; manufacturer's standard.

2.06 MATERIALS

A. Primary structural components: 6000 Series aluminum alloy with 6061-T6:

   1. Stair stringers;

   2. Stair treads;

   3. Tread brackets;

   4. Stair attachment brackets.

B. Grating Walkway: 6000 Series aluminum alloy with 6061-T6; removable panels up to 36" long laid on ledgers and butted end to end as shown.

C. Steel Bolts, Nuts, and Washers: Stainless steel grade 304 where connecting dissimilar components.

D. Welding Materials: AWS D1.2/D1.2M: 2008; type required for materials being welded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on shop drawings. Perform field welding in accordance with AWS D1.1.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. Coat surfaces to be in contact with concrete with bituminous paint, or separate dissimilar materials by other means.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

DIVISION 6 - WOOD AND PLASTICS

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Rough carpentry for:
      a. Wood framing and sheathing.
      b. Miscellaneous lumber for attachment and support of other work.
   2. Preservative treatment.

1.02 SUBMITTALS

A. Product Data: Submit for: Air infiltration barrier.
B. Framing Connectors and Supports: Submit manufacturer's standard data demonstrating compliance with building code requirements.
C. Treated Wood: Treating plant's instructions for use, including storage, cutting, and finishing.
   1. Pressure preservative treatment: Treating plant's certification of compliance with specified standards and stating process employed and preservative retention values.
      a. Treatment for above-ground use: Certification of kiln drying after treatment.

1.03 QUALITY ASSURANCE

A. Inspection Agencies:
   1. SPIB: Southern Pine Inspection Bureau; treated lumber, trusses.
   2. NLGA: National Lumber Grades Authority: structural framing.

PART 2 – PRODUCTS

2.01 DIMENSION LUMBER

A. Size: Provide nominal sizes indicated, complying with NIST PS 20 except where actual sizes are specifically required. Provide continuous members; splicing is not acceptable.
   1. Surfacing: Dressed lumber (S4S).
   2. Moisture content: Kiln-dry or MC15 (15 percent maximum moisture content).
B. Stud Framing -- 2 x 4 through 2 x 6: Grade: No. 2 (Structural Light Framing).
C. Joist and Small Beam Framing -- 2 x 6 through 4 x 16:
   1. Species: Southern Yellow Pine (SP), Grade: No. 2.
D. Engineer Lumber:
   1. GP Lam LVL (or equal) beams and headers qualified to ASTM D 5456 by APA- The Engineered Wood Association. 1.9E min., 1 ¾" thick, Fb = min. 2,600 psi. For depth other than 12", Fb shall be multiplied by $(12/d)^{1/9}$.
E. Miscellaneous Lumber: Provide dimension lumber and boards necessary for the support of work specified in other sections, whether or not specifically indicated, and including but not limited to blocking, nailers, etc.
   1. Lumber: S4S, No. 2 or better, 15 percent maximum (kiln-dry).

2.02 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented Strand Board sheathing: APA Rated, OSB Structural Panels, Exposure 1 (exterior glue), PS-2 or APA PRP-108 performance standards, 24/16 spacing, and 5/8" thick.
   a. Tongue and groove edges.
B. Wall Sheathing: Oriented Strand Board (OSB), square edged, APA Rated (exterior glue) sheathing panels with nailing pattern recommended by the manufacturer for shear walls, and nominal ½" thick.

2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Provide as required by applicable codes and as otherwise indicated.
   1. Provide fasteners with a hot-dip zinc coating (ASTM A 153) for treated lumber and where wood is in ground contact, subjected to high relative humidity, or exposed to weather.
B. Framing Connectors and Supports: Prefabricated, formed steel units; hot-dip galvanized finish unless otherwise indicated; type and size as required; approved by applicable codes.
C. Air Infiltration Barrier: Spunbonded olefin or woven polyolefin sheet, UV-stabilized, for building wrap.

1. The following products or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. "**Styrofoam Weathermate Plus*, Brand Housewrap**", The Dow Chemical Co.; "Tyvek"; or "Amowrap".

D. Sill Sealer Gaskets: Glass fiber insulation strips; uncompressed thickness, 1 inch (1/32 inch compressed); width to match sill members.

2.04 WOOD TREATMENT BY PRESSURE PROCESS

A. Aboveground Lumber: AWPB LP-2 (waterborne preservatives).
   1. Kiln dried after treatment to 19 percent maximum moisture content.
   2. Treat the following:
      a. Wood in contact with masonry or concrete.
      b. Sill plate.
      c. Other members indicated.

B. Fasteners for Preservative Treated Wood: Hot-dip galvanized steel (ASTM A153).

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Arrange work to use full length pieces except where lengths would exceed commercially available lengths. Discard pieces with defects that would lower the required strength or appearance of the work.
B. Cut and fit members accurately. Install plumb and true to line and level.
C. Fasten carpentry in accordance with applicable codes and recognized standards.
D. Where exposed, countersink nails and fill flush with suitable wood filler.

3.02 MISCELLANEOUS CARPENTRY

A. Provide miscellaneous blocking, nailers, grounds, and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim. Cut and shape to the required size. Provide in locations required by other work.
B. Use countersunk fasteners appropriate to applied loading.

3.03 WOOD FRAMING - GENERAL

A. Comply with sizes, spacing, and configurations indicated. Where not specifically indicated, comply with applicable codes and NFPA "Manual for Wood Frame Construction." Splice members only where specifically indicated or approved.
B. Space fasteners as indicated. Where not specifically indicated, comply with applicable codes and the "Recommended Nailing Schedule" of NFPA "Manual for Wood Frame Construction" and "National Design Specification for Wood Construction."

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Employ the following fastening methods:
   1. Nail roof and wall sheathing to framing.
      a. Provide solid blocking under panel edges other than intact tongue and groove edges.

3.05 AIR INFILTRATION BARRIER

A. Install air infiltration barrier in accordance with manufacturer's instructions.

END OF SECTION 06100

SECTION 06192 - PREFABRICATED WOOD TRUSSES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Trusses fabricated from dimension lumber.
   2. Plate connectors.
   3. Engineering of trusses.
   4. Erection of trusses.
   5. Erection accessories and bracing.
   6. Bridging.
   7. Attachment to structure.

1.02 REFERENCES

A. ASTM A 446/A 446M-93 -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality; 1993.
B. ASTM A 525-93 -- Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process; 1993.
C. ASTM A 792-93a—Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements; 1993.
D. NBS PS 20-70 -- American Softwood Lumber Standard; U. S. Department of Commerce, National Bureau of Standards; 1970 (Amended 1986).
E. TPI PCT-80 -- Design Specification for Metal Plate Connected Parallel Chord Wood Trusses; Truss Plate Institute; 1980.
F. TPI QST-89 -- Quality Standard for Metal Plate Connected Wood Trusses (Appendix P to TPI-85); Truss Plate Institute; 1989.
G. TPI-85 -- Design Specification for Metal Plate Connected Wood Trusses; Truss Plate Institute; 1985, with current errata and addenda. Refer to TPI Truss Bracing Booklet HIB-91.

1.03 SYSTEM DESCRIPTION

A. Design trusses and bracing to support dead loads and to withstand live loads indicated on the drawings.

1.04 SUBMITTALS

A. Shop Drawings: Submit detailed drawings for fabrication, bracing, and erection of trusses including plans, elevations, and large scale details of special connections, joining, and accessories.
B. Shop drawings shall be sealed by a professional engineer registered in the state in which the project is located.

1.05 QUALITY ASSURANCE

A. Provide trusses fabricated as specified herein and complying with the following:
   1. TPI-85, "Design Specification for Metal Plate Connected Wood Trusses."
   2. TPI-80, "Design Specification for Metal Plate Connected Parallel Chord Wood Trusses."
   3. TPI-89, "Quality Standard for Metal Plate Connected Wood Trusses."
B. Lumber Quality:
   1. Comply with NBS PS 20 and applicable grading rules.
   2. Grade stamp: Provide factory marking on each lumber member showing type, grade, mill, and grading agency.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle units to avoid damage. Comply with AITC recommendations and manufacturer's printed instructions.
   1. Protect trusses from weather and condensation. Trusses showing discoloration, corrosion, or other evidence of deterioration must be inspected by the truss plate manufacturer or other acceptable inspection agency before concealment. Replace trusses which inspection determines to be damaged or defective.

PART 2 – PRODUCTS

2.01 TRUSS CONNECTOR PLATES

A. Connector Plate Manufacturers:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Alpine Engineered Products, Inc.
      b. Clary, a Division of Alpine Engineered Products, Inc.
      c. Mitek Industries, Inc.
      d. Tee-Lok Corporation.
      e. Truss Connectors of America.

B. Connector Plates: Fabricate connector plates from sheet metal meeting the following requirements:
   1. Structural properties: ASTM A 446, any grade.
   2. Finish: Hot-dip galvanized; ASTM A 525, G60, minimum.
   3. Thickness: As required by truss design but not less than 0.036 inch (21 gage).

2.02 LUMBER

A. General: Southern Yellow Pine, No. 2 or better.
   1. Surfacing: Dressed, S4S.
   2. Moisture content: 15 percent maximum at time of dressing and shipment.

2.03 FASTENERS AND ANCHORAGES

A. Framing Anchors and Supports: Prefabricated, formed steel units; galvanized finish, ASTM A 525, G60, unless otherwise indicated; type and size as required; approved by applicable codes.
   1. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Harlen Metal Products, Inc.
      b. Simpson Strong-Tie Company, Inc.
      c. Teco.
      d. United Steel Products Company.

B. Fasteners: Comply with applicable codes and standards. Fasten trusses to top plate per Table 2304.9.1 of the NCSBC for rafters to plate in addition to connector shown on the drawings.

2.04 FABRICATION

A. Shop fabricate trusses to comply with TPI QST "Quality Standard for Metal Plate Connected Wood Trusses" and to fulfill with design requirements.
B. Press connectors into both sides of joint simultaneously.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Lift trusses at designated lifting points only.
B. Install trusses in accordance with manufacturer's instructions for erection.
1. Truss spacing: 24 inches on center, typical.
C. Install trusses true to line and level, with webs plumb, and with ends accurately located.
D. Provide temporary bracing to hold trusses upright and in place until permanently secured.
E. Install permanent bridging, bracing, and anchors to maintain trusses straight and in correct position before installing supported construction or superimposing loads.
F. Field cutting of truss members not allowed.
G. Coordinate installation of framing to be attached to or supported by trusses. Verify that concentrated loads will occur only at locations incorporated into the design of the trusses.

END OF SECTION 06192

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Fiber-cement soffit panels, and trim.

1.02 SUBMITTALS

A. Fiber-cement soffit panels, and trim.
   1. Product data.

B. Coordinate installation of woodwork with other work to avoid damage.

1.03 MANUFACTURERS

A. Fiber-cement panels and trim.
   1. Acceptable manufacturers include but are not limited to the following subject to the requirements of the specifications and the drawings.
      a. Certainteed Saint Gobain: www.certainteed.com; Weatherboards.
      b. Guardian Building Products: www.guardian.com; Guardian Trim.
      c. James Hardie Building Products: jameshardie.com.

PART 2 - PRODUCTS

2.01 WOODWORK

A. All Woodwork Finishes: As indicated on drawings.

2.02 WOOD MATERIALS

A. Lumber: Species and grade as indicated; lumber ready for installation shall comply with WM 4, "General Requirements For Finish Wood Molding," Wood Molding and Millwork Producers (WMMP).
   1. Specie(s):
      a. "Pine": Clear, plain sawn Spruce or Idaho white pine at storage shelving and miscellaneous trim.
   2. Softwood: Comply with NIST PS 20 and grade in accordance with the grading rules of the grading and inspection agency applicable to the species.
   3. For transparent finish, use only solid pieces of lumber; WM 4 N-grade.
   4. For opaque finish, pieces which are glued up may be used; WM 4 N- or P-grade.
   5. Moisture content: Not greater than that required by applicable grading rules; provide kiln-dried lumber.
   6. Provide lumber dressed on all exposed faces, unless otherwise indicated.
   7. Do not use twisted, warped, bowed, or otherwise defective lumber.
   8. Sizes indicated are nominal, unless otherwise indicated.
   9. Do not mark or color lumber, except where such marking will be concealed in finish work.

B. Plywood: Types, grades, and cores as indicated.
   1. Medium density overlaid plywood: NBS PS 1, Special Exterior MDO.
   2. Plywood in concealed locations: Comply with NBS PS 1, Grade C minimum.
   3. Telephone boards: fire-retardant treated, Grade B-C minimum.

2.03 FABRICATION

A. Fabricate in sizes and shapes indicated and using details indicated.

B. Complete fabrication and assembly in shop.
   1. Ease edges of solid lumber members where indicated, using:
      a. 1/16-inch radius for members 1 inch or less nominal thickness.
      b. 1/8-inch radius for members more than 1 inch nominal thickness.

C. Where woodwork is indicated to be field finished, sand smooth, fill nail holes, clean thoroughly, and otherwise prepare for finishing.

D. Standing and Running Trim: Miter exposed ends of members to match profile.
   1. Rout out backs of flat members over 2 inches wide, unless ends are exposed.
   2. Kerf backs of flat members over 4 inches wide, except where ends are exposed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that blocking and backings have been installed at appropriate locations for anchorage.

3.02 INSTALLATION - GENERAL

A. Do not begin installation of interior woodwork until potentially damaging construction operations are complete in the installation area.
B. Make joints neatly, with uniform appearance.
C. Install woodwork in correct location, plumb and level, without rack or warp.
   1. Where adjoining surfaces are flush, install with maximum 1/16-inch offset.
   2. Where adjoining surfaces are separated by a reveal, install with maximum 1/8-inch offset.
D. Cut woodwork precisely to fit.
E. Secure woodwork to blocking or use anchors indicated.
   1. Where anchorage method is not indicated, conceal all fasteners where possible.
   2. Where exposed nailing is required or indicated, use finishing nails, countersink, and fill.
F. Repair damaged and defective woodwork to eliminate visual and functional defects; where repair is not possible, replace woodwork.
G. Standing and Running Trim: Use longest pieces available and as few joints as possible.
   1. Stagger joints in built-up trim members. Miter all joints tight at 45 degrees. Miter external and miter internal corners.
   2. Cope or miter at inside corners and miter at outside corners; fit tightly.
   3. Allowed variation in plumb and level: Not more than 1/8 inch in 8 feet.
   4. Install by blind-nailing where possible. Use face-nailing with fine finishing nails countersunk and filled.

3.03 PROTECTION

A. Protect woodwork from damage and maintain design environmental conditions.

END OF SECTION 06200

SECTION 06410 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated casework units.

B. Shop fabricated cabinet units.

B. Countertops.

C. Cabinet hardware.

D. Factory finishing.

1.02 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

B. ANSI A208.1 - American National Standard for Particleboard; 2009.

C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

F. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Federal Specifications and Standards; Revision A, 1996.

G. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

H. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2011.

I. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
   2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

C. Product Data

   1. Hardware accessories.
   2. Plastic Laminate
   3. Solid surfacing materials

D. Samples:
   1. Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
   2. Plastic Laminate: 2- by 2-inch piece of each type, pattern, and color.
   3. Solid surfacing materials: 3 by 3-inch piece of each type, pattern, and color.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.06 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Custom Grade.

B. Breakroom Cabinets: Custom grade; Flush overlay doors and drawer fronts.

1. Plywood or Medium Density Fiberboard

2. Exposed surfaces: Plastic laminate;

3. Interior exposed surfaces: Melamine.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide wood harvested within a 500 mile radius of the project site.

2.03 LAMINATE MATERIALS

A. Manufacturers:

1. Acceptable manufacturers include but are not limited to the following subject to the requirements of the specifications and the drawings.

a. Avonite.
b. Nevamar.
c. WilsonArt

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 SOLID SURFACE MATERIALS

A. Manufacturers:

1. Acceptable manufacturers include but are not limited to the following subject to the requirements of the specifications and the drawings.

a. Avonite; Avonite, Inc.
b. Corian; DuPont Polymers.
c. Fountainhead; Nevamar Corp.
d. Gibraltar; Ralph Wilson Plastics Co.
e. Swanstone; The Swan Corporation.
f. WilsonArt Solid Surface

B. Homogenous solid sheets of filled plastic resin; ASTM Z124.3, Type 5 or 6 without precoated finish

2.05 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments; AWI 400A-T-11.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

D. Catches: Magnetic.

E. Drawer Slides:
   1. Type: Extension types as scheduled.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers: Acceptable manufacturers include but are not limited to the following subject to the requirements of the specifications and the drawings.
      a. Accuride International, Inc: www.accuride.com.
      b. Grass America Inc: www.grassusa.com.
      c. Hettich America, LP; Quadro: www.hettichamerica.com.
      d. Knape & Vogt Manufacturing Company: www.knapeandvogt.com.

F. Hinges: Frameless concealed self-closing type, steel with polished finish.
   1. Basis of Design: Amerock; Frameless Concealed, 165° Full Overlay, Clip On.
   2. Manufacturers: Acceptable manufacturers include but are not limited to the following subject to the requirements of the specifications and the drawings.
      a. Amerock, a Newell/RubberMaid Company: www.amerock.com.
      b. Grass America Inc: www.grassusa.com.
      c. Hardware Resources: www.hardwareresources.com.
      d. Hettich America, LP; Sensys: www.hettichamerica.com.
      e. Julius Blum, Inc: www.blum.com.
   3. Installation Requirement: AWI 400B-T-8.

2.06 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Drawer construction:

1. Drawer Front: Solid lumber or MDF;

2. Drawer Sides and Back: Solid lumber with opaque finish, or 7-ply Veneer Core Plywood with HDPL finish and edge banding.

3. Drawer Bottom: Veneer core panel product with "B" face hardwood veneer, or hardboard; AWI 400A-T-8.

4. Drawer Construction: Dovetail, Dowel, Lock Shoulder; AWI 400B-T-7.

C. Case Body Construction: AWI 400B-T-10; Stop dado/glued with pressure; dowelled/glued with pressure; or fully concealed interlocking mechanical system.

D. Plastic Laminate Countertops: Self-edged HPDL; AWI 400C-G-1 Type B edge.

1. Material Grades and Size Requirements: AWI 400C-T-1.

2. Workmanship: AWI 400C-T-2.

3. Joint Tolerances: AWI 400C-C-1.

E. Solid Surface Countertops: AWI 400C-G-1, Type E edge.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length. AWI-400A-C6; AWI 400B-T-3; AWI 400B-T-4; AWI 400B-T-5.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting. AWI 400B-C-1.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. AWI 400B-T-1

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

 New 3-11-14

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07140

FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid applied membrane waterproofing.

B. Cant strips and other accessories.

C. Drainage panels and Protection boards.

1.02 REFERENCE STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use With Separate W earing Course; 2012.

B. ASTM C1306 - Standard Test Method for Hydrostatic Pressure Resistance of a Liquid-Applied Waterproofing Membrane; 2008.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension; 2006a.

D. ASTM D429 - Standard Test Methods for Rubber Property--Adhesion to Rigid Substrates; 2008.

E. ASTM D624 - Standard Test Method For Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2012).

F. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2006 (Reapproved 2011).

G. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2007.

H. ASTM D2240 - Standard Test Method For Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

I. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings; 1998 (Reapproved 2010).

J. ASTM D2939 - Standard Test Methods for Emulsified Bitumens Used As Protective Coatings; 2003.

K. ASTM D3468 - Standard Specification for Liquid-Applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing; 1999 (Reapproved 2006).

L. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2009.

M. ASTM D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 1993 (Reapproved 2006).

N. ASTM E96/E96M - Standard Test Methods For Water Vapor Transmission of Materials; 2010.

O. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no cost to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hot-Applied Rubberized Asphalt Waterproofing Manufacturers:
1. American Hydrotech, Inc; www.hydrotechusa.com.
2. Barrett Company; www.barrettroofs.com.
3. Carlisle Coatings & Waterproofing, Inc; www.carlisle-ccw.com.
4. W.R. Meadows, Inc; www.wrmeadows.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MEMBRANE AND FLASHING MATERIALS

A. Hot-Applied Rubberized Asphalt Waterproofing: Elasticized rubberized asphaltic compound, hot-applied and quick setting.
1. Cured Thickness: 0.03 inches, minimum.
2. Suitable for installation over concrete substrates.
3. Tensile Strength: 15 psi, measured in accordance with ASTM D412.
4. Ultimate Elongation: 500 percent, measured in accordance with ASTM D412.
5. Hardness: 60, measured in accordance with ASTM D2240, using Type A durometer.
6. Tear Strength: 150 lbf/inch, measured in accordance with ASTM D624.
7. Water Vapor Permeability: 0.014 perm inch, measured in accordance with ASTM E96/E96M.
8. Adhesion: Greater than 150 psi, measured in accordance with ASTM D4541.
9. Brittleness Temperature: -40 F, measured in accordance with ASTM D746.

2.03 ACCESSORIES

A. Surface Conditioner: compatible with membrane compound; as recommended by membrane manufacturer.

B. Protection Board: Type capable of preventing damage to waterproofing due to backfilling and construction traffic.
1. Use one of the following:
   a. Polystyrene foam board, 1 inch thick.
   b. Recycled or reclaimed closed-cell foam plastic with non-woven filter fabric cover; 1 inch thick.
   c. Semi-rigid glass fiber board; unaffected by water, freeze-thaw, fungus, or soil bacteria; containing no formaldehyde, phenol, acrylic, or artificial color; 3/4 inch thick, nominal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer.

D. Seal cracks and joints with sealant using methods recommended by sealant manufacturer.

E. Install cant strips at inside corners.

3.03 INSTALLATION

A. Apply waterproofing in accordance with manufacturer's instructions to specified minimum thickness.

B. Apply primer or surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

C. At joints and cracks less than 1/2 inch in width including joints between horizontal and vertical surfaces, apply 12 inch wide strip of joint cover sheet.

D. At joints from 1/2 to 1 inch in width, loop joint cover sheet down into joint between 1-1/4 and 1/-3/4 inch. Extend sheet 6 inches on either side of expansion joint.

E. Center joint cover sheet over joints. Roll sheet into 1/8 inch coating of waterproofing material. Apply second coat over sheet extending minimum of 6 inches beyond sheet edges.

F. Apply extra thickness of waterproofing material at corners, intersections, and angles.

G. Install flexible flashings where required and seal into waterproofing material. Seal items penetrating through membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.04 INSTALLATION - PROTECTION BOARD

A. Place protection board directly against cured membrane; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

A. Flood to minimum depth of 1 inch with clean water. After 48 hours, inspect for leaks.

B. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test. Repair damage to building.

C. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION 07140

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Substrate preparation.
   2. Bituminous dampproofing for new foundation walls.
   3. Edge and penetration detailing materials.

1.02 SUBMITTALS

A. Product Data: Technical product information and installation instructions which demonstrate that products comply with project requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver dampproofing materials to project site in factory-sealed containers.
B. Store materials in dry, well-ventilated space.

1.04 SITE CONDITIONS

A. Install dampproofing only when site weather conditions are acceptable per manufacturer's recommendations.
B. Ventilation: Provide sufficient ventilation during application and curing of dampproofing to prevent buildup of toxic or flammable fumes.

PART 2 - PRODUCTS

2.01 BITUMINOUS DAMPPROOFING MATERIALS

A. Cold-Applied Cut-Back Semimastic Asphalt: Solvent-based asphaltic dampproofing mastic of brushing (medium) consistency, fibrated, meeting the requirements of ASTM D 4479, Type I; asbestos free.

2.02 INSTALLATION ACCESSORIES

A. Reinforcing Fabric: Woven or nonwoven glass fiber, treated with organic binders and coated for compatibility with dampproofing bitumen.
B. Detailing Mastic: Asphalt-based plastic roof cement, trowel consistency, meeting the requirements of ASTM D 4586.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are smooth, sound, clean, and dry, and that elements which will penetrate dampproofing have been completed and are rigidly installed. Verify that annular openings at penetrations are tightly, rigidly, and permanently sealed.

3.02 PREPARATION

A. Remove honeycomb, aggregate pockets, fins, ridges, and projecting rough areas.
B. Fill cracks, holes, depressions, and irregularities with latex patching mortar or detailing mastic as recommended by membrane manufacturer.
C. Form fillets (cants) at inside corners and around projecting elements using latex patching mortar or detailing mastic.

3.03 INSTALLATION - GENERAL

A. Comply with dampproofing manufacturer's instructions for handling, preparation, application, and protection of dampproofing materials.

3.04 BELOW-GRADE DAMPPROOFING

A. Form flashings at outside corners, changes in plane, and penetrations. Apply coating of dampproofing or detailing mastic, embed layer of fiberglass reinforcing extending at least 12 inches onto dampproofing surface, and topcoat with another layer of dampproofing or detailing mastic.
B. Apply a uniform coat of semimastic dampproofing using spray applicator, brush, or mop. Coverage, 4-1/2 to 5-1/2 gallons per 100 square feet to provide minimum 30-mil dry film thickness.
C. Apply a "touch-up" coating over areas where coating is thin or has not formed a smooth lustrous surface.
D. Install protection board over finished dampproofing at Inspection Pit before backfilling;
   1. Minimum 1/8" thick premolded, semi-rigid board.
   2. Manufacturers including but not limited to:
      a. PC-2 Protection Course: W. R. Meadows, Inc
      b. Protection Sheet: Pecora Corp.
      c. Tremboard: Tremco, Inc.

3.05 INSPECTION

A. Before covering or backfilling dampproofing, notify the Engineer that the dampproofing is ready for inspection.

3.06 PROTECTION AND CLEANING

A. Take measures required to protect completed dampproofing after installation.
B. Install protection board per manufacturer's instructions. Verify that protection board is secure before backfilling. Do not permit backfilling operations to dislodge or dislocate boards.
B. Clean spillage and soiling from adjacent surfaces using cleaning agents and procedures recommended by the manufacturer of the surface.

END OF SECTION 07160

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Extruded polystyrene board.
   2. Glass fiber blanket/batt.

1.02 DEFINITIONS

A. Thermal Resistance (R-value): The temperature difference in degrees F between the two surfaces of a material of given thickness, required to make 1 Btu of energy flow through 1 square foot of the material in 1 hour.

1.03 SUBMITTALS

A. Product Data: Submit for each product specified in this section.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Foamed Plastic Insulation: Minimize period between product delivery and actual installation. Protect against exposure to flame, sparks, or excessive heat. Minimize exposure to sunlight.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide manufacturer's standard preformed insulation units, sized for proper fit in indicated applications.
B. Blanket/Batt Insulation: Where installation of blanket/batt insulation is indicated, glass fiber blanket/batt complying with requirements below.
C. Extruded Polystyrene Board Insulation for wall cavities: Manufactured by extrusion process with integral high density skin:
   1. Type IV (ASTM C 578): 25.0 psi compressive strength.
   2. Total R-value: 5.0 per inch minimum.
   3. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Amoco Foam Products Company.
      b. Dow U.S.A.
      c. DiversiFoam Products Company.
      d. UC Industries, Inc.
D. Glass Fiber Insulation-Blanket/Batt:
   1. Kraft-faced blanket/batt: Type II, Class C (ASTM C 665).
   2. Total R-value: 13 at exterior walls; 38 at ceilings.
   3. Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. CertainTeed Corporation.
      b. Manville Roofing Systems, a Division of Schuller International, Inc.
      c. Owens-Corning Fiberglas Corporation.

2.02 ACCESSORIES

A. Provide accessories as necessary to properly install specified products.
   Adhesive: Insulation manufacturer's recommended adhesive, complying with fire performance requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with insulation manufacturer's recommendations and installation sequence. Provide permanent placement and support of insulation.

B. Install materials in a manner which will maximize continuity of thermal envelope. Use a single layer of insulation wherever possible to achieve indicated requirements, unless otherwise indicated.
C. Insulation Boards:
   1. Extruded polystyrene insulation:
      a. Foundation installation: Provide installation capable of sustaining subsequent construction work without damage or displacement.
         1. Adhesive: Use insulation manufacturer's recommended adhesive to attach insulation boards to foundation. Maximize contact between board surface and substrate.
      b. Cavity wall insulation: Provide continuous insulation attached or adhered to building sheathing. Tape joints
D. Insulation Blankets/Batts:
   1. Application: Wood-framed construction:
      a. Kraft-faced insulation: Friction-fit insulation between framing members; staple flanges to face of wood studs and trusses.
      b. Verify that all kraft-faced insulation is covered by gypsum wall board

END OF SECTION 07210

SECTION 07411-PREFORMED METAL WALL & ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Architectural roofing and fascia system of preformed aluminum panels.
B. Fastening system.
C. Factory finishing.
D. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS
A. Section 06100 – Rough Carpentry: Roof sheathing.
B. Section 07900 - Joint Sealers: Field-installed sealants.

1.03 REFERENCE STANDARDS
A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2005.
B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.
D. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.
E. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; 2006.

1.04 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.
C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.
D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in NCDOT's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY
A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 20 year period from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Acceptable manufacturers or approved equal are:
   1. Architectural Building Components: www.archmetalroof.com.
   2. Construction Metal Products, Inc., (704) 871-8704 www.constructionmetalproducts.com.
   3. Petersen Aluminum Corporation*: www.pac-clad.com.

2.02 ARCHITECTURAL ROOF AND FASCIA PANELS

A. Performance Requirements: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Roofing: Factory-formed panels with factory-applied finish.
   1. Aluminum Panels:
      a. Alloy: Aluminum conforming to ASTM B 209/B 209M; temper as required for forming.
      b. Thickness: Minimum 0.032 inch (0.8 mm).
   2. Profile: Standing seam, with minimum 1.75 inch seam height; lapped seam in standing seam profile with concealed floating steel clip allowing free expansion and contraction of panels while holding panels permanently in place.
   3. Texture: Smooth.
   4. Length: Full length of roof slope, without lapped horizontal joints.
   5. Width: Maximum panel coverage of 16 inches with minor stiffening beads.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 PANEL FINISH

A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil (0.023 mm).

B. Colors:
   1. Wall panels, Eaves, Soffits, Downspouts, Corner Trim, Miscellaneous trim: Basis of Design: Peterson Aluminum Company (www.pac-clad.com) "Champagne".
   2. Roof Panels, Gutters, Rake Trim: Basis of Design: Peterson Aluminum Company (www.pac-clad.com) "Hunter Green".

2.05 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Miscellaneous Sheet Metal Items: Provide ridge caps, flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
   1. Gutters and Downspouts: Englert LeafGuard, Dixie GutterGuard, or Gutter Shutter Co.: Prefinished Aluminum Sheet: ASTM B 209, manufacturer's standard alloy and temper for indicated applications.
      1. Minimum thickness: 0.027 inch thick, unless indicated otherwise.
      2. Finish: 70 percent "Kynar 500" or "Hylar 5000" resin finish over epoxy primer; minimum system thickness 1.0 mil. Provide manufacturer's standard prime coat on underside.
         a. Color: "Lt. Gray".
      3. Provide strippable plastic protective film on prefinished surface.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of closed-cell synthetic rubber, neoprene, or PVC.

C. Soffit: As specified in Section 06200 – Finish Carpentry.

D. Sealants: As specified in Section 07900.
   1. Exposed sealant must cure to rubber-like consistency.
   2. Concealed sealant must be non-hardening type.
   3. Seam sealant must be factory-applied, non-skinning, non-drying type.

E. Underlayment for Wood Substrate: ASTM D 226 roofing felt, perforated type; covered by water-resistant rosin-sized building paper.

F. Snow Guards: Approved equal to Sno Gem polycarbonate snow guards with adhesive fastening to the standing seam panel and manufacturer's instructions.

2.06 FABRICATION

A. Panels: Fabricate and finish panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

C. Accessories:
1. Form sheet metal to match profiles indicated, substantially free from oil-canning, fish-mouths, and other defects.
2. Comply with SMACNA "Architectural Sheet Metal Manual" for applications indicated.
3. Conceal fasteners and expansion provisions wherever possible.
a. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
4. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
a. Gage: As recommended by SMACNA or metal manufacturer for application, but in no case less than gage of metal being secured.

PART 3 EXECUTION

3.01 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.
B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

A. Overall: Install roofing system in accordance with panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
1. Install roofing system with concealed clips and fasteners.
2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
3. Install panels square and true to line. Seams shall be installed straight, smooth, and free of waves, dents, and scrapes.
B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
C. Underlayment: Install roofing felt and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches (50 mm) and side and end laps a minimum of 3 inches (75 mm). Offset seams in building paper and seams in roofing felt.
D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
E. Provide expansion joints in gutters at spacing not to exceed 30 feet.
F. Provide sheet metal baffles 6 inches high with legs 18 inches long at gutter corners below roof valleys.

3.03 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.04 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
B. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

END OF SECTION

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. The sealing of joints indicated on schedule at the end of this section.
   2. The sealing of other joints indicated on drawings.

B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

1.02 DEFINITIONS

A. Substrates:
   1. M-type substrates: Concrete, concrete masonry units, brick, mortar, natural stone. The term "masonry" means brick, stone, and concrete masonry work.
   2. G-type substrates: Glass and transparent plastic glazing sheets.
   3. A-type substrates: Metals, porcelain, glazed tile, and smooth plastics.
   4. O-type substrates: Wood, unglazed tile; substrates not included under other categories.

1.03 SUBMITTALS

A. Product data.

B. Samples for Color Selection. (Products exposed to view only.)

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
   1. Air or substrate temperature exceeds the range recommended by sealer manufacturers.
   2. Substrate is wet, damp, or covered with snow, ice, or frost.

B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Architect/Engineer and get sealer manufacturer's recommendations for alternative procedures.

1.05 WARRANTY

A. Submit Manufacturer's written warranty for failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weather-tight due to faulty materials. Correction is limited to replacement of sealers.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
   1. Provide only materials which are compatible with each other and with joint substrates.
   2. Colors of exposed sealers: As selected by the Architect from manufacturer's standard colors.

B. Manufacturers: Products of the manufacturers listed or approved equal, provided they comply with requirements of the contract documents will be among those considered acceptable.
   1. Silicone sealants:
      a. Dow Corning Corporation.
      b. Pecora Corporation.
      c. GE Silicones.

2.02 ELASTOMERIC SEALANTS

A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.

1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of application.
2. For M-type substrates: Comply with requirements for Use M.
3. For G-type substrates: Comply with requirements for Use G.
4. For A-type substrates: Comply with requirements for Use A.
5. For O-type substrates: Comply with requirements for Use M (minimum) and Use O for the particular substrate.

B. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.

C. Mildew-Resistant Silicone Sealant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates, color to match grout in glazed wall tile.

2.03 SILICONE-LATEX SEALANTS

A. Silicone-Latex Emulsion Sealant: One-part, nonsag, mildew-resistant, paintable at hollow metal frames; complying with ASTM C 834 use at fiber-cement panel joints.

2.04 SEALANT BACKERS

A. Backers - General: Nonstaining; recommended or approved by sealant manufacturer for specific use.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

B. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.

3.02 INSTALLATION

A. Comply with sealer manufacturer's installation instructions and recommendations, except where more restrictive requirements are specified.

3.03 SCHEDULE OF JOINT SEALERS

A. Exterior Joints at fiber-cement panel joints.
1. Use Silicone-Latex sealants, paintable type.
2. Joint shape: Concave joint configuration.

B. Interior inside corners of all glazed tile walls; Mildew-Resistant Silicone Sealant color to match tile grout.

C. Interior Joints for Which No Other Sealer Is Indicated:
1. Use one of the following sealants:
   a. Use Silicone-Latex sealants, paintable type.
   b. Mildew-resistant silicone sealant at all ceramic tile corners and at fixtures.
2. Joint shape: Concave joint configuration.

END OF SECTION 07900

DIVISION 8 - DOORS AND WINDOWS

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Standard steel frames.
   2. Insulated doors.

1.02 REFERENCES
A. SDI 100-1991 -- Recommended Specifications: Standard Steel Doors and Frames; Steel Door Institute; 1991.

1.03 SUBMITTALS
A. Product Data: Submit manufacturer's printed product information indicating compliance with specified requirements.
B. Shop Drawings: Submit drawings for fabrication and installation of specified items, coordinated with opening schedule included in contract documents.

1.04 QUALITY ASSURANCE
A. Quality Standard: Comply with SDI 100.
B. Coordination: Transmit copy of final shop drawings to wood door manufacturer to allow prefitting of wood doors to steel frames.
C. Wind loading shall comply with the 2012 NC State Building Code and ASCE-7-05.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Deliver products in crates or cartons suitable for storage at the site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   1. Benchmark Commercial Door Products.
   2. Curries Company/Essex Industries, Inc.
   3. Republic Builders Products Division/DESCO.
   4. Steelcraft Manufacturing Company/Masco Industries.
   5. D & D Specialties (864) 427-0368.

2.02 MATERIALS
A. Steel Sheets, Hot-Rolled: ASTM A 569 and ASTM A 568, commercial quality, pickled and oiled.
B. Steel Sheets, Cold-Rolled: ASTM A 366 and ASTM A 568, commercial quality, matte finish exposed, oiled.
C. Steel Sheets, Galvanized: ASTM A 591, electrolytic zinc-coated, Class A, mill phosphatized.
D. Anchorages: Galvanized steel, minimum 18 gage.
E. Fasteners and Inserts: Units standard with manufacturer.
   1. Exterior walls: ASTM A 153, hot-dip galvanized, Class C or D.
F. Paint Primer: Manufacturer's standard rust-inhibitive coating, suitable to receive finish coatings specified.

2.03 FABRICATION

A. Exposed Panel Faces: Fabricate from cold-rolled steel.
B. Exposed Door Faces: Fabricate from cold-rolled steel.
C. Frames: Fabricate from cold-rolled or hot-rolled steel.
D. Exterior Doors: Fabricate from electrolytic galvanized steel.
E. Weld all door edges and grind smooth.
F. Exterior Frames: Fabricate from galvanized steel.
G. Exposed Screws and Bolts: Where required, provide only countersunk, flat Phillips-head fasteners.
H. Insulated Assemblies: At locations scheduled, provide insulating door and frame assemblies which have been tested in accordance with ASTM C 236 for thermal resistance.
   1. U-value: 0.24 BTU per hour per square foot per degree F, minimum.
I. Hardware Preparation: Comply with DHI A115 series specifications.
   1. Locations: Comply with final shop drawings.
J. Shop Painting:
   1. Primer: Apply primer evenly to achieve full protection of all exposed surfaces.

2.04 STEEL DOORS

A. General: Fabricate steel doors in accordance with requirements of SDI 100.
B. Exterior Doors:
   1. Grade III - Extra Heavy-Duty, Model 1 - Full Flush, 16 gage.
C. Fixed Panels:
   1. Provide fixed panels of same fabrication as doors.

2.05 STEEL FRAMES

A. General: Fabricate steel frames for scheduled openings, in styles and profiles as shown, using concealed fasteners.
   1. Minimum thickness: 16 gage interior; 14 gage exterior.
   2. Construction: Mitered and welded corners. Grind smooth.
A. Guards: Weld protective covers to back of hardware openings at locations where grout, plaster, or other materials might interfere with hardware operation.
B. Foam Insulation: Fill exterior frame voids with foam insulation, non-expansive type by DAP Inc. or Dow or Foamseal Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install steel doors, frames, and accessories to comply with manufacturer's recommendations.
   1. Comply with detailed installation requirements of final shop drawings.
B. Frame Installation:
   1. General: Adhere to provisions of SDI 105.
   2. Anchors: Provide 3 wall anchors per jamb at hinge and strike levels and minimum 18 gage base anchors.
C. Door Installation:
   1. General: Comply with requirements and clearances specified in SDI 100.
D. Fixed Panel Installation: Install fixed panels with concealed fasteners.

3.02 ADJUST AND CLEAN

A. Touch-Up: At locations where primer has been abraded or minor rusting has occurred, sand smooth and spray-apply compatible primer.
   A. Final Operating Adjustments: Check hardware at all openings for proper operation of doors, making final corrections as required to assure that work of this section is complete and undamaged.

END OF SECTION 08110

SECTION 08211 - SOLID CORE FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUBMITTALS

A. Product data.
B. Shop Drawings:
   1. Dimensions and location of each product specified.
   2. Construction details for each distinct product type.
   3. Dimensions and location of blocking for hardware.
   4. Fire ratings.

1.02 QUALITY ASSURANCE

A. Flush Doors: Comply with the following, hereinafter referred to as referenced standard(s):
   1. "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program," including Section 1300, "Architectural Flush Doors," Architectural Woodwork Institute (AWI).
   2. Acceptable testing and inspection agencies:
      a. Underwriters Laboratories Inc.

1.03 WARRANTIES

A. Warranty:
   1. Solid core wood-faced interior doors: 5 years.

PART 2 - PRODUCTS

2.01 SOLID CORE WOOD-FACED DOORS

A. Description:
   1. Faces: Veneers for transparent finish.
      a. Species: Red Oak.
      b. Cut: Rotary cut.
   2. Finish: Transparent finish specified elsewhere.
   3. Grade: Custom.
   4. Construction: 5 ply or 7 ply.
   5. Core: Particleboard; manufacturer's standard construction.
B. Manufacturers:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Algoma Hardwoods, Inc.
      b. Fenestra Corporation.
      c. GlenMar Door Manufacturing Company.
      d. Graham Manufacturing Corporation.
      e. Mohawk Flush Doors, Inc.
      f. Weyerhaeuser Company
      g. Approved equal.

2.02 FABRICATION

A. Doors: Fabricate to provide consistent clearances as indicated.
   1. Hinge and lock edges: Provide standard (1/8-inch in 2 inches) bevel at edges, unless standard bevel would not precisely match hardware bevel; provide proper bevel for hardware.
   2. Make neat mortises and cutouts for door hardware indicated.
   3. Prefitting: Fabricate and trim doors to size at factory to coordinate with frame shop drawings and floor finishes as indicated in the finish schedule.
   4. Premachining: Make all mortises and cutouts required for hardware at the factory to conform to approved hardware schedule, hardware templates, and door frame shop drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's recommended procedures and requirements of referenced standard.
B. Prefit Doors: Minimize field fitting to those procedures that are necessary to complete work unfinished during factory prefitting and to provide trouble free operation.
C. Fitting of Doors:
   1. Accurately align and fit doors for trouble free operation throughout range of door swing.
D. Clearances:
   1. Clearance between door edge and head: 1/8 inch.
   2. Clearance between door edge and jamb: 1/8 inch.
   3. Clearance between door bottom edge and top surface of threshold: ¼ inch.
   4. Clearance between door bottom edge and floor covering surface or finish (where threshold is not indicated): 1/8 inch.
   5. Clearance between meeting edges at pairs of doors: 1/8 inch.

END OF SECTION 08211

SECTION 08360 - OVERHEAD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated, emergency manual chain hoist.
B. Operating hardware and supports.
C. Electrical controls.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Rough wood blocking for door opening.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1999a.
B. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
C. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; Door & Access Systems Manufacturers' Association, International; 1996.
D. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1998.
E. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, installation details and lift clearances.
C. Product Data: Provide component construction, anchorage method, hardware, and operation manual.
D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified.

1.06 WARRANTY

A. Correct defective Work within a one year period after Project Acceptance.
B. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. **Overhead Door Co.; Product Series 424**.
B. Other Acceptable Manufacturers:
   1. Fimbel Door Corp.
   2. Wayne-Dalton Corp.
   3. Rayanor
   4. Substitutions: See Section 01600 - Product Requirements.

2.02 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, 24 gage, non-insulated ribbed door panels; high lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Performance: Withstand positive and negative wind loads equal to lateral wind loads specified by the NC State Building Code using the coefficients for components and cladding without damage or permanent set, when tested in accordance with ASTM E 330, using 10 second duration of maximum load. Comply with requirements of ASCE 7-98, for components and cladding.
   2. Door Nominal Thickness: 2 inches thick.
   3. Exterior Finish: Prime paint for finish specified in Section 09900.
   4. Interior Finish: Pre-finished with baked-on epoxy of white color.

5. Glazed Lights: Full panel width, 3- row; set in place with resilient glazing channel.
6. Operation: Electric.

B. Door Panels: Flush steel construction; outer steel sheet of 16 gauge minimum, v-grooved profile; inner steel sheet of 16 gauge minimum, flat profile; core reinforcement of 1-3/4 inch thick sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; insulated.

C. Glazing: Double strength clear glass, manufacturer's standard full glazing panels.

2.03 DOOR COMPONENTS

A. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

B. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
1. For Manual Chain Operation: Requiring maximum exertion of 25 lbs force to open.

C. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

D. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

E. Head Weatherstripping: EPDM rubber seal, one piece full length.

F. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

H. Bottom sensing edge.

2.04 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, with G60/Z180 coating, plain surface.

B. Insulation: Polyurethane foam, bonded to facing; Minimum thermal resistance R-8.74.

C. Metal Primer Paint: Zinc molybdate type.

2.05 ELECTRICAL OPERATION

A. Electrical Characteristics:

B. Motor: NEMA MG1, Type 1.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

E. Electric Operator: ¾ Horsepower; side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to reverse door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
1. 24 volt circuit.
2. Surface mounted.
3. Locate at inside door jamb.

H. Coordinate electrical power requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install perimeter trim.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.
B. Maximum Variation from Level: 1/16 inch.
C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
D. Maintain dimensional tolerances and alignment with adjacent work.

3.04 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.
B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.05 CLEANING AND PROTECTION

A. Clean doors, frames and glazing.
B. Remove temporary labels and visible markings.
C. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08450 – TRANSLUC ENT WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
   1. Factory prefabricated structural insulated translucent sandwich panels
   2. 2 ¾" Aluminum framing system
   3. Aluminum sill flashing

1.02 RELATED SECTIONS

A. Pre-engineered Metal Buildings: Section 13610
B. Preformed Wall & Roof Panels: Section 07411
C. Sealants: Section 07900.

1.03 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
B. Submit shop drawings. Include elevations and details.
C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
   1. Sandwich panels: 12" x 12" units
   2. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

1.04 REFERENCE STANDARDS

A. Flame Spread and Smoke Developed (UL 723)
B. Burn Extent (ASTM D 635)
C. Color Difference (ASTM D 2244)
D. Impact Strength (UL 972)
E. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
F. Bond Shear Strength (ASTM D 1002)
G. Beam Bending Strength (ASTM E 72)
H. Insulation U-Factor (NFRC 100)
I. NFRC System U-Factor Certification (NFRC 700)
J. Solar Heat Gain Coefficient (NFRC or Calculations)
K. Condensation Resistance Factor (AAMA 1503)
L. Air Leakage (ASTM E 283)
M. Structural Performance (ASTM E 330)
N. Water Penetration (ASTM E 331)

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications
   1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can

show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.

2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least three consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.05 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads; Provide system capable of handling the following loads:

a. Positive Wind Load: +14.5 PSF
b. Negative Wind Load: -19.4 PSF
c. Seismic Design Criteria: Seismic Design Category C
    1. Ss = 31.4%
    2. S1 = 10.4%
    3. Site Class D

1.06 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.07 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels, or other components of the work.
B. Extended Warranty: five years for failure of materials and workmanship as defined above.

PART 2 - PRODUCTS

2.01 PANEL COMPONENTS

A. Face Sheets
    1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
        a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
        b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.

2. Interior face sheets:
   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 250 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1".

3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

B. Appearance:
1. Exterior face sheets: Smooth 0.070" thick, and Crystal in color.
2. Interior face sheets: Smooth .045" thick, and White in color.
3. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

C. Grid Core
1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

D. Laminate Adhesive
1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives"."
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.

3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.02 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
   1. Thickness: 2-3/4"
   2. Light transmission: 20%
   3. Solar heat gain coefficient 0.28.
   4. Panel U-factor by NFRC certified laboratory: 2-3/4" aluminum grid 0.29.
   5. Grid pattern: Nominal size 12" x 24"; pattern: Shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

2.03 PERIMETER CLOSURE SYSTEM

A. Closure system: Concealed fasteners extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
B. Translucent Panel frame: Manufacturer's standard non-thermal aluminum extrusion with integral gasketing and sized and configured specifically for the translucent panel.
B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
D. Finish:
   1. Light Bronze anodized.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.
B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

3.03 INSTALLATION

A. Install the panel system in accordance with the manufacturer's installation recommendations and approved shop drawings.
B. Anchor component parts securely in place by permanent mechanical attachment system.
C. Accommodate thermal and mechanical movements.
D. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather- tight construction.
E. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.04 CLEANING

A. Clean the panel system inside and outside, immediately after installation.
B. Refer to manufacturer's written recommendations.

END OF SECTION

SECTION 08520 - ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Rough opening framing.

B. Section 06100 - Rough Carpentry: Wood perimeter shims.

C. Section 07260 - Weather Barriers: Perimeter air and vapor seal between window frame and adjacent construction.

D. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08800 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 2009.

C. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

I. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008).

L. FS L-S-125 - Screening, Insect, Nonmetallic; Federal Specifications and Standards; Revision B, 1972.

1.04 PERFORMANCE REQUIREMENTS

A. Performance Requirements: As specified in PART 2, with the following additional requirements:

B. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
   1. Design Wind Loads: Comply with requirements of ASCE 7-05.

C. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

D. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

D. Samples: Submit two samples, 12 x 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Certificates: Certify that windows meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.07 QUALITY ASSURANCE

A. Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440-05:
   1. AW-80 (Operable)
   2. AW-100 (Fixed)

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.10 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Aluminum Windows: Basis of Design: YKK-AP Model YSW 400T.
   1. EFCO, A Pella Company: www.efcocorp.com.

2. Peerless Products, Inc: www.peerlessproducts.com.
3. TRACO: www.traco.com.
4. Wausau Window and Wall Systems: www.wausauwindow.com.
5. YKK-AP: www.ykkap.com
5. Substitutions: See Section 01600 - Product Requirements.

2.02 WINDOWS

A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
   1. Frame Depth: 4".
   2. Air Infiltration: Limit air infiltration through assembly to 0.10 cu ft/min/sq ft of wall area, measured at a specified differential pressure across assembly in accordance with ASTM E283.
   3. Water Infiltration Test Pressure Differential: 15.0 pounds per square foot.

B. Standard Glazing – U Value: 0.27.

C. Fixed, Non-Operable Type:
   1. Construction: Thermally broken.
   2. Glazing: See Glass Schedule, Drawing A5.
   3. Exterior Finish: Class I natural anodized.
   4. Interior Finish: Class I natural anodized.

D. Horizontal Sliding Type:
   1. Construction: Thermally broken.
   2. Provide screens.
   3. Glazing: See Glass Schedule, Drawing A5.
   4. Exterior Finish: Class I natural anodized.
   5. Interior Finish: Class I natural anodized.

E Horizontal Sliding Type:
   1. Construction: Non-thermal.
   2. Provide screens.
   3. Glazing: See Glass Schedule, Drawing A5.
   4. Exterior Finish: Class I natural anodized.
   5. Interior Finish: Class I natural anodized.

2.03 ACCESSORIES

A. Sill Flashing: Match material & finish of window; design shall permit proper installation of backer rod & sealant along bottom and at sides.

B. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

C. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

D. Fasteners: Stainless steel.

E. Glass and Glazing Materials: As specified in Section 08800.

F. Sealant and Backing Materials: As specified in Section 07900.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.05 HARDWARE

A. Sash lock: Lever handle with cam lock.

B. Operator: Lever action handle fitted to projecting sash arms with limit stops.

C. Bottom Rollers: Stainless steel, adjustable.

D. Limit Stops: Resilient rubber.

2.06 FABRICATION

A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide steel internal reinforcement in mullions as required to meet loading requirements.

G. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.

I. Double weatherstrip operable units.

J. Factory glaze window units.

2.07 FINISHES

A. Class I Light Bronze Anodized Finish.

B. Apply 1 coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

G. Install operating hardware not pre-installed by manufacturer.

H. Install glass and infill panels in accordance with requirements specified in Section 08800.

I. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

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3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUBMITTALS

A. Product Data.
B. Final Hardware Schedule.
C. Keying Schedule: Separate schedule showing how each lock is keyed.

PART 2 - PRODUCTS

A. Latching and Locking Devices: Mortise locks, unless otherwise indicated, with appropriate locking function; provide on every door.

2.01 MATERIALS - GENERAL

A. Manufacturers:
   1. Where a particular manufacturer's product is specified, products of other manufacturers will be considered for substitution.
B. Fasteners: Provide hardware prepared by the manufacturer with fastener holes for machine screws, unless otherwise indicated.
   1. Provide all fasteners required for secure installation.
   2. Select fasteners appropriate to substrate and material being fastened.
   3. Use wood screws for installation in wood.
   4. Use fasteners impervious to corrosion outdoors and on exterior doors.
   5. Exposed screws: Match hardware finish.
C. Finish on All Exposed Metal Items: Satin chrome plated (626).
   1. Exceptions:
      a. Plates and bars: Satin stainless steel (630).
      b. Hinges: Where steel hinges are acceptable, use matching plated finish.
      c. As indicated for specific items.

2.02 LOCKS, LATCHES, AND BOLTS

A. Mortise Locksets and Latchsets:
   1. Comply with requirements of BHMA A156.13, Operational Grade 2.
      a. Security Grade 1.
   2. Trim: Cast lever with escutcheon plate.
B. Strikes: Provide strike for each latch bolt and lock bolt.
   1. Finish to match other hardware on door.
   2. Use wrought box strikes with curved lips unless otherwise indicated.
   3. Open strike plates may be used on interior wood door frames.

2.03 LOCK CYLINDERS AND KEYING

A. Keying: Obtain the owner's keying instructions.
   1. Match existing master key system.
   2. Provide standard cylinders for locks on all doors, unless otherwise indicated.
B. Cylinders: Minimum 7-pin pin tumbler cylinders.
   1. Construction: All parts brass, bronze, nickel silver or stainless steel.
   2. Cylinders made by manufacturers other than the lockset manufacturer will not be acceptable.
C. Keys: Nickel silver.
   1. Stamp each key with manufacturer's change symbol.
   2. Provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
   3. Provide 3 of each change key. Master key system shall match existing: 5 master keys.

2.04 DOOR CONTROL DEVICES

A. Closers - General:
   1. Use closers of sizes recommended by manufacturer, unless a larger size is specified.
   2. Size closer or adjust closer opening force to comply with applicable codes.

B. Surface-Mounted Closers:
   1. Comply with requirements of BHMA A156.4, Grade 2.
      a. Provide the following features:
         1. PT 4D: Adjustable hydraulic back check.
         2. PT 4F: Delayed action.
   2. Style: CO2021.
   3. Parallel arms: Provide for all closers; use larger size than normal.
      1. Finish: Metallic paint finish, color similar to metal hardware on same door.
B. Recessed-Mounted Closers: Replace existing closers at the 2-Welcome Center entry doors.
C. Wall/Floor-Mounted Stops/Holders: Comply with requirements of ANSI A156.16.
   1. Floor-mounted stops: Style: L12121.
   2. Resilient bumpers: Gray.

2.05 SEALS AND THRESHOLDS

A. Weatherstripping:
   1. At jambs and head: Replaceable bumper in surface-mounted extruded aluminum housing.
      a. Bumper: Solid neoprene, hollow bulb or loop.
   2. At bottom: Replaceable sweep in surface-mounted extruded aluminum housing.
      a. Sweep: Solid neoprene.
   3. Housing finish: Natural anodized.
B. Thresholds: Ribbed aluminum.
   1. Select style to suit changes in elevation and to fit door hardware and frames.
   2. Interlocking hook type threshold: Hook strip on bottom of door, interlocking with top lip of threshold.
      a. At doors that swing in, provide internal drain and drain pan.
C. Sealant for Setting Thresholds: Butyl-rubber or butyl-polyisobutylene sealant.

2.06 ARCHITECTURAL DOOR TRIM

A. Manufacturers:
   1. Architectural door trim: Products of the following manufacturers, or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Yale Security, Inc.
      b. Hiawatha, Inc.
      c. H. B. Ives, a Harrow Company.
      d. Rockwood Manufacturing Company.
      e. Triangle Brass Manufacturing Company, Inc.
B. Push / pulls:
   1. Decorative pulls: 1 inch round bars, radius ends, vertical(pull side) and horizontal(push side), 12 & 32 inches long respectively.
   2. Pull handles which are not mounted on plates: Fasten with through-bolts concealed under plate on opposite side.
   3. Where matching handles or bars are installed on each side of door, mount back-to-back with concealed fasteners.

PART 3 - EXECUTION

3.01 PREPARATION

A. Factory- or shop-prepare all work for installation of hardware.

3.02 INSTALLATION

A. Follow hardware manufacturer's recommendations and instructions.
B. Mount at heights specified in the Door and Hardware Institute's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   1. Exception(s): As required by applicable regulations.
C. Install hardware in correct location, plumb and level.
D. Reinforce substrates as required for secure attachment and proper operation.
E. Thresholds: Apply continuous bead of sealant to all contact surfaces before installing.

3.03 ADJUSTMENT

A. Adjust each operable unit for correct function and smooth, free operation.
B. Adjust door closers to overcome air pressure produced by HVAC systems.
C. If hardware adjustment is completed more than one month before substantial completion, readjust hardware not more than one week before substantial completion.

3.04 CONTRACT CLOSEOUT

A. Deliver all keys to the owner.

END OF SECTION 08710

SECTION 08711 – DOOR HARDWARE SCHEDULE

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SUBSTITUTIONS ALLOWED ONLY PER SPECIFIED SUBSTITUTION PROCEDURE.

HINGES:	HAGER	BB1199	BB1279	BB1168 BB1193
	MCKINNEY	T4A3386	TA2714	T4A3786 TA2314
	HB IVES	5BB1HW	5BB1	

EXIT DEVICES:	SARGENT	88 SERIES	US32D
	VON DUPRIN	99 SERIES	US26D
	CORBIN	ED5000 SERIES	US32D

LOCKS:	YALE	8800FL CRR	US26D
	SCHLAGE	9000 03A	US26D
	BEST	45H 3H	US26D

CLOSERS:	SARGENT	281	SERIES
	LCN	4041XP	SERIES
	CORBIN	DC8200	SERIES

OH STOPS	GLYNN JOHNSON:	900	SERIES US32D
		454	SERIES US32D
	ABH:	9020	SERIES US32D
		4400	SERIES US32D
	RIXSON	9-006	SERIES US32D
		10-006	SERIES US32D

BASIS OF DESIGN PRODUCTS. SEE ABOVE FOR OTHER ACCEPTABLE MANUFACTURERS.

Manufacturer List

Code	Name
IV	Ives
LC	LCN Closers
MGDF	MGDF
NA	National Guard
RO	Rockwood
SC	Schlage
VO	Von Duprin

Hardware Sets

SET #01

1	Continuous Hinge	224HD 83"	US28	IV
1	Exit Device	99NL x 990NL-R&V 425-SNB (QTY-2)	US26D	VO
1	Rim Cylinder	80-159	626	SC
1	Cylinder Core	80-037	626	SC
1	Closer	4040 XP CUSH	AL	LC
1	KERFED FRAME	WITH SEALS		MGDF
1	Drip Cap	16 A 40"		NA
1	Saddle Threshold	425 36"	AL	NA

SET #02				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Lockset	L9050HD 03A	630	SC
1	Cylinder Core	80-037	626	SC
1	Wall Bumper	409	US32D	RO
3	Door Silencer	SR64		IV
SET #03				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Lockset	L9080HD 03A	630	SC
1	Cylinder Core	80-037	626	SC
1	Closer	4040 XP EDA	AL	LC
1	Wall Bumper	409	US32D	RO
3	Door Silencer	SR64		IV
SET #04				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Lockset	L9080HD 03A	630	SC
1	Cylinder Core	80-037	626	SC
1	Closer	4040 XP REG	AL	LC
1	Kickplate	8400 10" x 34"	US32D	IV
1	Wall Bumper	409	US32D	RO
3	Door Silencer	SR64		IV
SET #05				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Privacy Set	L9040 03A L583-363	630	SC
1	Closer	4040 XP REG	AL	LC
1	Kickplate	8400 10" x 34"	US32D	IV
1	Wall Bumper	409	US32D	RO
1	Coat & Hat Hook	574 B	26D	IV
3	Door Silencer	SR64		IV
SET #06				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Privacy Set	L9040 03A L583-363	630	SC
1	Closer	4040 XP EDA	AL	LC
1	Kickplate	8400 10" x 34"	US32D	IV
1	Wall Bumper	409	US32D	RO
1	Coat & Hat Hook	574 B	26D	IV
3	Door Silencer	SR64		IV
SET #07				
3	Hinges	5BB1 4 1/2 x 4 1/2	630	IV
1	Lockset	L9080HD 03A	630	SC
1	Cylinder Core	80-037	626	SC
1	Closer	4040 XP CUSH	AL	LC
1	Kickplate	8400 10" x 34"	US32D	IV
3	Door Silencer	SR64		IV

END OF SECTION 08711

SECTION 08800 - GLAZING

Revised 3-11-14

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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Insulating glass units.
   2. Non-insulating glass units.
   2. Glazing accessories.

B. Types of work in this section include work for:
   1. Single pane glass in interior aluminum windows.
   2. Single pane glass in interior doors.
   3. Insulating glass units in exterior aluminum windows.
   4. Insulating glass units in exterior doors.

1.02 PERFORMANCE REQUIREMENTS

A. Exterior Glazing: Provide glazing assemblies which will withstand normal conditions without failure, loss of weathertightness, or deterioration.

B. Deterioration includes:
   1. For insulating glass:
      a. Moisture or dirt between panes.
      b. Development of condensation between panes.
      c. Damage to internal coating, if any.
      d. Development of other visible indication of seal failure.

1.03 SUBMITTALS

A. Product Data.

B. Insulating Unit Warranty.

1.04 WARRANTY

A. Warranty on Insulating Glass: Fabricator's standard warranty for 5 years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Guardian Industries Corporation: www.guardian.com
      b. Oldcastle Building Envelope: www.oldcastlebe.com
      c. Pittsburgh Paint and Glass:
      d. Viracon, Inc.: www.viracon.com

2.02 GLASS TYPES

A. Glass Types - General: Provide glass types fabricated of the glass products indicated.
   1. Single lite glass thickness: 6 mm (1/4 inch nominal), unless otherwise indicated.
   2. Where safety glazing is required by governing authorities, provide certified safety glazing.

B. Glass Type G1: Insulating units at sliding and fixed windows.
   1. Total thickness: 1 inch insulating, nominal.
   2. Exterior: Basis of Design: PPG Solarban 60 clear on clear
      a. Two-ply.
      b. Thickness of plies: ¼" (6 mm).
      c. Color: Outer and inner plies: Clear.
      d. Shading Coefficient: 0.45.
      e. Solar Heat Gain Coefficient: 0.39.
      f. visible light transmission=70%.
      g. Winter U-value: 0.29 or better.
      h. Summer U-value: 0.27 or better.
      i. Air Space: ½" thick.

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C. Glass Type G2: Insulating units at exterior doors. **464**
   1. Total thickness: 11/16 inch insulating, nominal.
   2. Exterior: Basis of Design: PPG Solarban 60 clear on clear
      a. Two-ply.
      b. Thickness of plies: 1/4" (6 mm).
      c. Color: Outer and inner plies: Clear.
      d. Shading Coefficient: 0.45
      e. Solar Heat Gain Coefficient: 0.39.
      f. visible light transmission=70%.
      g. Winter U-value: 0.29 or better.
      h. Summer U-value: 0.27 or better.
      i. Air Space: 3/16" thick.

D. Glass Type G3: 1" Fully Tempered Insulating glass units. Thermal requirements same as Type G1.

E. Glass Type G4: ¼" Clear Fully Tempered Float Glass.

2.03 BASIC GLASS PRODUCTS

A. Sealed Insulating Units: Factory-assembled multiple panes separated by and sealed to spacers forming air-tight, dehydrated air space(s).
   1. ASTM E 774, Class B.
   2. Spacer seals: Manufacturer's standard.

B. Fully tempered float Glass: Quality q3, unless otherwise indicated.
   1. ASTM C 1048, Kind FT, Condition A, Type 1, Class 1. Minimized distortion.

C. Clear Float Glass: Quality q3, unless otherwise indicated.
   1. ASTM C 1036, Type 1, Class 1 (Clear).

2.04 INSTALLATION MATERIALS

A. Installation Materials - General: Select products which have appropriate performance characteristics as recommended by glass and glazing materials manufacturers and which are compatible with all materials with which they will come into contact.

B. Heel and Toe Bead Sealant: Non-curing, non-skinning, minimum 75 percent solids, butyl or polyisobutylene rubber, complying with 802.3, Type II ductile back bedding compound, as described in AAMA 800.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with recommendations for installation contained in the FGMA "Glazing Manual" and "Sealant Manual" except when specifically not recommended or prohibited by the glass or glazing material manufacturer; comply with manufacturer's recommendations.

B. Protect glazing from edge damage during handling and installation.

C. Do not install glass that has edge damage or defects that reduce glass strength or performance or diminish appearance.

3.02 GLAZING IN FRAMES

A. Use continuous heel or toe bead at all exterior glazing.

B. Do not block weep holes.

C. Structural Adhesive Glazing: Perform glazing in strict accordance with instructions of structural glazing adhesive manufacturer and additional requirements elsewhere in the contract documents.

3.03 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter.

B. Wash glass on both faces not more than four (4) days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

SECTION 08910 – METAL LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim.

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; Air Movement and Control Association International, Inc.; 2010.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Louvers:
   1. Airolite Company, LLC; www.airolite.com.
   2. American Warming and Ventilating; www.awv.com.

3. Construction Specialties, Inc; www.c-sgroup.com.
4. Approved equal.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction.
   1. Free Area: 50 percent, minimum.
   2. Blades: straight.
   3. Frame: 4 inches deep, channel profile; corner joints mitered and mechanically fastened, with continuous recessed caulking channel each side.
   4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
   5. Finish: Clear anodized; finish welded units after fabrication.

C. Operable Louvers: Operable horizontal blades, extruded aluminum construction.
   1. Free Area: 50 percent, minimum.
   2. Operation: Gravity balanced, 90 degree opening with adjustment device to permit setting for varying differential static pressure.
   3. Movable Blades: Straight, pivoted at center, with vinyl, rubber, or polyethylene blade edge and jamb seals; rattle-free linkage.
   4. Frame: 4 inches deep, channel profile; corner joints mitered and mechanically fastened, with continuous recessed caulking channel each side.
   5. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
   6. Finish: Clear anodized; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M),.
   1. Clear Anodizing: AAMA 611 Class I, AA-M12C22A41.

B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Galvanized steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Install perimeter sealant and backing rod in accordance with Section 07 9005.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

DIVISION 9 - FINISHES

SECTION 09260 - GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Gypsum wallboard and ceiling board.
2. Drywall finishing.
3. Cementitious backer boards.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD

A. Gypsum Wallboard and Ceiling Board: ASTM C 36; maximum lengths available to minimize end-to-end butt joints in each area receiving finished gypsum board.
1. Edges: Tapered.
2. Thickness: 5/8 inch, except as otherwise shown.

B. Cementitious Backer Boards: ANSI A118.9
1. ½" thick boards for shower walls with full height wall tile

C. Gypsum Wallboard suspension system:

D. Water resistant gypsum wall board: For use in shower ceilings and behind wall tile except for shower walls.
1. Thickness: 5/8".
2. Glass-mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

D. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
1. Domtar Gypsum.
2. Georgia-Pacific Corporation.
3. Gold Bond Building Products, a National Gypsum Division.
4. USG Corporation.

2.02 TRIM AND ACCESSORIES

A. General: Except as otherwise specifically indicated, provide trim and accessories by manufacturer of gypsum board materials, made of galvanized steel or zinc alloy and configured for concealment in joint compound.

2.03 JOINT TREATMENT

A. General: Provide products by manufacturer of gypsum boards. Comply with ASTM C 475 and with manufacturer's recommendations for specific project conditions.

B. Joint Tape: Manufacturer's standard fiberglass mesh reinforcing tape.

C. Setting Type Joint Compound: Chemical hardening type, for the following applications:
1. Exterior use: Prefilling and topping.

D. Drying Type Joint Compound: Vinyl-based type for interior use, and as follows:
1. All-purpose type, for both embedding tape and as topping.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide miscellaneous materials as produced or recommended by manufacturer of gypsum products.

B. Gypsum Wallboard Suspension system
   1. Commercial quality, cold-rolled steel, hot dipped galvanized finish:
   2. Main Tees: Heavy Duty classification 1.617" high x 144" long, integral reversible splice with knurled face. (15/16" Face and 1-1/2" high)
   3. Cross Members: knurled face. Cross Tees: 1-1/2" high x 48" long with 1-1/2" wide face; quick release cross tee ends for positive locking and removability without tools.
   4. Accessory Cross Tees: Cross tees must have knurled faces and quick release cross tee ends for positive locking and removability without tools.
   5. Provide 9-gauge steel hanger wire.
   6. Suspension System shall meet or exceed load compliance specifications per ASTM C635. Loads are limited to L/240 of each span per ASTM C645.

PART 3 - EXECUTION

3.01 INSTALLATION OF GYPSUM BOARD ASSEMBLIES

A. General: Comply with ASTM C 840 and GA-216 except where exceeded by other requirements.
   1. Wherever possible, install gypsum board to minimize butt end joints.
   2. Apply ceiling boards prior to installation of wallboards. Arrange to minimize butt end joints near center of ceiling area.
   3. Install wallboards in a manner which will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls.
   4. Cut gypsum board accurately to fit closely around penetrating construction.
   5. Apply fasteners so that screwheads bear tightly against face of board and board bears tightly to framing but do not cut into face paper.
   6. Install cementitious backer boards in compliance with ANSI A 108.11.
   7. Install ceiling boards first; then install boards on walls tight to ceiling, leaving a one-half inch gap between wall board and floor.

B. Metal Framing for Suspended Gypsum Board: Install in accordance with ASTM C754 and manufacturer's instructions.
   1. Level suspension system to tolerance of 1/1200.

C. Installation on Wood Framing:
   1. Single-layer application: Install gypsum board by the following method:
      a. Screw attachment.
      b. Comply with attachment requirements as indicated by Structural drawings, where gypsum wall board is used for structural wall diaphragm.

3.02 FINISHING

A. General: Comply with ASTM C 840 and GA-216 except where exceeded by other requirements.
B. Treat cut edges and holes in moisture resistant gypsum board with sealant.
C. Finish gypsum board in accordance with the following level of finish per GA-214, except where indicated otherwise on the drawings:
   1. Level 4: Provide for wall and ceiling surfaces to receive wall paper or flat paint finishes. Embed tape in joint compound at all joints and interior angles. Provide two separate coats of compound at all joints, angles, fastener heads, and accessories. Provide smooth surfaces free of tool marks and ridges.
   2. Level 5: Provide for wall and ceiling surfaces to receive semi-gloss or gloss paint finishes.

END OF SECTION 09260

SECTION 09300 - TILE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Porcelain wall tiles.
   2. Floor paver tiles.

1.03 SUBMITTALS

A. Samples for Verification: Submit each tile type selected mounted on a minimum 12 inch square board with joints filled using selected grout.

1.04 MAINTENANCE

A. Extra Materials: Furnish not less than 1 percent of total product installed maintenance stock for each type, color, pattern, and size of tile product installed.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. Colors, Textures, and Patterns, Tile, Grout, and Other Products: As manufactured by the Dal-Tile Corporation, American Olean Tile, Florida Tile, or approved equals.

2.02 TILE PRODUCTS

A. Basis of Design:
   1. Wall Tile: Dal-tile "Torreon" "Colorbody" Porcelain.
   2. Floor Tile: Dal-tile "Quarry Textures" quarry tile.

B. Wall Tile: compliant with ANSI A137.1, and as follows:
   1. Porcelain Wall Tile.
   2. Moisture Absorption: ASTM C373; less than 0.5 percent.
   3. Size and Shape: 12 inch square.
   4. Edges: Eased.
   5. Surface Finish: High gloss.
   6. Colors: As selected by Architect from manufacturer's full range of colors. Provide up to four (4) colors for all tile shapes.
   7. Trim Units: Matching bead and bullnose shapes in sizes indicated and other shapes as required.

C. Quarry Tile Pavers: compliant with ANSI A137.1, and as follows:
   1. Moisture Absorption: ASTM C373: less than or equal to 3.0 percent.
   2. Size: 6" x 6".
   3. Thickness: 1/2"
   4. Face: Plain.
   5. Edges: Cushioned.
   6. Coefficient of Friction: ASTM C1028:
      a. Wet: greater than or equal to 0.70;
      b. Dry: greater than or equal to 0.80.
   7. Colors: As selected by Architect from manufacturer's full range of colors. Provide up to two (2) colors.
   8. Trim Units: Matching bullnose and cove base shapes:
      a. Bullnose: Size 4"x12".
      b. Cove Base: 5"x6".

D. Marble Thresholds: ASTM C 503; minimum hardness 10.0 per ASTM C241; white with honed finish. Shape as indicated or as required for accessibility.

2.03 SETTING MATERIALS

A. Acceptable Manufacturers:
   1. Bonsal: www.bonsalamerican.com.
   2. Bostik Inc: www.bostik-us.com.

3. Custom Building Products: www.custombuildingproducts.com.
4. Approved equal.

B. Thick-set Mortar bed materials: Portland cement, sand, latex additive, and water; complying with ANSI A118.1A or A118.1B, for floors and walls.

C. Mortar bond coat materials: Dry-set Portland cement type, ANSI A118.1.

2.04 GROUTING MATERIALS

A. Toilet Room Walls: Un-Sanded-Portland Cement Grout: ANSI A108.10.
1. Basis of Design: Bostik Quartzlock2 , #224" Mushroom".

B. Toilet Room Floors and Shower Walls: Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Basis of Design: Bostik Quartzlock2, #255 "Solid Buff".
1. All components premeasured and prepackaged.
2. Color(s): As selected by Architect from manufacturer's full range of colors; up to two (2) colors may be selected.

C. Acceptable Manufacturers:
1. Bostik, Inc: www.bostik-us.com
2. Laticrete: Laticrete SpectraLock PRO premium grout; www.laticrete.com
3. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com.
4. ProSpec, an Oldcastle brand; B-7000 Epoxy Mortar and Grout: www.prospec.com.
5. Approved equal.

2.05 SEALANTS

A. Compatibility: Provide elastomeric sealants, joint fillers, and other related materials that are compatible with each other and with joint substrates for project performance conditions; color shall match wall tile grout color.

B. Masonry / Silicone Sealant: Impregnating masonry sealer for interior and exterior manufactured stone surfaces and grout or ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and O (for nonporous substrates) with added fungicide.

2.06 MISCELLANEOUS MATERIALS

A. Cementitious Backer Units: see Specification Section 09260 – Gypsum Board Systems.

B. Tile Cleaner: Product specifically acceptable to tile manufacturer and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Tile Installation Standard: ANSI A108 series, for setting and grouting materials listed.

B. Installation Methods: Comply with TCA "Handbook for Ceramic Tile Installation" for type of applications indicated.

C. Cementitious Backer Units: Install in accordance with ANSI A108.11.

3.02 TILE APPLICATIONS

A. Interior Floor, Thick-Set:
1. Tile: Quarry tile paver.
2. Installation method:
   a. Concrete subfloor: TCA F112-12.
   b. Bond coat: Latex-portland cement mortar, ANSI A108.5.
   c. Joints shall be ¼" wide.
3. Grout: Sand-portland cement.

B. Interior Wall, Thin-Set:
1. Tile: Glazed wall.
2. Installation method:
   a. Cementitious backer units on studs: TCA W244.
   b. Bond coat: Latex-portland cement mortar, ANSI A108.5.
      7. Grout: Latex-portland cement.

C. Tolerances: Maximum variation in floor and wall finished surface/sub-structures shall not exceed 1/8" in 10'-0" from the required tile surface plane. All individual tile edges shall align with adjacent tile edges and no greater than a 1/64" offset variation shall be acceptable.

D. Shower Receptor Tile Installation Method: TCA B415-12 with cement backer board.
   1. Provide waterproof membrane (ANSI A118.10) on all walls of shower and drying area.
   2. Environmental Classification Com3:
      a. Provide epoxy bond coat per ANSI A118.3.
      b. Provide epoxy grout per ANSI A118.3.
   3. Slope shower pan membrane ¼" per foot to weep holes in drain; turn shower pan up 6" above floor on shower walls. Provide pea gravel at drain weep holes to prevent blockage by mortar.

E. Plan floor and wall tile layout before installing tiling materials.
   1. Center floor tile in center of room.
   2. Floor tiles at wall shall be one-half tile in width or greater.
   3. Saw-cut tiles with smooth, straight edges. Tiles cut with flaked, broken, or spalled edges are not acceptable.
   4. Align joints of cove base with floor tile joints.
   5. Align joints of wall tiles with base tiles.
   6. Floor joints shall be parallel and perpendicular to walls; wall joints shall be straight, plumb, and level.

F. Provide grout release if using dark pigmented grout to prevent finely powdered pigments from lodging in surface pores.

G. Provide marble thresholds at Toilet Room doors. Separate tile floors between Toilet Room, Drying Area, and Shower with marble thresholds.

3.03 CLEANING AND PROTECTION

A. Clean tile surfaces after installation is complete.

B. Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with Kraft paper for protection from subsequent construction activities.

3.04 MAINTENANCE

A. Extra Materials: At time of completing installation, deliver stock of maintenance materials to the owner. Furnish products matching those actually installed, packaged for storage and clearly labeled.
   1. Floor tile: 2 percent of each variety installed and/or a minimum of 10 units of each field and accent color or trim units, whichever is the greater quantity.
   2. Wall Tile: 2 percent of each variety installed and/or a minimum of 10 units of each field and accent color or trim units, whichever is the greater quantity.

END OF SECTION 09300

SECTION 09511 - ACOUSTICAL LAY-IN CEILINGS

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Exposed suspension system.
   2. Acoustical lay-in panels.

1.02 SUBMITTALS
A. Product data.
B. Samples: Submit the following:
   1. Verification samples:
      a. Acoustical units: 6-inch-square samples of each type required.
      b. Exposed suspension and trim elements:
         12-inch-long samples of each type and finish required.

1.03 PROJECT CONDITIONS
A. In a timely manner, furnish to affected installers, attachment devices for incorporation into other work.
B. Do not begin installation of ceiling system until building's normal operating temperature and humidity levels have been reached and will be maintained.

PART 2 - PRODUCTS

2.01 ACOUSTICAL CEILING UNITS - GENERAL
A. Standard for Acoustical Ceiling Units: Provide units conforming to applicable requirements of ASTM E 1264 and ASTM E 84 for Class A materials.
B. Basis of Design: USG Corporation - "Eclipse Clima Plus", SLT, Model 76775HRC.
C. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   1. Mineral fiber acoustical units:
      a. Armstrong World Industries, Inc.
      b. Celotex Corporation.
      c. USG Corporation

2.02 CEILING SUSPENSION SYSTEMS - GENERAL
A. Attachment Devices for Suspension System:
   1. Anchors and intermediate support members: Provide sizes capable of sustaining 5 times the load-carrying capabilities shown in ASTM C 635, Table 1, "Direct Hung" column.
   2. Hanger clips: Fabricate from hot-dip galvanized steel.
   3. Hanger wire: Zinc-coated (galvanized) carbon steel wire, ASTM A 641, soft temper, with Class 1 coating, minimum 12 gage (0.106 inch diameter).
B. Basis of Design: Donn DX/DXL metal suspension system.
B. Edge Moldings and Trim:
   1. Factory-formed lapping wall angle: Basis of Design: Donn M7
   2. Factory-formed wall angle corners: inside and outside corners specifically designed for use with wall angles and suspension system.
C. Manufacturer: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   1. Exposed steel suspension system:
      a. Armstrong World Industries, Inc.
      b. Chicago Metallic Corporation.
      c. USG Corporation.

2.03 LAY-IN ACOUSTICAL CEILING SYSTEM
A. Acoustical Panels: Water felted, rigid mineral fiber boards:

1. Size: 24 by 24 by ¾ inches.
2. Ceiling sound transmission class: Minimum CSTC 35.
   a. Provide foil or other noncombustible backing on panels if standard with manufacturer or if required to achieve specified CSTC value.
3. Noise reduction coefficient: Minimum NRC 0.70.
4. Light Reflectance: Minimum LR 0.86.
4. Edge profile: Manufacturer's standard profile tegular edge.
5. Equal to USG Model Number 76775HRC.
6. Finish: Manufacturer's factory standard.
7. Color: White.
8. Face texture/pattern: Stippled (lightly textured); (ASTM E 1264, Type III, Form 1, Pattern EI).
9. Classification: Class A.
10. Flame spread: 25.
11. Smoke Developed: 50.

B. Exposed Grid: Formed, hot-dip galvanized steel with special corrosion-resistant painted finish.
   1. Profile: Single-web tee, 15/16 inch wide.
   2. Structural classification (ASTM C 635): Intermediate-Duty System.
   3. Color and texture: White color to match ceiling panels; standard smooth texture.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that products furnished as work of this section, but not installed under this section, have been properly installed by the entity performing the installation.

3.02 SUSPENSION SYSTEM INSTALLATION

A. General:
   1. Ceiling grid shall be suspended according to ASCE 7-05 and ASTM C580 seismic requirement.
   2. Install hangers plumb and supported solely by building structure or carrying channels. Do not allow hangers to contact any objects or materials in ceiling plenum which are not actual components of ceiling system.
   3. Install extra hangers as required to support light fixtures, diffusers, grilles, etc. without sag or other distortion of grid.
   4. Level ceiling suspension system to tolerance of 1/8 inch in 12 feet, with cumulative tolerance not to exceed ¼ inch. Bending or kinking of hangers is not allowed.

3.03 TRIM INSTALLATION

A. Install edge moldings and trim units at acoustical ceiling borders, at locations indicated, and where required to cover acoustical unit edges.
   1. Face-riveting of trim and moldings is not allowed.

3.04 LAY-IN PANEL INSTALLATION

A. Panel Installation: Install acoustical panels for accurate fit with suspension system and trim members. Scribe and cut panels at ceiling perimeter and at obstructions to provide neat, precise fit.
   1. Tegular-edge panel installation: Provide installation with panel edges which fit snuggly and neatly into suspension system. Neatly and accurately duplicate edge profile for all cut panels for uniform appearance.

3.05 MAINTENANCE

A. Extra Materials: At time of completing installation, deliver stock of maintenance materials to the owner. Furnish products matching those actually installed, packaged for storage and clearly labeled.
   1. Ceiling Tile: 2 percent of variety installed and/or a minimum of 10 units, whichever is the greater quantity.

END OF SECTION 09511

SECTION 09660 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Resilient base.

1.02 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

1.03 SUBMITTALS

A. Product Data: Submit technical data from each manufacturer of resilient products required.
B. Initial Samples: Submit manufacturer's standard color selection samples for resilient products required, including all available colors and patterns.
C. Verification Samples: Submit samples of each type, color, and pattern of resilient product required, as follows:
   1. Actual tiles.
   2. Cut sections of resilient flooring accessories, not less than six inches in length.
   3. Other materials requested by architect.

1.04 PROJECT CONDITIONS

A. Environmental Requirements: At least 48 hours prior to beginning work, move resilient flooring materials to areas of installation and maintain at minimum 70 degrees F until 48 hours after completing installation and at minimum 55 degrees F thereafter.
B. Sequencing: Do not begin installation of resilient flooring products until painting has been completed for each area.
C. Existing Conditions: Do not install resilient flooring on concrete substrates until testing has been conducted to assure that moisture levels are acceptable.

1.05 MAINTENANCE

A. Extra Materials: At time of completing installation, deliver stock of maintenance materials to the owner. Furnish products matching those actually installed, packaged for storage and clearly labeled.
   1. Resilient tile: 2 percent of each variety installed.
   2. Resilient base: 2 percent of each variety installed.

PART 2 - PRODUCTS

2.01 TILE FLOORING MATERIALS

A. Vinyl Composition Tile
   1. Basis of Design: Mannington Commercial, "Progressions":
      a. Field: #55505 "Deep Sage".
      b. Border and Accent: #55122 "Glacier".
   2. Acceptable Manufacturers: Products of the following manufacturers or approved equal will be among those considered acceptable, provided they comply with requirements of the contract documents:
      a. Armstrong World Industries;
      b. Azrock by Tarkett;
      c. Mannington Commercial..
   3. Size and gage: 12" x 12" x 1/8".

2.02 RESILIENT BASE MATERIALS

A. Rubber Wall Base: FS SS-W-40, Type I, and as follows:
   1. Basis of Design: Roppe #P197 "Iceberg".

2. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. Burke Flooring - Corner Ready Rubber Myte.
   b. Flexco Company.
   c. Johnsonite, Inc.
   d. Roppe Corporation.
3. Height: 4 inches.
4. Style: Standard cove/toe base.
5. Corners: At contractor's option, provide prefabricated units matching base in color and finish, or site-fabricate corners, using heat-forming tool acceptable to manufacturer.
6. Colors:
   a. As selected by Architect from manufacturer's full color range. Up to three (3) colors may be selected.

2.03 MISCELLANEOUS ACCESSORIES

A. Resilient Edge Strips: Solid rubber or vinyl edging, in tapered or rounded profile, nominally 1 inch in width and 1/8 inch in thickness.
   1. Color: Matching flooring.
B. Concrete Slab Primer: Type recommended by manufacturer of resilient product.
C. Adhesive: Type recommended by manufacturer of resilient product for specific substrate conditions.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Before beginning tile installation, verify that floor slab is level and smooth. Use leveling compound where required for level substrate. Patch all imperfections that would otherwise telegraph through resilient materials.
B. Comply with manufacturer's published recommendations for installation in each area, extending resilient flooring into spaces which are partially concealed.
B. Cut and fit tightly to fixtures, pipes, and other obstructions, as well as to walls and partitions.
B. Tightly adhere resilient flooring to substrate with no open joints or cracks, and without raised or blistered areas. Spread adhesive evenly, so that final installation will be without telegraphed markings from adhesive or substrate.

3.02 TILE INSTALLATION

A. Layout: Establish center of each space and lay tile from center point, so tiles at each edge will be not less than ½ tile and will be equal in width.
B. Matching: In each space, use tiles from same production run, and lay tiles in same sequence as removed from cartons. Discard broken, chipped, or otherwise damaged tiles.
   1. Lay tile square to room axis.
   2. Lay tile with pattern in adjacent tiles oriented in perpendicular directions.

3.03 INSTALLATION OF RESILIENT BASE

A. Apply resilient base securely in locations indicated, using maximum lengths available.
B. Install pre-formed interior and exterior corners.

3.04 INSTALLATION OF MISCELLANEOUS ACCESSORIES

A. Resilient Edge Strips: At locations shown on drawings, or where otherwise required to protect edge of resilient flooring, install resilient edge strips securely with recommended adhesive, to achieve tightly butted joint.

3.05 CLEANING

A. Initial Cleaning: Remove excess and waste materials promptly, and sweep or vacuum clean resilient flooring as soon as installation has been completed in each area. After adhesive has had adequate time to set, mop each area with damp mop and mild detergent.

B. Final Cleaning: Remove scuff marks, excess adhesive, and other foreign substances, using only cleaning products and techniques recommended by manufacturer of resilient products.
   1. Polish: Apply protective polish to clean resilient flooring surfaces, unless manufacturer of resilient product recommends otherwise.
   2. Schedule work of other trades to avoid further work after completion of resilient tile installation. If other work is unavoidable, protect resilient flooring with kraft paper or other protective covering.

END OF SECTION 09660

SECTION 09680 - CARPET

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).
B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2010e1.
C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.
E. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 2002.

1.02 SUBMITTALS

A. Product Data: Submit technical data for each distinct type of carpeting material and accessory indicated.
B. Initial Selection Samples: For each carpet type indicated, submit manufacturer's standard samples showing full range of colors, textures, and patterns available.

1.03 PERFORMANCE CHARACTERISTICS

A. Fire Performance: Provide carpet materials capable of meeting the following requirements when tested in accordance with methods indicated, by UL (Underwriters Laboratories Inc.) or other independent testing agency acceptable to governing authorities.
   1. Methenamine pill test (ASTM D 2859): Passes.
   2. Fire hazard classification (ASTM E 84/UL 723/NFPA 255):
      a. Class A: Flame spread 0-25, smoke developed 0-450.
   3. Average critical radiant flux (ASTM E 648/NFPA 253): Minimum 0.45 watt per square centimeter.
   4. Smoke density with flame (ASTM E 662): Less than 450.
   5. Smoke density without flame (ASTM E 662): Less than 450.
B. Physical Properties: Provide carpet materials capable of meeting the following requirements when tested in accordance with methods indicated.
   1. Static electricity generation (AATCC 134): 3.5 kilovolts when tested at 20 percent relative humidity and 70 degrees F.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Take measures as required to ensure materials are not damaged or deformed. Store products in flat position in properly ventilated, dry space. Use suitable means to prevent materials from lying in direct contact with the ground.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Tufted Carpet: Basis of Design: Patcraft Commercial Carpet, Product name: Socrates II , Product number: 10126, Color/texture/pattern: "Croce", # 00314.
B. Acceptable manufacturers: Provide products complying with requirements of the contract documents and made by one of the following:
   1. Lees Commercial Carpets Division/Burlington Industries, Inc.
   2. Mohawk Carpet Corporation.
   3. Patcraft Commercial Carpet

2.02 MATERIALS

A. Carpet:
   1. Location: Conference Room and Office areas noted in the Color-Finish Schedule.
   2. Installation method: Direct glue-down.
   3. Edge guard: Rubber to match color of base.
   4. Additional requirements:
      a. Face yarn: SD nylon.
      b. Dye system: Solution Dyed (stain resistant).
      c. Face weight: 28 oz. per sq. yd.
      d. Backing construction: ActionLock, Unibond, or equal.
      e. Primary & secondary back: woven polypropylene (ActionLock).

2.03 ACCESSORIES

A. Provide accessories recommended by carpet manufacturer.
B. Rubber Edge Guard: Minimum width of anchorage flange 2 inches, size and shape indicated, colors selected by the architect from manufacturer's full range of colors.
C. Carpet Installation Adhesive: Manufacturer's recommended water-resistant, low VOC, adhesive manufactured for use with type of carpet and substrates indicated, and complying with fire performance requirements indicated for carpet.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Perform installation in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
   1. Maximize consistency of carpet appearance, particularly in terms of lay of pile and its direction. Follow manufacturer's recommendations for placement of seams.
   2. Continue carpet into recessed spaces such as closets, and underneath obstacles with open bases.
B. At door openings, orient carpet seam perpendicular to traffic direction; doorway seam shall be located directly underneath door in closed position.

3.02 INSTALLATION - GLUE-DOWN CARPET

A. Before applying adhesive to substrate, prefit carpet in areas where it is to be installed. Where cutting is necessary, provide properly prepared, straight, and unfrayed edges.
B. Install prefitted carpet; butt edges snugly at seams and against vertical obstructions.
   1. Stretch carpet tightly over substrate, so that it lies flat, is uniformly smooth, and free of bulges.
C. Install edge guards at exposed carpet edges unless indicated otherwise; provide secure attachment to substrate.
D. Immediately remove adhesive from surface of carpet by method which will not damage carpet.

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
1. Painting and finishing of exposed exterior items and surfaces.
2. Painting and finishing of exposed interior items and surfaces.

1.02 DEFINITIONS
A. DFM (dry film mils): Thickness, measured in mils, of a coat of paint in the cured state.

1.03 SUBMITTALS
A. Product Data: Manufacturer's technical data sheets for each coating.
B. Color and Texture Samples:
1. Provide for each coating system, color, and texture and applied to representative substrate samples.
a. Prepare samples to show bare, prepared surface and each successive coat.
b. Label each sample with coating name and color.
2. Miscellaneous substrates: 12-by-12-inch hardboard.
3. Wood: 8-inch square samples for surfaces; 8-inch long samples for trim.
4. Metal: 5-by-7-inch samples.

1.04 QUALITY ASSURANCE
A. Materials: All coating materials required by this section shall be provided by a single manufacturer, unless otherwise required or approved.
B. Applicator: Firm with successful experience in painting work similar in scope to work of this project.
1. Maintain throughout duration of the work a crew of painters who are fully qualified to satisfy requirements of the specifications.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Delivery: Deliver materials in manufacturer's original containers bearing coating name and color, material composition data, date of manufacture, legal notices if applicable, and mixing, thinning, and application instructions.

1.06 PROJECT CONDITIONS
A. Apply coatings only under the following environmental conditions:
1. Provide continuous ventilation and heating to prevent accumulation of hazardous fumes and to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and for 48 hours after application of finishes, or longer if required to obtain fuel cure as indicated by manufacturer's instructions.

1.07 COORDINATION
A. Coordination: Where special coatings will be applied over shop coatings specified in other sections, coordinate work of such other sections to ensure that only approved, compatible primers are applied.

1.08 MAINTENANCE STOCK
A. At time of completing application, deliver stock of maintenance material to the owner. Furnish not less than one properly labeled and sealed 1-gallon can of each type of finish coat of each color, taken from lots furnished for the work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Basis of Design: The brand-name products listed in the schedule at the end of this section and made by the following manufacturer are the basis of the contract documents:
1. The Glidden Company – Lifemaster paints.

B. Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered in accordance with standard substitution procedures:
   1. Benjamin Moore & Company - Natura.
   2. The Glidden Company - Lifemaster
   3. Sherwin Williams Company - Harmony.
   4. Devoe Paint.

2.02 PRODUCTS

A. Colors:
   1. For multicoat systems, apply each coat using a successively darker tint or shade, unless approved otherwise.
   2. Top coat colors: As shown on drawings and schedules.
B. Interior Paints: Primers and paints for use inside buildings shall be Low VOC or No VOC content specifically formulated for the substrates indicated.
C. Lead Content:
   1. Not more than 0.06 percent lead by weight (calculated as lead metal) in the total nonvolatile content of the paint or the equivalent measure of lead in the dried film.
   2. Exception: Where permitted by applicable regulations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that surfaces and conditions are ready for work in accordance with coating manufacturer's recommendations.

3.02 SURFACE PREPARATION

A. Apply coatings to surfaces that are clean and properly prepared in accordance with manufacturer's instructions. Remove dirt, dust, grease, oils, and foreign matter. Prepare surface for proper texture necessary to optimum coating adhesion and intended finished appearance. Plan cleaning, preparation, and coating operations to avoid contamination of freshly coated surfaces.
   1. Do not apply coatings to labels that identify equipment, fire-resistance ratings, etc.
   2. Remove hardware, cover plates, and similar items before applying coatings.
   3. Provide protection for non-removable items not scheduled for coating. After application of coatings, install removed items. Use only skilled workmen for removal and replacement of such items.
   4. Protect surfaces not scheduled for coating. Clean, repair, or replace to the satisfaction of the Architect/Engineer any surfaces inadvertently spattered or coated.
   5. Allow substrate to dry thoroughly. Test for moisture in accordance with coating manufacturer's recommendations before applying coatings.
   6. Intricate fabricated shapes may be pickled in lieu of hand or power tool cleaning.
   7. Before hand or power tool cleaning, remove visible oil, grease, soluble welding residue, and salts by solvent cleaning. After hand or power tool cleaning, re-clean surfaces if necessary.
   8. Before touching up coatings damaged by handling or welding, re-prepare damaged surfaces.

3.03 MIXING AND THINNING

A. Remove and discard any skin formed on surface of coatings in containers. Discard any containers where skin comprises 2 percent or more of the remaining material. Do not add thinner except as specifically recommended (not merely permitted) by the coating manufacturer for proper coating application under the circumstances prevailing at the project site when application equipment recommended by the coating manufacturer is employed. Use only the quantities and the types of thinner recommended.

3.04 APPLICATION

A. General:
   1. Apply coatings in accordance with coating manufacturer's instructions and using application method best suited for obtaining full, uniform coverage of surfaces to be coated.
   2. Apply each coat to achieve the dry film thickness per coat recommended by the coating manufacturer. Application rates in excess of those recommended and fewer numbers of coats than specified will not be accepted.

3. Completed coatings shall be free of defects such as runs, sags, variations in color, lap or brush marks, holidays, and skips.
4. Apply coatings according to the schedule at the end of this section and as otherwise indicated. Coat all similar surfaces not specifically mentioned unless specifically exempted.
5. Coat front and back of miscellaneous items such as covers, access panels, and grilles. Apply fully finish coats behind movable items of furniture and equipment before installation. Apply prime coat only behind non-movable items of furniture and equipment before installation.
6. Sand gloss coats before applying subsequent coatings.

B. Remove coatings not in compliance with this specification, re-clean and re-prepare surfaces as specified, and apply coatings to comply with the contract documents.

C. Scheduling:
1. Apply first coat of material to properly prepared surfaces without delay.
a. Apply successive coats within the time limits recommended by the manufacturer.

3.05 PRIME COATS

A. General:
1. Field apply bottom coats scheduled except where the contract documents require shop coating of ferrous metals.
2. Ferrous metals that have not been shop primed shall be field primed promptly after arrival at the site or shall be stored away from the effects of weather.
3. Re-prepare and retouch damaged prime coats using approved, compatible primer.

B. Primers for Wood and Wood Products:
1. Apply first coat to wood upon receipt at the site and before wood is exposed to sun or rain.
2. Thoroughly back-prime concealed surfaces and cut edges of exterior wood trim prior to installation.

3.06 FINISH COATS

A. Number of Coats and Minimum Coating Thickness:
1. Apply not less than the number of coats indicated.
2. Apply each coat to achieve not less than the dry film thicknesses indicated per coat.
3. Apply additional coats at no additional cost to the owner when necessary to achieve complete hiding, uniform texture, or uniform sheen and appearance.

3.07 CLEANING AND PROTECTION

A. Cleaning:
1. Clean work area on a daily basis; dispose of spent materials and empty containers. If requested, turn over the Architect/Engineer all empty coatings containers used during the course of each day.
2. Remove all trace of coatings from adjacent surfaces not scheduled to be coated. Remove by appropriate methods that do not damage surfaces.

B. Protection:
1. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.
2. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.
3. Touch-up of minor damage will be acceptable where result is not visibly different from surrounding surfaces. Where result is different either in color, sheen, or texture, recoat entire surface.

3.08 SCHEDULE OF COATINGS FOR INTERIOR NONTRAFFIC SURFACES

A. **Gypsum Wallboard: Walls & ceilings.**
1. Latex, egg-shell.
a. Bottom coat: Ultra-Hide PVA Primer-Sealer 5019; 1.1DFM.
b. Intermediate coat: Same as top coat.
c. Top coat: Lifemaster 2000 Flat without petroleum based solvents 9300 Series (color # 43YY 78/053, "Antique White RM"; 1.4 DFM.

B. **Wood: Doors, windows, and trim, and cabinetry.**
3. Varnish, satin (stained wood).
a. Stain: Woodmaster Oil Wood Stain 1600 Series (color ICI "Natural").
b. Bottom and intermediate coats: Woodmaster Clear Finish, Gloss 81.
c. Top coat: Woodmaster Clear Finish, Satin 82.

C. **Ferrous Metal: Hollow metal frames.**
   1. Lifemaster Pro HB Acrylic Coating, semigloss:
      a. Bottom coat: Glid-Guard Tank & Structural Primer 5205 Series.
      b. Intermediate coat: Same as top coat.
      c. Top coat: Lifemaster Pro HB Acrylic Coating, Semigloss, 5440 Series (4 mils dry thickness, 148 s.f. / gal.); (Color: # 50GY 12/032, "Black Smith").

3.09 SCHEDULE OF COATINGS FOR EXTERIOR NONTRAFFIC SURFACES

A. **Fiber-Cement: Wall panel siding, lap siding & trim touch up by James-Hardie or equal;**
   1. Acrylic / Latex, flat.
      a. Bottom coat: Same as top coat.
      b. Top coat: Ultra-Hide Duras 2210 Exterior Acrylic Flat Finish; 1.5 DFM.
      (Siding & trim color shall match the fiber-cement ColorPlus colors **"Khaki Brown"** 1.4 DFM).

B. **Ferrous Metal: Hollow metal doors and frames.**
   1. Lifemaster Pro HB Acrylic Coating, semigloss:
      a. Bottom coat: Glid-Guard Tank & Structural Primer 5205 Series.
      b. Intermediate coat: Same as top coat.
      c. Top coat: Lifemaster Pro HB Acrylic Coating, Semigloss, 5440 Series (4 mils dry thickness, 148 s.f. / gal.); (Color: 50YR 09/244, "Redbrick" at metal doors & frames at Storage Building).

END OF SECTION 09900

DIVISION 10 - SPECIALTIES

SECTION 10270 - ACCESS FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural floor system supported by metal pedestals.
B. Integrally designed metal stringers.
B. Removable 24"x24" floor panels with bare metallic face to receive vinyl composition tile.

1.02 RELATED REQUIREMENTS

A. Section 09660 - Resilient Flooring: Finish for access flooring panels.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
B. NFPA 75 - Standard for the Protection of Information Technology Equipment; National Fire Protection Association; 2009.
C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.
D. CISCA (Ceilings & Interior Systems Construction Association) - "Recommended Test Procedures for Access Floors" shall be used as a guideline when presenting load performance product information.

1.04 SUBMITTALS

A. Product Data: Provide data for grid system, panels, and accessories; electrical resistance characteristics and ground connection requirements.
B. Shop Drawings: Indicate floor layout, interruptions to grid, panels requiring drilling or cut-out for services, appurtenances or interruptions, edge details, elevation differences.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

1.06 ENVIRONMENTAL CONDITIONS FOR STORAGE AND INSTALLATION

A. Area to receive and store access floor materials shall be enclosed and maintained at ambient temperatures between 35° to 95° F and relative humidity levels between 20 to 80%. All floor panels shall be stored at ambient temperatures between 50° to 90° F for at least 24 hours before installation begins. All areas of installation shall be enclosed and maintained at ambient temperature between 50° to 90° F and at relative humidity levels between 20% to 80% and shall remain within these environmental limits throughout occupancy.

1.07 PERFORMANCE REQUIREMENTS

2 Design Load: Panel supported on actual understructure system shall be capable of supporting a point load of 1000 lbs applied on a one square inch area at any location on the panel without experiencing permanent set as defined by CISCA. The loading method used to determine design (allowable) load shall be in conformance with CISCA Concentrated Load test method but with panel tested on actual understructure instead of steel blocks.

3 Safety Factor: Panel supported on actual understructure system shall withstand a point load of no less than

4 (2) two times the design load rating on a one square inch area anywhere on the panel without failure when tested in accordance with CISCA A/F, Section 2 "Ultimate Loading". Failure is defined as the point at which the system will no longer accept the load.

5 Ultimate Load: Panel supported on actual understructure system shall be capable of supporting a point load of at least 2000 lbs applied through a load indentor on a one square inch area at any location on the panel without failure (i.e. minimum safety factor of 2) when tested in accordance with CISCA A/F, Section 2, "Ultimate Loading".

6 Rolling Load: Panel supported on actual understructure system shall be able to withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inches when tested in accordance with CISCA A/F, Section 3, "Rolling Loads". Note: wheel 1 and wheel 2 tests shall be performed on two separate panels.

CISCA Wheel 1:	Size: 3" dia x 1 13/16" wide	Load: 800 lbs. Passes: 10
CISCA Wheel 2:	Size: 6" dia x 2" wide	Load: 600 lbs. Passes: 10,000

7 Impact Load: Panel supported on actual understructure (the system) shall be capable of supporting an impact load of 150 lbs. dropped from a height of 36 inches onto a one square inch area (using a round or square indentor) at any location on the panel when tested in accordance with CISCA A/F Section 8, "Drop Impact Load Test".

8 Panel Drop Test: Panel shall be capable of being dropped face up onto to a concrete slab from a height of 36", after which it shall continue to meet all load performance requirements as previously defined.

9 Panel Cutout: Panel with an 8" diameter interior cutout supported on actual understructure shall be capable of maintaining its design load strength with a minimum safety factor of 2 anywhere on the panel without the use of additional supports.

10 Flammability: System shall meet *Class A* Flame spread requirements for flame spread and smoke development. Tests shall be performed in accordance with ASTM-E84-1998, Standard Test Method for Surface Burning Characteristics for Building Materials.

11 Combustibility: All components of the access floor system shall qualify as noncombustible by demonstrating compliance with requirements of ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 deg C.

12 Recycled Content: Panel and understructure system shall be required to have a minimum post-consumer recycled content of 18% and a minimum total recycled content of 49%

13 Axial Load: Pedestal support assembly shall provide a minimum 6000 lb. axial load without permanent deformation when tested in accordance with CISCA A/F, Section 5, "Pedestal Axial Load Test.".

14 Overturning Moment: Pedestal support assembly shall provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA A?F, Section 6, "Pedestal Overturning Moment Test".. ICBO number for the specific system or structural calculations shall be required attesting to the lateral stability of the system under seismic conditions.

15 Stringer Concentrated Load: Stringer shall be capable of withstanding a concentrated load of 450 lbs. placed in its midspan on a one square inch area using a round or square indentor without exceeding a permanent set of 0.010" after the load is removed when tested in accordance with CISCA A/F, Section 4, "Stringer Load Testing".

1.08 DESIGN REQUIREMENTS:

A. Access floor system, where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels fastened onto, and supported by, adjustable height

pedestal assemblies. Pedestal head and panel corner design must provide a positive location and lateral engagement of the panel to the understructure support system without the use of fasteners.

B. Panel shall be easily removed by one person with a suction cup lifting device and shall be interchangeable except where cut for special conditions.

C. Quantities, finished floor heights (FFH) and location of accessories shall be as specified on the contract drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Tate Access Floors, Inc., ConCore® 1000 Access Floor Panel, PosiLock™ Understructure.

B. Access Flooring:
1. ASM Products: www.asmproducts.com;
2. Haworth: www.haworth.com;
3. Tate Access Floors, Inc.: www.tateaccessfloors.com;
4. approved equal.

2.02 PEDESTALS

A. Pedestal assemblies shall be corrosive resistant, all steel welded construction, and shall provide an adjustment range of +/- 1" for finished floor heights 6" or greater. Zinc electroplating shall be prohibited on all pedestal components, including head plate, threaded rod, adjustment nut, pedestal tube, base plate, and all fasteners.

B. Pedestal assemblies shall provide a means of leveling and locking the assembly at a selected height, which requires deliberate action to change height setting and prevents vibration displacement.

C. Hot dip galvanized steel pedestal head shall be welded to a threaded rod which includes a specially designed adjusting nut. The nut shall provide location lugs to engage the pedestal base assembly, such that deliberate action is required to change the height setting.

D. Hot dip galvanized pedestal base assembly shall consist of a formed steel plate with no less than 16 inches of bearing area, welded to a 7/8" square steel tube and shall be designed to engage the head assembly.

2.03 STRINGERS

A. Stringers shall support each edge of panel.

B. Steel stringer shall have conductive galvannealed coating. Zinc electroplating shall be prohibited on stringers and stringer fasteners.

C. Stringers shall be individually and rigidly fastened to the pedestal with one machine screw for each foot of stringer length. Bolts shall provide positive electrical contact between the stringers and pedestals. Connections depending on gravity or spring action are unacceptable.

D. Stringer grid shall be as recommended by manufacturer for arrangement indicated.

2.04 FLOOR PANELS

A. Panels shall consist of a top steel sheet welded to a formed steel bottom pan filled internally with a lightweight cementitious material. Mechanical or adhesive methods for attachment of the steel top and bottom sheets are unacceptable.

B. Floor panels shall be protected from corrosion by electro-deposited epoxy paint. The use of zinc electroplating shall be prohibited.

C. Cementitious fill material shall be totally encased within the steel welded shell except where cut for special conditions. Note: This greatly reduces the potential for dust in the environment from exposed cement materials.

D. Panel shall have an electrically conductive epoxy paint finish.

E. Perforated Airflow Panels: Perforated steel airflow panels designed for static loads of 1000 lbs. shall be interchangeable with standard field panels and shall have 25% open surface area with the following air distribution capability:
   1. Panel without damper: 746 cfm at 0.1-inch of H_2O (static pressure).
   2. Panel with damper at 100% open position: 515 cfm at 0.1-inch of H_2O (static pressure).

F. Corner of panel shall have a locating tab and integral shape design to interface with the pedestal head for positive lateral retention and positioning with or without fasteners.

G. Fastening of panels to pedestal heads shall be accomplished by the use of a machine screw which is specially designed to be self capturing within the body of the panel. Note: This prevents the inadvertent loss of panel fastening screws when accessing the underfloor space and potential damage to objects by screws which extend beyond the depth of the panel.

H. Top surface of the panel shall have an option for four positioning location holes to engage positioning buttons on the PosiTile® carpet tile for precise matching of the carpet tile to the panel.

I. Fit between the pedestal head, panel, and screw shall enable an installation with an average panel to panel gap of 0.015".

2.05 FINISHES

A. Floor Panel Factory Finish: Suitable for receiving field-installed vinyl tile.
B. Floor Panel Field Finish:
   1. Vinyl tile 1/8 inch thick, as specified in 09660; color as selected.

2.06 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Floor Panel Flatness: Plus or minus 0.02 inch in any direction.
   2. Floor Panel Width or Length From Specified Size: Plus or minus 0.02 inch.
   3. Floor Panel Squareness: Plus or minus 0.03 inch difference between opposite diagonal dimensions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements are as shown on shop drawings. Verify that field conditions are acceptable for installation of assembly.

3.02 PREPARATION

A. Vacuum clean substrate surfaces.

3.03 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Secure pedestal base plate to subfloor with mechanical anchors.

D. Install floor panels on pedestals with full bearing.

E. Cut 10-28 holes in floor panels to accommodate NCDOT equipment. Coordinate with owner. Provide cable cut-out protection.

F. Provide positive electrical earth grounding of entire floor assembly in accordance with NFPA 75.

G. Pedestal locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with pedestal installation.

H. Installation of access floor shall be coordinated with other trades to maintain the integrity of the installed system. All traffic on access floor shall be controlled by access floor installer. No traffic but that of access floor installers shall be permitted on any floor area for 24 hours to allow the pedestal adhesive to set. Access floor panels shall not be removed by other trades for 72 hours after their installation.

I. Floor system and accessories shall be installed under the supervision of the manufacturer's authorized representative and according to manufacturer's recommendations.

J. No dust or debris producing operations by other trades shall be allowed in areas where access floor is being installed to ensure proper bonding of pedestals to subfloor.

K. Access floor installer shall keep the subfloor broom clean as installation progresses.

L. Partially complete floors shall be braced against shifting to maintain the integrity of the installed system where required.

M. Understructure shall be aligned such that all uncut panels are interchangeable and fit snugly but do not bind when placed in alternate positions.

N. Finished floor shall be level, not varying more than 0.062" in 10 feet or 0.125" overall.

O. Inspect system prior to application of floor covering and replace any floor panels that are cracked, broken and structurally damaged and do not comply with specified requirements.

3.04 TOLERANCES

A. Maximum Out of Level Floor Panel Tolerance: 1/16 inch in 10 ft, non-cumulative.

3.05 ADJUSTING

A. Adjust pedestals to achieve a level floor and to assure adjacent floor panel surfaces are flush.

3.06 PROTECTION

A. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 10425 - SIGNS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Plastic plaque signs.
B. Provide signage as indicated on the signage schedules.

1.02 SUBMITTALS

A. Product Data: Submit for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
B. Shop drawings:
   1. Show fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Accusign, Inc.
B. Plastic Signs:
   1. Accusign, Inc.; (919) 872-2008 or approved equal.
   2. AdHenderson Printing Products, Inc.
   3. Best Manufacturing Co.
   4. Mohawk Sign Systems, Inc.

2.02 RAISED LETTER SIGNS

A. Base Color: Light Teal, # 348 solid color acrylic plastic:
   1. Total Thickness: 1/8 inch.
   2. Height: 2 inches.
   3. Edges: Square
B. Raised Character Size and Style: Acrylic plastic, character adhered to base material:
   1. Comply with applicable provisions of 2012 NC Building Code, Chapter 11, Accessibility, including International Symbol of Accessibility (restrooms, Family), and ANSI/ICC A117.1, including Tactile Characters and Braille.
   2. Character Color: White.
   3. Character Thickness: 1/8 inch.
   4. Height: 5/8 inch.
   5. Edges: Square.
   6. Character Font: Helvetica.
   7. Character Case: Upper case only.

2.03 ACCESSORIES

A. Mounting Hardware: Chrome screws.
B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Mount signs per ANSI A117.1. Otherwise, position sign 2" from strike side of door frame; center of sign plaque 60" AFF on the wall surface; level. If the strike side wall is not available center on the door or if the door and strike side wall is not available the adjacent wall maybe considered for mounting.

3.02 SCHEDULES

A. Sign plaques shall read as follows:

1. TRUCKER LOBBY	@ door 04
2. OFFICE 1	@ room 102
3. OFFICE 2	@ room 103
4. OFFICE 3	@ room 104
5. OFFICE 4	@ room 105
6. OFFICE 5	@ room 106
7. STOCK ROOM	@ room 107
8. IT ROOM	@ room 108
9. MECHANICAL	@ room 109
10. TRAINING ROOM	@ room 110
11. JANITOR	@ room 112
12. UNISEX	@ room 114
13. UNISEX TOILET & SHOWER	@ room 115
14. UNISEX	@ room 116
15. CALIBRATION	@ room 117

B. Handicap Parking Signs shall be furnished, 1-required, including $250 Penalty sign, type R7-8d (Van Accessible) and shall be painted metal with green copy mounted 84" to the top in accordance with GS20-30.6.

C. Project sign: see following page.

GASTON COUNTY WEIGH STATION

6" HIGH COPY

NC DEPARTMENT OF TRANSPORTATION

2" HIGH COPY

ARCHITECT / ENGINEER:

1-1/2" HIGH COPY

FACILITIES DESIGN

2" HIGH COPY

Facilities Management Division, NCDOT

2" HIGH COPY

CONTRACTORS:

1 1/2" HIGH COPY

GENERAL CONTRACTOR

2" HIGH COPY

PLUMBING Subcontractor

HVAC Subcontractor

ELECTRICAL Subcontractor

4' x 6' x 3/4" exterior plywood, painted light grey color #30GY 76/017, "N.B.C. White" (Glidden) background W/ 2 - 4" x 4" treated wood posts (3' below grade), bottom of sign panel 3' above grade, all copy Helvetica Medium Style, color # 30GG 22/079-"Bicentennial".

END OF SECTION

SECTION 10505 - METAL LOCKERS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Standard duty metal lockers.
B. Work Not Included:
   1. Padlocks: Provided by the owner.

1.02 DEFINITIONS

A. Standard Duty: This term is used to designate a particular type of locker specified in this section, regardless of individual manufacturer designations.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data and installation instructions.
B. Shop Drawings: Show layouts, dimensions, trim, fillers, and accessories.
   1. Indicate installation and anchoring methods.
   2. Show verified field measurements.
   3. Show locker numbering scheme.
B. Samples for Color Verification: Actual finish samples on similar sheet metal.

1.04 PROJECT CONDITIONS

A. Fit lockers neatly to actual construction; take field measurements before fabrication, unless taking of such measurements will delay the work. In that case, provide trim and filler panels as required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive lockers are clean and dry.
B. Protect lockers from damage.

PART 2 – PRODUCTS

2.01 LOCKER CONFIGURATIONS AND COMPONENTS

A. Lockers:
   1. Location: Lockers 113.
   2. Standard duty.
   3. Single-tier.
   4. Height: 72 inches.
   5. Width: 12 inches.
   6. Depth: 18 inches.
   7. Doors: Solid with mini-louvers.
   8. Sides and vertical dividers: Solid.
   9. Shelves: Solid.
   10. Top: Sloped.
   11. Door handles.
   12. Shelf.
   13. Ceiling hook.
   14. Two wall hooks.

2.02 STANDARD DUTY LOCKERS

A. Provide all standard duty lockers and accessories by one manufacturer.
   1. Basis of Design: Penco Products.
   2. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Lyon Metal Products, Inc.;
      b. Penco Products;

c. Republic Storage Systems Company, Inc.;
d. Approved equal.

B. Components:
1. Frame: 16 gage steel channels or 13 gage steel angles, minimum.
2. Tops: 24 gage steel sheet, minimum.
3. Bottoms: 24 gage steel sheet, minimum.
4. Horizontal dividers: 24 gage steel sheet, minimum.
5. Sides and vertical dividers: 24 gage steel sheet, minimum.
6. Backs: 24 gage steel sheet, minimum.
7. Solid doors: 16 gage steel sheet, minimum.
8. Louvers: Manufacturer's standard style, size, and quantity.
9. Door handles: Standard type.
10. Latching mechanism: Concealed in door, designed so that door can be closed while locked, with spring-loaded latches engaging beveled strikes on frame.
a. Doors over 36 inches high: Three-point latching, minimum.

C. Miscellaneous Components and Trim: 18 gage steel sheet, minimum.
D. Fabrication: Weld all joints between frame members.
1. Weld hinges to frame and fasten to door with at least 2 fasteners which are either tamperproof or concealed when door is closed.

2.03 MATERIALS

A. Steel Sheet: Cold-rolled, leveled mild steel.
B. Fasteners: Zinc-, cadmium-, or nickel-plated steel or stainless steel.
1. Exposed bolt heads: Tamperproof type.
2. For fastening moving components: Use lock washers or self-locking nuts.
C. Hinges: 5-knuckle, nonremovable-pin hinges, of loop style with 2 full thicknesses in each leaf; minimum 2 inches high.
1. Minimum of 2 hinges per door.
2. Doors over 42 inches high: Three hinges.
D. Standard Door Handles: Die-cast zinc alloy or chrome-plated steel latch lifter and padlock hasp, designed so that door can be closed while locked; pry-resistant.
E. Interior Fittings: Cadmium- or zinc-plated steel or cast aluminum, except shelves.
F. Number Plates: Aluminum, zinc alloy, or stainless steel; raised or recessed numerals at least 3/8 inch high.
1. Number lockers as directed by the Architect.
2. Fasten to doors, centered near the top, using 2 fasteners.

2.04 FABRICATION - ALL LOCKERS

A. Factory-fabricate and fully assemble lockers; do not knock down for shipping.
B. Make lockers square with rigid joints, without dents or warped surfaces.
1. Exposed metal edges: Smooth off sharp edges and corners.
2. Exposed welds: Grind flush.
3. Door and frame fronts: No exposed bolts or rivet heads.
4. Where exposed holes for built-in locks are not used, cover holes neatly using permanent materials.
C. Doors: Fabricate with flanged edges, reinforced if required for stiffness, and designed to open and close without springing.
1. Fabricate sheet steel doors of one piece.
2. Provide extra stiffeners for doors more than 15 inches wide.
D. Miscellaneous Components: Provide all parts, filler panels, closures, clips, and fasteners required for a complete installation.
E. Finishing: Pretreat and finish all surfaces, both exposed and concealed, except stainless steel, chrome, and aluminum.
1. Factory-finish all accessory components to match.
2. Pretreatment: Remove scale, rust, and contaminants; chemically degrease and phosphatize.
3. Finish: Manufacturer's standard baked-on enamel.
4. Custom Color: **No. 952, "Turquoise Teal" by Penco.**

PART 3 – EXECUTION

3.01 PREPARATION

A. Clean debris from under and behind lockers before installation.

3.02 INSTALLATION

A. Install lockers on curb as indicated.
B. Install lockers plumb and level.
C. Anchor lockers securely to substrates in manner recommended by manufacturer.
   1. Use reinforcing plates and spacers as required to prevent metal distortion.
   2. Provide anchors at not more than 48 inches on center.
   3. Conceal fasteners wherever possible.
D. Install accessory components with flush, tight joints using concealed fasteners.

3.03 ADJUSTING

A. Adjust doors and latches for smooth operation.

3.04 CLEANING

A. Clean and touch up finishes; if finish cannot be restored to original appearance, replace locker.
B. Use only cleaning and touch-up materials recommended by manufacturer.

END OF SECTION 10505

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Semi-recessed cabinet mounted fire extinguisher (provide 1-unit).

1.02 SUBMITTALS

A. Product Data.
B. Operating and Maintenance Data.

1.03 QUALITY ASSURANCE

A. Labels: Provide only fire extinguishers which are listed and labeled by Underwriters Laboratories Inc. or Factory Mutual System.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:
   1. Fire extinguishers:
      a. Buckeye Fire Equipment Co.
      b. Fire-End & Croker Corporation.
      c. General Fire Extinguisher Corporation.
      d. Walter Kidde, The Fire Extinguisher Co.
B. Fire Extinguisher FE - 1:
   1. Rating: 4A:60B:C.
   2. Type: Multipurpose dry chemical (ammonium phosphate).
      a. Stored pressure type.
   3. Wall mounted.

2.02 CABINETS AND CABINET ACCESSORIES

A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:
   1. Cabinets and accessories:
      a. J.L. Industries.
      b. Larsen's Manufacturing Company.
      c. Potter-Roemer Division/Smith Industries, Inc.
B. Cabinets:
   1. To house one extinguisher.
      a. Extinguisher: FE-1.
   2. Size: Inside box dimensions: 27"h. x 9"w. x 6"d.; 4" deep into wall.
   3. Style: Semi-recessed mounted, protruding not more than 1-1/2 inches from face of wall.
      a. Rolled edge trim.
   4. Single flat door.
      a. Frameless acrylic.
         1. Clear.
      b. Door material: Aluminum, satin anodized.
         1. Color: Clear.
      c. Surface mounted door handle, finished to match door.
      d. Friction or roller catch.
   5. Trim (box flange or frame): Same material and finish as door.
   6. Manufacturer's standard vertical lettering identifying contents of cabinet.
      a. Letters silk screen painted; Red.
   7. Box: Aluminum sheet.
C. Hinges: Provide hinges for each door; concealed or continuous type; allow full 180 degree opening of door.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare openings for recessed cabinets.

3.02 INSTALLATION

A. Perform installation in accordance with the manufacturer's instructions except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
B. Install brackets for wall mounted extinguishers at height necessary to place the top of the extinguisher at 48 inches above finish floor.
C. Install cabinets at locations indicated.
D. Install handle of the cabinet 48" above the finish floor.

END OF SECTION 10522

SECTION 10800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms, shower, and utility rooms.
B. Grab bars.

1.02 REFERENCES

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 1998.
B. ASTM C 1036 - Standard Specification for Flat Glass; 1991 (Reapproved 1997).
C. FS DD-M-411 - Mirrors, Glass; Federal Specifications and Standards; Revision C, 1990.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

1.04 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: American Specialties, Inc.
B. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:
   1. American Specialties, Inc;
   2. Bobrick Washroom Equipment, Inc.;
   3. Bradley Corp.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
B. Keys: Provide 2 keys for each accessory to NC Department of Transportation.
C. Stainless Steel Sheet: ASTM A 666, Type 304.
D. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS DD-M-411.
E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.04 TOILET ROOM ACCESSORIES

A. Double Roll Toilet Tissue Dispenser: Heavy-duty cast aluminum, satin matte silver-gray finish. No waste rocking action spindles of cycolac ABS thermoplastic. Holds 2 rolls up to 6" (150 mm) diameter (2000 sheets).
   1. Product: No. 0264-1 manufactured by American Specialties.
B. Waste Receptacle: recessed, stainless steel, continuously welded bottom pan and seamless exposed flanges, 11-gallon capacity.
   1. Product: No. 20458 manufactured by American Specialties.
C. Paper Towel Dispenser: Wall Mounted stainless steel; 400 C-fold capacity; seamless wall flanges, continuous piano hinges.
   1. Product: No. 200210 manufactured by American Specialties.

D. Soap Dispenser: All-purpose soap valve dispenses liquid, lotion and detergent-type soap. Unbreakable refill window, concealed fastening and hinged filler-top for vandal resistance. Capacity: 48 fluid ounces.
E. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
   1. Frame: 0.05 inch channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   2. Sizes:
      a. 20"x36";
      b. 20"x60".
   3. Product: 0620 manufactured by American Specialties.
F. Toilet Seat Cover Dispenser: Dispenses 250 seat covers. Fabricated of 20 gauge type 304 stainless steel with a satin finish.
   1. Product: No. 20477-SM manufactured by American Specialties.
G. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
   1. Lengths: 18, 24, 36 & 42 inches.
   2. Product: 3700-P manufactured by American Specialties.

2.05 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets, 3 mop holders/4 utility hooks 34" (860 mm) long.
   1. Product: 1308-3 manufactured by American Specialties.

2.06 SHOWER ROOM ACCESSORIES

A. Towel Shelf with Towel Bar: Polished stainless steel, ¾" bars.
   1. Size: 18" long.
   2. Projects 3 ¼" from wall.
   3. Product: Model 7310 by American Specialties.
B. Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 18-gage wall thickness, satin-finished, with 2-1/2 inch square stainless steel flanges, for installation with exposed fasteners.
   1. Product: Model 1214 by American Specialties.
C. Shower Curtain: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
   1. Size: Min. 60x72 inches, hemmed edges.
   2. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
   3. Color: White.
   4. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
   5. Product: Model 1200-V & 1200-SHU by American Specialties.
I. L-Shaped Four Leg Fold-Up Shower Seat: Ivory colored solid phenolic seat with stainless steel frame and legs.
   1. Size: 33-1/2" long x 14"/21" x 17"-18-1/4" high.
   2. Product: Model 8202 by American Specialties.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

END OF SECTION

SECTION 11310 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 REFERENCE STANDARDS

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in NCDOT's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide five (5) year manufacturer warranty on magnetron tube of microwave ovens.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator: Free-standing, side-by-side, frost-free.
   1. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
   2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by DOE.
   3. Features: Include glass shelves, automatic icemaker, light in freezer compartment, and in-door water and ice dispenser.
   4. Finish: Porcelain enameled steel, color white.
   5. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com.
      b. GE Appliances: www.geappliances.com.
      c. Whirlpool Corp: www.whirlpool.com, or approved equal.

C. Microwave: Over counter.
   1. Capacity: 1.3 cubic ft.
   2. Power: 1000 watts.
   3. Features: Include turntable and 2-speed exhaust fan.
   4. Finish: White.
   5. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com.
      b. GE Appliances: www.geappliances.com.
      c. Whirlpool Corp: www.whirlpool.com, or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment.
B. Wash and clean equipment.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13121 - PRE-ENGINEERED METAL BUILDINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Metal wall and roof panels including soffits.

C. Building insulation systems

1.02 RELATED REQUIREMENTS

A. Section 07900 - Joint Sealers.

B. Section 08110 - Steel Doors and Frames.

C. Section 08360 - Overhead Doors.

D. Section 08450 - Translucent Windows.

E. Section 08800 - Glazing.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2010.

B. AISC "Specifications for the Design of Cold-Formed Steel Structural Members"

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2010.

F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

G. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

I. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

J. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).

K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

L. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011.

N. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings; 2008e1.

O. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2011.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

S. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2012.

T. MBMA "Low Rise Building Systems Manual".

U. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

V. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 DESIGN REQUIREMENTS

A. Installed Thermal Resistance of Wall System: See Drawing T3.

B. Design building structure and enclosure to withstand the structural design criteria and loads specified on plans. Structural design criteria are given on sheet T3, Building Code Summary, and on sheet S6.

C. Design Standards: Comply with the applicable requirements of:

1. AISC "Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design."
2. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
3. MBMA "Low Rise Building Systems Manual."
4. ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures."
5. 2012 North Carolina State Building Code.

D. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

E. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

F. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Samples: Submit two samples of precoated metal panels for each color selected, 16x16 inch in size illustrating color and texture of finish.

E. Manufacturer Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

F. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

H. Project Record Documents: Record actual locations of concealed components and utilities.

1.07 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
   1. Design Engineer Qualifications: Licensed in the State of North Carolina.
   2. Conform to applicable code for submission of design calculations as required for acquiring permits.
   3. Cooperate with regulatory agency or authority and provide data as requested.

B. Perform work in accordance with AISC 360 - Specification for Structural Steel Buildings.
   1. Maintain one copy on site.

C. Perform welding in accordance with AWS D1.1.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 5 years of documented experience
   2. Accredited by IAS according to IAS AC472.

E. Erector Qualifications: Company specializing in performing the work of this section with minimum five years' experience.

1.08 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings:
   1. Butler Manufacturing Company: www.butlermfg.com/speclink.
   2. Ceco Building Systems: www.cecobuildings.com.
   3. Nucor Building Systems: www.nucorbuildingsystems.com
   4. VP Buildings: www.vp.com.
   5. Approved equal.

2.02 METAL BUILDING

A. Single span rigid frame.

B. Bay Spacing: 20 ft.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

D. Secondary Framing: Purlins, and other items detailed.

E. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

F. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components. Floating steel roofing clips allowing roof panels to expand and contract without causing panel warping, distortion, or any permanent deformity.

G. Roof Slope: 1 inch in 12 inches.

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A 572/A 572M, Grade 50.

B. Structural Tubing: ASTM A 500, Grade B cold-formed.

C. Plate or Bar Stock: ASTM A 529/A 529M, Grade 50.

D. Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M, Class C.

F. Welding Materials: Type required for materials being welded.

G. Primer: SSPC-Paint 20, zinc rich.

H. Grout: ASTM C1107/C1107M, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in two days and 7000 psi in 28 days.

2.04 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, SS Grade 33/230, with G90/Z275 coating.

B. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.

C. Insulation: ASTM C665 Type II Class A; R-19 minimum.
   1. Vapor Retarder: Sheet polypropylene/metallized polyester with fiberglass reinforcing scrim, 0.0015 inch thick minimum, white; ASTM C1136, Type II.

D. Joint Seal Gaskets: Manufacturer's standard type.

E. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

F. Bituminous Paint: Asphaltic type.

G. Roof Curbs: Insulated metal same as roofing, designed for imposed equipment loads, anchor fasteners to equipment, counterflashed to metal roof system.

H. Trim, Closure Pieces, Caps, Flashings, Rain Water Diverter: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

I. Thermal Blocks: Manufacturer's standard. Thermal value: R-5 minimum.

J. Snow Guards: Provide snow guards specifically designed to fit profile of roof panels provided. Install snow guards per manufacturer's instructions to be permanently attached without penetrating the standing seam or the panel. Finish shall match roof panel.

2.05 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

2.06 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 24 gauge metal thickness minimum, ribbed profile indicated, 1 1/2 inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Minimum 24 gauge metal thickness minimum, standing seam profile, male/female edges fitted with continuous gaskets.

C. Liner: Minimum 0.015 inch metal thickness, V crimped profile, male/female edges fitted with continuous gaskets.

D. Soffit Panels: Minimum 24 gauge metal thickness, flat profile indicated, unperforated.

E. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

F. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners.

G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.07 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

C. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.08 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected by Architect from manufacturer's standard range.

C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected by Architect from manufacturer's standard range.

D. Colors

1. Wall Panels, Eaves, Soffits, Downspouts, Corner Trim, Miscellaneous Trim: Finish color of wall panels shall match Basis of Design.

a. Basis of Design color: Peterson Aluminum Company www.pac-clad.com) "Champagne".

2. Roof Panels, Rake Trim, Gutters: Finish color of wall panels shall match Basis of Design.

a. Basis of Design: Peterson Aluminum Company (www.pac-clad.com) "Hunter Green".

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360 - Specification for Structural Steel Buildings.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install insulation and vapor retarder. Place wire mesh under vapor retarder for support between framing members.

H. Install sealant and gaskets to prevent weather penetration.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Apply bituminous paint on surfaces in contact with cementitious materials.

C. Slope gutters minimum 1/8 inch/ft.

3.05 INSTALLATION - ACCESSORIES

A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

DIVISION 14 – CONVEYING EQUIPMENT

(NOT USED)

DIVISION 15A - PLUMBING

SECTION 15010 - BASIC PLUMBING REQUIREMENTS 509

PART I - GENERAL

1.1 GENERAL CONDITIONS

A. The stipulations and conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 15A.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

1.4 INTENT

A. The intent of these drawings and specifications are to describe the installation of a complete, fully adjusted and operational system. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

1.5 DEFINITIONS

A. The Plumbing Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the plumbing systems. All items of equipment are specified in the singular; however, the Plumbing Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this Section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. The Plumbing Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

1.8 PERMITS AND FEES

A. The Plumbing Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Plumbing Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Plumbing Contractor under whose work such services appear. Before the job is certified as substantially complete, a ***Certificate of Approval*** from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Plumbing Contractor shall figure on the most expensive of the items in conflict.

B. The Plumbing Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. The Plumbing Contractor shall not under any circumstances scale drawings for the location of equipment. The Plumbing Contractor shall verify the locations of all utility services.

C. The Plumbing Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.10 SUPERVISION

A. The Plumbing Contractor performing the work specified shall be required to employ a qualified Superintendent or Foreman to continuously supervise the installation of their work, with authorization to act as agent. Contractors: He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

PART II - PRODUCTS

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Plumbing Contractor has in his possession the approved shop drawing for the particular material or equipment. The Plumbing Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Plumbing Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of Submittal Data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Plumbing Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown, shall be new and of the highest grade and quality and free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Plumbing Contractor shall purchase and install all materials required.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

B. The Plumbing Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Plumbing Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Plumbing Contractor at the Plumbing Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Plumbing Contractor that is larger than those indicated on the drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

PART III - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. The Plumbing Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Plumbing Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Plumbing Contractor shall provide all cutting and patching necessary to install the work specified in this section. The patching shall match adjacent surfaces.

B. No structural member shall be cut without the approval of the Engineer, and all such cutting shall be done in a manner directed by him.

3.4 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Plumbing Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Plumbing Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after award of the contract. No departure shall be made without written approval of the Architect/Engineer.

3.5 DAMAGE TO WORK ALREADY IN PLACE

A. The Plumbing Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades to the approval of the Architect/Engineer.

3.6 JURISDICTION OF WORK

A. It may become necessary for the Plumbing Contractor to furnish labor or materials which is not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.7 COORDINATION WITH OTHER TRADES

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Plumbing Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Plumbing Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.

C. The Plumbing Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

3.8 DIVISION OF WORK

A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Plumbing Division.

B. All equipment covered in the Plumbing Division of the specifications shall be furnished, mounted, and aligned under the Plumbing Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Plumbing Contractor.

C. All final electrical connections to equipment covered in the Plumbing Division of the specifications shall be completed under the Plumbing Division.

D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.

E. Electrical equipment and wiring that is provided by the Plumbing Contractor shall be in accordance with the Electrical specification.

3.9 EQUIPMENT INSTALLATION

A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these drawings and specifications.

3.10 OPERATION AND MAINTENANCE MANUALS

A. One complete manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the name of the Section, such as "Plumbing" and the name of the Plumbing Contractor. Two copies of each approved manual shall be submitted to the Owner and one copy shall be submitted to the Architect/Engineer.

C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.

D. Manuals shall include the following:

1. Complete operating installations, covering start-up and shutdown for all components installed.

2. Legible copies of all shop drawings. Any comments incorporated in "as noted" approvals of shop drawings shall be recorded on the drawings included in the manuals.

3. All equipment Maintenance and Service Manuals.

E. A complete parts list for each piece of equipment.

F. All descriptive literature for the equipment.

G. Operating characteristics, performance data, ratings, and curves for each piece of equipment.

H. Internal wiring and control diagrams.

I. All other information pertinent to the maintenance and servicing of equipment and systems provided in the project.

J. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS

A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.

B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

3.12 EQUIPMENT START-UP

A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and Certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments required to meet design conditions. Such services shall be at no additional cost to the Owner.

3.13 GUARANTEE

A. The Plumbing Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Plumbing Contractor without cost to the Owner.

3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Plumbing Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

A. All final payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15010

SECTION 15140 - HANGERS AND SUPPORTS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Hangers and Supports for Plumbing Systems Piping and Equipment.

PART II - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers: Galvanized carbon steel, adjustable, clevis

B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

C. Vertical Support: Steel riser clamp

D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

E. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

F. Shields for Insulated Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

G. Sheet metal saddles must be ½ the circumference of the insulation, turned up or rounded at the corners to avoid damage to the vapor barrier.

2.2 HANGER RODS

A. Steel Hanger Rods: Threaded both ends or continuous threaded.

2.3 FLASHING

A. Metal Flashing: 26 gauge galvanized steel

B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing

2.4 SLEEVES

A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe

B. Fire Stopping Insulation: Glass fiber type, non-combustible

C. Caulk: Fire Barrier type sealant

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts

C. Washers: ASTM F 844, steel, plain, flat washers

D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength

3. Water: Potable

4. Packaging: Pre-mixed and factory-packaged

2.6 ATTACHMENTS

A. Mechanical Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over four (4) inches thick.

B. Weld: Type 22

C. Beam clamps: Types 20, 21, 28 or 29

D. Wood: Wood screws or lag bolts

PART III - EXECUTION

3.1 HANGERS AND SUPPORTS INSTALLATION

A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints ,and at changes in direction of piping.

C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends and similar units.

E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Support horizontal piping as follows:

PIPE SIZE	HANGER SPACING	MAXIMUM DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
Waste Pipe	5'-0"	3/8"

G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work

H. Place a hanger within 12 inches of each horizontal elbow.

I. Use hangers with 1½ inch minimum vertical adjustment

J. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

K. Support horizontal cast iron pipe adjacent to each hub with 5 feet maximum spacing between hangers.

L. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

M. Support riser piping independently of connected horizontal piping.

N. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.2 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal arc welding, appearance and quality of welds.

3.5 FLASHING

A. Provide flashing and counter-flashing where piping penetrates weather-proofed walls, floors and roofs.

B. Flash vent and soil pipes projecting six (6) inches minimum above finished roof surface with lead worked one (1) inch minimum into hub. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

3.6 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe

C. Extend sleeves through floors one (1) inch above finished floor level. Caulk sleeves full depth and provide floor plate.

D. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air-tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

F. Pipe strapping will not be allowed.

END OF SECTION 15140

SECTION 15190 - PLUMBING IDENTIFICATION

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing identification materials and devices.

1.3 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART II - PRODUCTS

2.1 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

1. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.

3. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

4. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

PART III - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.

B. Plastic Tags: Install with corrosive-resistant chain.

C. Plastic Tape Pipe Markers: Install complete around pipe in accordance with the manufacturer's instructions

D. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above the buried pipe.

E. Equipment: Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may by identified with plastic tags

F. Controls: Identify control panels and major control components outside panels with plastic nameplates.

G. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 15190

SECTION 15250 - PLUMBING PIPING INSULATION

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Plumbing Pipe Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.4 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.
B. Schedule insulation application after installation and testing of heat trace tape.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Glass Fiber:
   a. Certain Teed Corporation
   b. Knauf Fiberglass GmbH
   c. Manville
   d. Owens-Corning Fiberglas Corporation
   e. USG Interiors, Inc. - Thermafiber Division

2. Flexible Elastomeric Cellular:
   a. Armstrong World Industries, Inc.
   b. Halstead Industrial Products
   c. IMCOA
   d. Rubatex Corporation

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin. Jacket: All purpose, factory applied, laminated glass fiber- reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.

B. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

1. Thermal Conductivity: 0.26 average maximum at 75 degrees F mean temperature.

2. Density: 10 average maximum.

C. Adhesive: Produced under the UL Classification and Follow-up Service.

1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 degrees to 180 degrees F.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

B. Form: Tubular materials conforming to ASTM C 534, Type I.

C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.

D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449

1. Thermal Conductivity: 1.2 average maximum at 400 degrees F mean temperature.

2. Compressive Strength: 100 psi at 5 percent deformation.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades.

1. Class 1, Grade A for bonding glass cloth and tape to un-faced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to un-faced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 JACKETS

A. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil thick, high impact, ultra-violet resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

B. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper

1. Finish and Thickness: Smooth finish, 0.020 inch thick

2. Elbows: Pre-formed 45-degree and 90-degree, short and long radius elbows, same material, finish, and thickness as jacket.

2.7 ACCESSORIES AND ATTACHMENTS

A. Bands: ¾ inch wide, 0.007 inch thick, Aluminum

B. Wire: 16 gauge, soft annealed stainless steel

2.8 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition

1. Water Vapor Permeance: 0.08 perm maximum
2. Temperature Range: Minus 20 degrees to 180 degrees F

B. Weatherproof Sealant: Flexible elastomer based, vapor barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum
2. Temperature Range: Minus 50 degrees to 250 degrees F
3. Color: Aluminum

PART III - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION - GENERAL

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Keep insulation materials dry during application and finishing.

D. Apply insulation continuously over fittings, valves and specialties.

E. Apply insulation with a minimum number of joints.

F. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Cover circumferential joints with butt strips, at least three (3) inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1½ inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at four (4) inches on center.

4. Vapor Barrier Coatings: Apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gauges, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

G. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire rated walls and partitions.

H. Fire Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.

I. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1 pipe diameter, whichever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than three (3) inches pipe size with pre-molded insulation.

5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least three (3) segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.3 GLASS FIBER INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

1. Miter cut materials to cover soldered elbows and tees.

2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 JACKETS

A. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.

B. Install metal jacket with two (2) inch overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches on center and at butt joints.

3.6 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.7 PIPE INSULATION SCHEDULES

PIPING	INSULATION TYPE	THICKNESS IN INCHES
Domestic Hot Water Supply	GLASS FIBER	1
Domestic Hot Water Re-Circulating	GLASS FIBER	1
Domestic Cold Water(EXTERIOR)	GLASS FIBER	1
Domestic Cold Water(INTERIOR)	GLASS FIBER	1/2
Roof Drains	GLASS FIBER	1
Piping Exposed to Freezing	GLASS FIBER	1
"P" Trap at Handicapped Fixtures	ELASTOMERIC	1/2

END OF SECTION 15250

SECTION 15410 - PLUMBING PIPING

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PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing piping systems to a point shown on the civil drawings. Systems include the following:

1. Potable water distribution, including cold and hot water supply and hot water circulation.

2. Drainage and Vent Systems, including sanitary and storm.

3. Cast iron piping must be used in all plenum areas. Review drawings for any plenum areas.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:

1. Water Distribution Systems, Below Ground: 150 psig.
2. Water Distribution Systems, Above Ground: 125 psig.
3. Soil, Waste and Vent Systems: 10-foot head of water

PART II - PRODUCTS

2.1 SANITARY SEWER PIPING - BURIED

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub and Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.2 SANITARY SEWER PIPING - ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub and Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp and shield assemblies.

C. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.3 WATER PIPING - BURIED

A. Copper Tubing: ASTM B88, Type K, annealed. Fittings; ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.4 WATER PIPING - ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.5 STORM WATER PIPING - BURIED

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub and Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp and shield assemblies.

C. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.6 STORM WATER PIPING - ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub and Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp and shield assemblies.

C. Sch 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.7 MANUFACTURERS

A. Acceptable Manufacturers-Valves:

1. Crane
2. Grinnell
3. Nibco
4. Apollo

2.8 GATE VALVES

A. 150 psig rated, bronze body, lever ball type, Apollo or equal.

2.9 GLOBE VALVES

A. 150 psig rated, bronze body, rising stem and hand wheel, inside screw, renewable composition disc, threaded ends, with back seating capacity. Apollo or equal.

2.10 BALL VALVES

A. 150 psig rated, bronze or stainless steel body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends. Apollo or equal.

PART III - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipes, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Slope water piping and arrange to drain at low points.

H. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

L. Excavate in accordance with Sections 15010.

M. Backfill in accordance with Sections 15010.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe or ball valves for throttling, bypass, or manual flow control services.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Inject disinfectant solution containing 100 ppm of available chlorine and allow to stand for 2 hours before flushing.

C. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.

E. Take samples from outlets and analyze in accordance with AWWA C601.

3.5 SERVICE CONNECTIONS

A. Provide new [sanitary] [storm] sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with reduced pressure back-flow preventer and water meter with by-pass valves.

END OF SECTION 15410

SECTION 15430 - PLUMBING SPECIALTIES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Plumbing Specialties for water distribution systems; and soil, waste and vent systems.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Backflow Preventers:

a. Ames Co., Inc.
b. Hersey Products, Inc., Grinnell Corp.
c. Watts Regulator Co.
d. Wilkins Regulator Div., Zurn Industries, Inc.

2. Water Pressure Regulators:

a. Spence Engineering Co., Inc.
b. Watts Regulator Co.
c. Wilkins Regulator Div., Zurn Industries, Inc.

3. Specialties:

a. Josam Co.
b. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
c. Watts Regulator Co.
d. Woodford Manufacturing Co. Div., WCM Industries, Inc.
e. Zurn by Hydromechanics Div., Zurn Industries, Inc.

2.2 CLEANOUTS

A. Exterior Surfaced Areas: Round cast nickel-bronze access frame and non-skid cover.

B. Exterior Un-Surfaced Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Interior Finished Floor Areas: Lacquered cast iron, two piece body, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.

D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.3 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

2.4 TRAP SEAL PRIMER VALVE:

A. ASSE 1018; water supply fed type, fully automatic 125psig minimum working pressure, Bronze body with atmospheric vented drain chamber, ½ inch threaded or solder joint inlet and outlet connections, Chrome plated, or rough bronze finish. Unit shall be capable of being located on any active water line.

2.5 BACKFLOW PREVENTERS

A. Reduced Pressure Back-flow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

PART III - EXECUTION

3.1 PREPARATION

A. Coordinate construction areas to receive drains to the required invert elevations.

3.2 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend clean-outs to finished floor. Lubricate threaded clean-out plugs Teflon pipe dope. Ensure clearance at clean-out for rodding of drainage system.

C. Encase exterior clean-outs in concrete flush with grade.

D. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION 15430

SECTION 15440 - PLUMBING FIXTURES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Fixtures and Trim:
   a. American Standard, Inc.
   b. Eljer; A Household International Co.
   c. Kohler Co.

2. Stainless Steel Sinks:
   a. Elkay Manufacturing Co.
   b. Just Manufacturing Co.
   c. Kohler Co.

3. Mop Basins:
   a. Crane Plumbing/Fiat Products.
   b. Florestone Products Co., Inc.
   c. Swan Corp.

4. Water Coolers:
   a. Elkay Manufacturing Co.
   b. Halsey Taylor
   c. Haws Drinking Faucet Co.
   d. Sunroc Corporation
   e. Oasis

5. Toilet Seats:
   a. Bemis Mfg. Co.
   b. Beneke Division: Sanderson Plumbing Products, Inc.
   c. Church Seat Co.
   d. Kohler Co.
   e. Olsonite Corp.

6. Flushometers:
   a. Coyne & Delaney Co.
   b. Sloan Valve Co.
   c. Zurn Industries, Inc.; Flush Valve Operations.

7. Commercial/Industrial Cast-Brass Faucets:
   a. American Standard, Inc.
   b. Chicago Faucet Co.
   c. Delta Faucet Co.
   d. Eljer; A Household International Co.
   e. T & S Brass and Bronze Works, Inc.
   f. Cambridge Brass
   g. Elkay Manufacturing Co.

8. Commercial/Institutional Shower and Bathtub Valves and Trim:
   a. Symmons Industries, Inc.
   b. Bradley Corp.
   c. Speakman Co.

PART III - EXECUTION

3.1 INSPECTION

A. Review Millwork Shop Drawings. Confirm location and size of fixtures and openings before rough-in and installation.

1. Verify adjacent construction is ready to receive rough-in work of this Section.

B. INSTALLATION

1. Install each fixture with trap, easily removable for servicing and cleaning.

2. Install components level and plumb.

3. Install and secure fixtures in place with wall carriers and bolts.

4. Seal fixtures to wall and floor surfaces with sealant.

C. ADJUSTING AND CLEANING

1. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

2. At completion, clean plumbing fixtures and equipment.

3. Solidly attach water closets to floor with lag screws.

END OF SECTION 15440

SECTION 15450 - WATER HEATERS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Electric Water Heaters and In-Line Circulators.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Water Heaters:
   (a) Bradford-White Corp.
   (b) A.O. Smith Water Products Co. Div.
   (c) State Industries, Inc.
   (d) Ruud

2.2 RESIDENTIAL ELECTRIC WATER HEATER

A. Automatic, electric, vertical storage type, 150 psig maximum working pressure.

B. Glass lined welded steel tank, thermally insulated with 2 thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.

C. Automatic water thermostat with[externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box.

D. Brass water connections and dip tube, drain valve, high density magnesium anode, and temperature and pressure relief valve.

2.3 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure

B. Impeller: Bronze

C. Shaft: Alloy steel with integral thrust collar and two (2) oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling

2.4 THERMAL EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, maximum operating temperature 210 degrees F., with flexible EPDM diaphragm sealed into tank.

B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 55 psig.

C. Size: 10.5" diameter, 16" overall length, 5 gallon capacity.

PART III - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions.
B. Coordinate with plumbing piping and electrical work to achieve operating system.

3.2 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 15450

DIVISION 15B: MECHANICAL

SECTION 15500 BASIC MECHANICAL REQUIREMENTS

PART I - GENERAL

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1.1 GENERAL CONDITIONS

A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", herein before set forth, shall apply to this and the other Sections of Division 15.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Mechanical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all Alternates at the back of this Specification to determine if any work described under the Mechanical Section will be affected thereby.

1.4 INTENT

A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Mechanical Contractor at his own expense.

1.5 DEFINITIONS

A. The Mechanical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, the Mechanical Contractor shall provide the number of items of equipment as indicated on the Drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

A. The Mechanical Contractor shall visit the site before submitting his bid, so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything that could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this Section shall be accomplished in strict accordance with State codes. Where these Plans and Specifications conflict with such codes, the codes shall govern. The Mechanical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

1.8 PERMITS AND FEES

A. The Mechanical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Mechanical Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Mechanical Contractor under whose work such services appear. Before the job is certified as substantially complete, a Certificate of Approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Mechanical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between general Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Mechanical Contractor shall figure on the most expensive of the items in conflict.

B. The Mechanical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale Drawings for the location of equipment. The Mechanical Contractor shall verify the locations of all utility services.

C. The Mechanical Contractor shall keep at least one (1) set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.10 SUPERVISION

A. The Mechanical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent Contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

PART II - PRODUCTS

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Mechanical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Mechanical Contractor has in his possession the approved shop drawing for the particular material or equipment. The Mechanical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but in no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific Service for which material or equipment to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Mechanical Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Mechanical Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a Standard of Quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Mechanical Contractor shall purchase and install all materials required.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner

B. The Mechanical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Mechanical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Mechanical Contractor at the Mechanical Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Mechanical Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

PART III - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. The Mechanical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding four (4) inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and back-filling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Mechanical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Mechanical Contractor shall provide all cutting and patching necessary to install the work specified in this Section. The patching shall match adjacent surfaces.

B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

3.4 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing and maintenance. The Mechanical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Mechanical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of Contract. No departure shall be made without written Approval of the Architect/Engineer.

3.5 DAMAGE TO WORK ALREADY IN PLACE

A. The Mechanical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.6 JURISDICTION OF WORK

A. It may become necessary for the Mechanical Contractor to furnish labor or material which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.7 COORDINATION WITH OTHER TRADES

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Mechanical Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.

C. The Mechanical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed will be borne by the subcontractor or contractors directed to do this work.

3.8 DIVISION OF WORK

A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division.

B. All equipment covered in the Mechanical Division of the Specifications shall be furnished, mounted and aligned under the Mechanical Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Mechanical Contractor.

C. All final electrical connections to equipment covered in the Mechanical Division of the Specifications shall be completed under the Mechanical Division.

D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.

E. Electrical equipment and wiring that is provided by the Mechanical Contractor shall be in accordance with the Electrical specification.

3.9 EQUIPMENT INSTALLATION

A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

3.10 OPERATION AND MAINTENANCE MANUALS

A. One complete Manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the name of the Section, such as "Heating" and the name of the Mechanical Contractor. Two (2) copies of each approved manual shall be submitted to the Owner and one (1) copy shall be submitted to the Architect/Engineer.

C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.

D. Manuals shall include the following:

1. Complete Operating Installations, covering start-up and shutdown for all components installed.

2. Legible copies of all Shop Drawings. Any comments incorporated in "as noted" approvals of Shop Drawings shall be recorded on the Drawings included in the Manuals.

3. All equipment Maintenance and Service Manuals.

4. A complete parts list for each piece of equipment.

5. All descriptive literature for the equipment.

6. Operating characteristics, performance data, ratings, and curves for each piece of equipment such as condensers, fans and air handling units.

7. Internal wiring and control diagrams.

8. Automatic temperature control diagrams, part descriptions and numbers, and sequences of operation. Drawings shall be neatly folded and inserted in a separate clear plastic binder. The plastic binders shall be bound in the back of each Manual.

9. Final Testing and Balancing Reports.

10. All other information pertinent to the maintenance and servicing of equipment and systems provided in the Project.

11. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS

A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.

B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

3.12 EQUIPMENT START-UP

A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments are required to meet design conditions. Such services shall be at no additional cost to the Owner.

3.13 GUARANTEE

A. The Mechanical Contractor shall present to the Owner a written Guarantee covering his work, including all equipment, material and workmanship. This Guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Mechanical Contractor without cost to the Owner.

3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Mechanical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15500

SECTION 15501 - HANGERS AND SUPPORTS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

B. This Section includes Hangers and Supports for Mechanical Systems Piping and Equipment.

1.3 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code - Steel".

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

PART II - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers: Galvanized carbon steel, adjustable, clevis.

B. Vertical Support: Steel riser clamp.

C. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

E. Shields for Insulated Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

F. Shields for Insulated Cold Water Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

2.2 HANGER RODS

A. Steel Hanger Rods: Threaded both ends or continuous threaded.

2.3 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

2.4 SLEEVES

A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe

B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

C. Sleeves for Round Ductwork: Form with galvanized steel.

D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.

E. Fire Stopping Insulation: Glass fiber type, non-combustible.

F. Caulk: Fire Barrier type sealant.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic.

1. Characteristics include post hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength.

3. Water: Potable

4. Packaging: Pre-mixed and factory-packaged.

2.6 ATTACHMENTS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.

B. Weld: Type 22

C. Beam Clamps: Types 20, 21, 28 or 29

D. Wood: Wood screws or lag bolts

PART III - EXECUTION

3.1 HANGERS AND SUPPORTS INSTALLATION

A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Support horizontal piping as follows:

PIPE SIZE	HANGER SPACING	MAXIMUM HANGER DIAMETER
1/2 to 1-1/4 inch	6' - 6"	3/8"
1-1/2 to 2 inch	10' - 0"	3/8"
2-1/2 to 3 inch	10' - 0"	1/2"
4 to 6 inch	10' - 0"	5/8"
8 to 12 inch	14' - 0"	7/8"
14 inch and over	20' - 0"	1"
PVC	6' - 0"	3/8"

G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

H. Place a hanger within 12 inches of each horizontal elbow.

I. Use hangers with 1½ inch minimum vertical adjustment.

J. Support vertical piping at every floor.

K. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

L. Support riser piping independently of connected horizontal piping.

M. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

N. Pipe strapping, duct tape or zip ties will not be allowed.

3.2 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal arc welding, appearance and quality of welds.

3.5 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.

3.6 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

D. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

END OF SECTION 15501

SECTION 15503 - MECHANICAL IDENTIFICATION

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PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

B. This Section includes Mechanical Identification Materials and Devices.

1.3 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART II - PRODUCTS

2.1 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART III - EXECUTION

3.1 PREPARATION

A. De-grease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with manufacturers recommendations.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosive resistant mechanical fasteners.

B. Plastic Tags Install with corrosive resistant chain.

C. Plastic Tape Pipe Markers: Install completely around pipe in accordance with manufacturer's instructions.

D. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

E. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tag.

F. Controls: Identify control panels and major control components outside panels with plastic nameplates.

G. Valves: Identify valves in main and branch piping with tags.

H. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure and at each obstruction.

END OF SECTION 15503

SECTION 15505 - PIPING INSULATION

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Mechanical Pipe Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50or less.
2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.4 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

B. Schedule insulation application after installation and testing of heat trace tape.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Glass Fiber:
   a. Certain Teed Corporation
   b. Knauf Fiberglass GmbH
   c. Manville
   d. Owens-Corning Fiberglass Corporation
   e. USG Interiors, Inc. - Thermafiber Division

2. Flexible Elastomeric Cellular:
   a. Armstrong World Industries, Inc.
   b. Halstead Industrial Products
   c. IMCOA
   d. Rubatex Corporation

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All purpose, factory applied, laminated glass fiber reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.

C. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

1. Thermal Conductivity: 0.26 average maximum at 75 degrees F mean temperature.

2. Density: 10 average maximum.

D. Adhesive: Produced under the UL Classification and Follow-up service.

1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 to 180 degrees F.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

B. Form: Tubular materials conforming to ASTM C 534, Type I.

C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.

D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic Setting Insulating and Finishing Cement: ASTM C 449

1. Thermal Conductivity: 1.2 average maximum at 400 degrees F mean temperature.

2. Compressive Strength: 100 psi at 5 percent deformation.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to un-faced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to un-faced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 JACKETS

A. Interior: PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil--thick, high impact, ultra-violet resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

B. Exterior: Aluminum Jacket: ASTMB 209, 3003 Alloy, H-14 temper

1. Finish and Thickness: Smooth finish, 0.020 inch thick

2. Elbows: Preformed 45-degree and 90-degree, short and long-radius elbows, same material, finish, and thickness as jacket.

2.7 ACCESSORIES AND ATTACHMENTS

A. Bands: ¾-inch wide, 0.007 inch thick, Aluminum

B. Wire: 16-gauge, soft-annealed stainless steel

2.8 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition

1. Water Vapor Permeance: 0.08 perm maximum

2. Temperature Range: Minus 20 to 180 degrees F

B. Weatherproof Sealant: Flexible elastomer based, vapor barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum

2. Temperature Range: Minus 50 to 250 degrees F

3. Color: Aluminum

PART III - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION - GENERAL

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Keep insulation materials dry during application and finishing.

D. Apply insulation continuously over fittings, valves, and specialties.

E. Apply insulation with a minimum number of joints.

F. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1½ inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

4. Vapor Barrier Coatings: Apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

G. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

H. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.

I. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than 3-inches pipe size with pre-molded insulation.

5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.3 GLASS FIBER INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

1. Miter cut materials to cover soldered elbows and tees.

2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 JACKETS

A. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.

B. Install metal jacket with 2 inch overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel draw bands 12 inches on center and at butt joints.

3.6 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation. Paint all exterior insulation with UV resistant paint as recommended by Insulation manufacturer.

3.7 PIPE INSULATION SCHEDULES

INTERIOR COLD CONDENSATE DRAINS

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES
1/2 TO 4	GLASS FIBER	1
	FLEXIBLE ELASTOMERIC	3/4

REFRIGERANT SUCTION

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	3/4
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1

END OF SECTION 15505

SECTION 15507 - DUCTWORK INSULATION

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Duct and Plenum Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including linings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

PART II – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Duct Board:
   a. Armstrong
   b. CSG Ultraliner
   c. Johns Manville

2. Glass Fiber:
   a. Certain Teed Corporation
   b. Knauf Fiberglass GmbH
   c. Manville
   d. Owens-Corning Fiberglass Corporation
   e. USG Interiors, Inc. - Thermafiber Division

2.2 INSTALLATION

A. DUCT BOARD

1. All exterior supply and return ductwork shall be completely insulated. See Schedule for type.

2. Provide aluminum sheet over duct board.

3. Exhaust air duct does not require insulation, unless otherwise noted on the plans.

B. GLASS FIBER

1. Material: Inorganic glass fibers, bonded with a thermosetting resin.

C. Jacket: All purpose, factory-applied, laminated glass fiber reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.

D. Board: 2" thick polyisocyanurate with factory applied foil backing.

1. Minimum R-value of 5.0 per inch.

E. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets

1. Thermal Conductivity: 0.32 average maximum, at 75 degrees F mean temperature.

F. Adhesive: Produced under the UL Classification and follow-up service.

1. Type: Non-Flammable, solvent-based.
2. Service Temperature Range: Minus 20 to 180 degrees F.

2.3 ACCESSORIES AND ATTACHMENTS

A. Corner Angles: 28-gauge, 1inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.

B. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.4 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition

1. Water Vapor Permeance: 0.08 perm maximum
2. Temperature Range: Minus 20 to 180 degrees F

PART III - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale and dirt.

3.2 INSTALLATION

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Install insulation with smooth, straight, and even surfaces.

D. Seal joints and seams to maintain vapor barrier.

E. Seal penetrations for hangers, supports, anchors and other projections.

F. Keep insulation materials dry during application and finishing.

G. Install block and board insulation as follows:

1. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 12 inches apart each way and three (3) inches from insulation joints. Protect insulation at exterior corners with metal corner angles. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures and voids in insulation.

2. Board insulation shall be covered with .032 mil embossed aluminum sheet attached with sheet metal screws with rubber washers. All joints shall be sealed with aluminum silicon caulking. All exterior insulation shall be pitched so that water cannot stand on top of the duct.

H. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:

1. Smaller Than 24 Inches: Bonding adhesive applied in 6-inch wide transverse strips on 12-inch centers.
2. Twenty-four (24) Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
3. Overlap joints three (3) inches.
4. Seal joints, breaks, and punctures with vapor barrier compound.

3.3 DUCT SYSTEMS INSULATION SCHEDULE

INTERIOR CONCEALED HVAC SUPPLY, RETURN AND OUTSIDE AIR DUCTS AND PLENUMS

MATERIAL	FORM	THICKNESS IN INCHES
GLASS FIBER	BLANKET	2

EXTERIOR EXPOSED HVAC SUPPLY, RETURN AND OUTSIDE AIR DUCTS AND PLENUMS

MATERIAL	FORM	HICKNESS IN INCHES
DUCT BOARD	BOARD - RECT.	2

END OF SECTION 15507

SECTION 15672 - SPLIT SYSTEM HEAT PUMP

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. Section includes Split System Heat Pumps.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.

B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

1.4 WARRANTY

A. Provide Five (5) Year Warranty.

B. Warranty: Include coverage for Refrigerant Compressors.

PART II - PRODUCTS

2.1 SPLIT SYSTEM HEAT PUMPS

A. Acceptable Manufacturers:

1. Carrier Air Conditioning: Division of Carrier Corp.
2. Trane (The) Co.: Division of American Standard Inc.
3. York: Division of York International
4. Lennox

2.2 GENERAL

A. Spilt System: The split-system unit shall be an outdoor heat pump unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 15 SEER. The minimum efficiency for systems of 65,000 BTUH or greater shall be in accordance with the 2012 N. C. State Building Code, Energy Conservation Code.

2.3 AIR HANDLER

A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Coils shall be of the cartridge type, removable from other side of casing and supported the entire length in tracks. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan shall be belt driven. Provide adjustable sheaves for each air handler. Fan and motor bearings shall be permanently lubricated type.

2.4 OUTDOOR HEAT PUMP UNIT

A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.

B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.

C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.

D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.

E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, pressure relief valves and circuit breakers.

F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.

G. Connections: Only one liquid line, one suction line, required for units under 15 tons in capacity shall be provided. A 15-ton unit shall be dual circuited. Double suction risers for the refrigerant lines shall be provided.

H. Piping shall be sized by the manufacturer.

2.5 TEMPERATURE CONTROL SYSTEM

A. Provide electronic programmable thermostat for each heat pump system.
B. Heat pumps with supplementary electric resistance heat shall have controls that except during defrost, prevent the supplementary heat operation when the heat pump can meet the heating load. In systems with cooling capacity of less than 65,000 Btuh, a heat strip outdoor temperature lockout shall be provided to prevent supplemental heat operation in response to the thermostat being changed to a warmer setting. The lockout shall be set not lower than 35 degrees F, and no higher than 40 degrees F.

2.6 FILTRATION

A. Provide a filter rack and a 1" replaceable pleated throwaway filter. Filter rack size shall be as required by AHU manufacture.

B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

PART III - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units with vibration isolation.

D. Install units on concrete base as indicated.

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare start systems under provisions of Section 15500.

B. Provide initial start-up.

C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION 15672

SECTION 15674 DUCT FREE SPLIT SYSTEM AIR CONDITIONER

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.

B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

1.3 WARRANTY

A. Provide Five (5) Year Warranty.

B. Warranty: Include coverage for Refrigerant Compressors.

PART II - PRODUCTS

2.1 SPLIT SYSTEM AIR CONDITIONER

A. Acceptable Manufacturers:

1. Mitsubishi
2. Sanyo.
3. Freidrich
4. Amana

2.2 GENERAL

A. Spilt System: The split-system unit shall be an outdoor condensing unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not be exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 15 SEER and shall be in accordance with the 2012 N. C. State Building Code, Energy Conservation Code.

2.3 AIR HANDLER

A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall

be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan and motor bearings shall be permanently lubricated type.

2.4 OUTDOOR CONDENSING UNIT

A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.

B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.

C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.

D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.

E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, AND pressure relief valve.

F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.

G. Piping shall be sized by the manufacturer.

2.5 FILTRATION

A. Provide a throw away filter.

B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

PART III - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units with vibration isolation.

D. Install units on concrete base as indicated.

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare start systems under provisions of Section 15500.

B. Provide initial start-up.

C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION

New 2-14-14

BURKE DESIGN GROUP, PA
CONSULTING ENGINEERS

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566-A

Date: 02/12/14

Project: I-4928: I-85 NBL Weigh Station
Gaston County NC

RE: Addendum #2
Approved equals

2/12/14

Fans-
a) Twin City Fans
b) American Coolair Fans

Duct-less Split Systems-
a) Panasonic
b) Samsung

SECTION 15910 - DUCT ACCESSORIES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Turning Vanes
2. Duct Mounted Access Doors and Panels
3. Flexible Connectors
4. Flexible Ducts

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:

C. Shop drawings from manufacturer detailing assemblies: Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

PART II - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.

C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum ¼ inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 9½ x 30 inches.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.2 AIR TURNING DEVICES

A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.3 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per sq. yd. approximately 6 inches wide, crimped into metal edging strip.

2.4 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

B. Review locations prior to fabrication.

C. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch thick insulation with sheet metal cover.

D. Access doors smaller than 12 inches square may be secured with sash locks.

E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors with sheet metal screw fasteners are not acceptable.

PART III - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.

C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

E. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION 15910

SECTION 15932 - AIR OUTLETS AND INLETS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of air outlets and inlets work is indicated by Drawings and Schedules and by Requirements of this Section.

B. Types of outlets and inlets required for this Project include the following:

1. Ceiling Air Diffusers
2. Wall Registers and Grilles
3. Louvers

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.

2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish and mounting details.

3. Performance data for each type of air outlet and inlet furnished, throw and drop; and noise criteria ratings. Indicate selections on data.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

PART II - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Diffusers & Grilles

1. Titus, Inc.
2. Metalaire, Inc.
3. Carnes, Inc.
4. E. H. Price

B. Louvers

1. Arrow United Industries, Inc.
2. Louvers & Dampers, Inc.
3. Penn Ventilator Co., Inc.

4. Ruskin Mfg. Co.
5. Safe-Air Inc.
6. Vent Products Co., Inc.
7. NCA
8. Cesco Products

2.2 RECTANGULAR CEILING DIFFUSERS

A. Rectangular, extruded aluminum, multi-core type diffuser to discharge air in 360 degree pattern.

B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of aluminum with baked enamel off-white finish.

D. Provide opposed blade damper with damper adjustable from diffuser face.

2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Fixed grilles of 1/2 x 1/2 x 1 inch egg crate.

B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of aluminum with baked enamel off-white finish.

D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.4 WALL SUPPLY REGISTERS/GRILLES

A. Streamlined and individually adjustable blades, depth of which exceeds ¾ inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Fabricate 1¼ inch margin frame with countersunk screw mounting and gasket.

C. Fabricate of aluminum extrusions with 20 gauge minimum frames and 22 gauge minimum blades, with baked enamel off-white finish.

D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.5 LINEAR WALL REGISTERS/GRILLES

A. Streamlined blades with 0 degree deflection, 1/8 x 3/4 inch on 1/4 inch centers.

B. Fabricate 1¼ inch margin frame with countersunk screw mounting and gasket.

C. Fabricate of aluminum extrusions with baked enamel off-white finish.

D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.6 LOUVERS

A. Provide 4-inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, bird screen with ½ inch square mesh.

B. Fabricate of 12-gauge extruded aluminum, welded assembly, with factory baked enamel finish. Color selection from manufacturer standard.

C. Furnish with interior screw holes in jambs for installation.

2.7. ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA Low Pressure Duct Construction Standards.

B. Fabricate of aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; bird screen with ½ inch square mesh and factory prime coat baked enamel finish.

C. Mount unit on minimum 12-inch high curb base with insulation between duct and curb.

D. Make hood outlet area minimum of twice throat area.

PART III - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

C. Install diffusers to ductwork with air-tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 15932

SECTION 15990 - TESTING, ADJUSTING AND BALANCING

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. This Section specifies the Requirements and Procedures of Total Mechanical Systems Testing, Adjusting and Balancing. Requirements include measurement and establishment of the fluid quantities of the Mechanical Systems as required to meet Design Specifications and Recording and reporting the results.

B. Testing and Balancing must be conducted by an independent, Certified Testing and Balancing firm, registered with either the AABC or the NEBB.

C. The Test and Balance Contractor shall be a subcontractor to the Mechanical Contractor.

1.3 SECTION INCLUDES

A. Testing, adjustment and balancing of air systems.

B. Measurement of final operating condition of HVAC Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 15500.

B. Submit name of adjusting and balancing agency for approval within 30 days after Award of Contract.

C. Field Reports: Submit under provisions of Section 15500.

D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.

G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the Contract Drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.

H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

1.5 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Maintain one copy of each document on site.

1.6 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Section 15500.

B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

C. Schedule work under the provisions of Section 15500.

D. Schedule and provide assistance in final adjustment and test of Smoke Control System with Fire Authority.

PART II - PRODUCTS (Not Used)

PART III - EXECUTION

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Ductwork Systems:

a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
b. Duct systems are clean of debris.
c. Fans are rotating correctly.
d. Dampers are in place and open.
e. Air coil fins are cleaned and combed.
f. Access doors are closed and duct end caps are in place.
g. Air inlets and outlets are installed and connected.
h. Duct system leakage is minimized.

5. Piping Systems:

   a. Hydronic systems are flushed, filled, tested and vented.
   b. Pumps are rotating correctly.
   c. Proper strainer baskets are clean and in place.
   d. Service and balance valves are open.

B. Submit Field Reports: Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.

B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust equipment and distribution systems to provide required or design air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure and record air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilize opposed blade dampers at air inlets and outlets.

F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.

G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust settings and minimum set points for motorized and back draft dampers to design conditions.

I. Measure and record temperature conditions across dampers to check leakage.

J. Where modulating dampers are provided, take measurements and balance at extreme conditions.

K Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure and record building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

N. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.

3.7 REPORT FORMS

A. Forms shall include the following:

1. Title Page:
   a. Name of Testing, Adjusting and Balancing Agency
   b. Address of Testing, Adjusting and Balancing Agency
   c. Telephone number of Testing, Adjusting and Balancing Agency
   d. Project Name
   e. Project Location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor
   i. Project Altitude
   j. Report Date

2. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence

d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
e. Nomenclature used throughout report
f. Test Conditions

3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model Number
   d. Serial Number
   e. Range
   f. Calibration Date

4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP/Efficiency
   d. Phase, Voltage, Amperage; Nameplate, Actual, No Load
   e. RPM
   f. Service Factor
   g. Starter Size, Rating, Heater Elements
   h. Sheave Make/Size/Bore

5. V-Belt Drive:
   a. Identification/Location
   b. Required Driven RPM
   c. Driven Sheave, Diameter and RPM
   d. Belt, Size and Quantity
   e. Motor Sheave Diameter and RPM
   f. Center to center distance, maximum, minimum, and actual

6. Equipment Data:
   a. Identification/number
   b. Manufacturer
   c. Model number and Serial number
   d. Capacity
   e. Service
   f. Design flow rate, pressure drop, BHP
   g. Actual flow rate, pressure drop, BHP
   h. Temperature readings

7. Duct Traverse:
   a. System zone/branch
   b. Duct size
   c. Area
   d. Design velocity
   e. Design air flow
   f. Test velocity
   g. Test air flow
   h Duct static pressure
   i Air temperature
   j Correction factor

8. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i Test (final) air flow
   j. Percent of design air flow

END OF SECTION 15990

DIVISION 16: ELECTRICAL

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART I - GENERAL

1.1 GENERAL CONDITIONS

A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions" and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 16.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Electrical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all alternates at the back of this Specification and on the Drawings to determine if any work described under the Electrical Section will be affected thereby.

1.4 INTENT

A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Electrical Contractor at his own expense.

1.5 DEFINITIONS

A. The Electrical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the Electrical systems. All items of equipment are specified in the singular; however, the Electrical Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

A. The Electrical Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern.

B. The Electrical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

C. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) are a minimum installation requirement.

D. The following regulatory shall be used as minimum standards:

AEIC	American Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
NCCM	N.C. Construction Manual w/G.S. as listed
NCSBC	N.C. State Building Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
U/L	Underwriters' Laboratories, Inc.
OSHA	Occupational Safety and Health Standards
ASHRAE/IES	90.1 energy code

1.8 TEST STANDARDS

A. All material and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., or third party agencies accredited by the North Carolina Building Code Councils latest edition or amendment.

1.9 PERMITS AND FEES

A. The Electrical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Electrical Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Electrical Contractor under whose work such services appear. Before the job is certified as substantially complete, a Certificate of Approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.10 DRAWINGS AND SPECIFICATIONS

A. The Electrical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The Drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Electrical Contractor shall include in his bid the most expensive of the items in conflict.

B. The Electrical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale drawings for the location of equipment. The Electrical Contractor shall verify the locations of all utility services and electrical equipment.

C. The Electrical Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit Drawings to Architect/Engineer before final payment is made.

1.11 SUPERVISION

A. The Electrical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

PART II - PRODUCTS

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Electrical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Electrical Contractor has in his possession the approved Shop Drawing for the particular material or equipment. The Electrical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Electrical Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Electrical Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Electrical Contractor shall purchase and install all materials required, unless otherwise noted.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

C. All products shall be furnished in compliance with NC General Statute 133-3.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

B. The Electrical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Electrical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Electrical Contractor at the Electrical Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of Specification grade and the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Mechanical Contractor or any other Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different Electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

PART III - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. The Electrical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides

vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed and thoroughly compacting each layer with Mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its original condition prior to construction at no expense to the owner. All work will be approved by the Engineer.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Electrical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Electrical Contractor shall provide all cutting and patching necessary to install the work specified in the 16000 Sections. The patching shall match adjacent surface material and finishes.

B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

C. Cutting or Holes:

1. Locate holes in advance where they are proposed in the Structural Sections such as ribs or beams. Obtain the approval of the Engineer prior to drilling through Structural Sections.

2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed.

3.4 WATERPROOFING

A. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight. All work subject to approval of the Engineer.

3.5 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Electrical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements. Working clearances shall be not less than N.E.C or other regulatory requirements.

B. These drawings indicate the extent and general arrangement of equipment. If any departures are deemed necessary by the Electrical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of the Contract. No departure shall be made without written approval of the Architect/Engineer. Any delay on the Contractor's part to provide such submittal will not constitute an extension of the Contract time.

3.6 DAMAGE TO WORK ALREADY IN PLACE

A. The Electrical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by Mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.7 JURISDICTION OF WORK

A. It may become necessary for the Electrical Contractor to furnish labor or materials which are not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of Trade Agreements as to jurisdiction, alleged or actual.

3.8 COORDINATION WITH OTHER TRADES

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Electrical Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, a Ceiling Suspension System may be installed as required for coordination.

C. The Electrical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

3.9 DIVISION OF WORK

A. These paragraphs are intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division or any other division.

C. All equipment covered in the Mechanical Division or any other Division of the Specifications shall be furnished, mounted, and aligned under the respective Division. All starters, controls and wiring for this equipment, including final connection to the same, shall be furnished and installed under that Division.

D. Divisions of the Specifications shall be completed under the respective Division.

E. Under Division 16, the Contractor shall be responsible for providing all line side power wiring, conduit, disconnect switches, and junction boxes as shown on the electrical drawings.

3.10 EQUIPMENT INSTALLATION

A. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

3.11 OPERATION AND MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

2. Manufacturer's printed Operating Procedures to include start-up, break-in, and routine and normal Operating Instructions; regulation, control, stopping, shutdown, and emergency instructions and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.

4. Servicing Instructions and Lubrication Charts and Schedules.

3.12 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed) dimensioned from prominent building lines.

3. Approved substitutions, Contract modifications and actual equipment and materials installed.

3.13 GUARANTEE

A. The Electrical Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Electrical Contractor without cost to the Owner.

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3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Electrical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

B. An authorized State Electrical Inspector from the Office of State Construction shall inspect the project during construction and upon completion of the construction phase. It shall be the responsibility of the Electrical Contractor to notify the Inspector as the work progresses. The Electrical Contractor shall schedule the the required inspections including rough-in, above ceiling and final inspections as required.

3.15 FINAL PAYMENTS

A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

3.16 DOCUMENTATION

A. All tests shall be completely documented indicated time of day, temperature, and all pertinent test information.

B. All required documentation of readings shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION 16010

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes limited Scope, General Construction Materials and Methods for Application with Electrical Installations as follows:

1. Miscellaneous metals for support of electrical materials and equipment.

2. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

1.3 DEFINITIONS

A. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

2. Sub-Base: As used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

3. Sub-Grade: As used in this Section refers to the compacted soil immediately below the slab or pavement system.

4. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific direction from the Architect.

1.4 SUBMITTALS

A. Product data for the following products:

1. Joint sealers

1.5 SEQUENCE AND SCHEDULING

A. Coordinate the shut-off and disconnection of electrical service with the Owner and the utility company.

PART II - PRODUCTS

2.1 SOIL MATERIALS

A. Sub-Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1½ inch sieve, and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

2.2 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Fasteners: Zinc-coated, type, grade and class as required.

2.3 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

B. Colors: As selected by the Architect from manufacturer's standard colors.

C. Elastomeric Joint Sealers: Provide the following types:

1. One-part, non-acid curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum and other substrates recommended by the sealant manufacturer.

2. One part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.

D. Acrylic-Emulsion Sealants: One part, non-sag, mildew resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.

E. Fire Resistant Joint Sealers: Two part, foamed-in-place, silicone sealant formulated for use in through penetration fire stopping around cables, conduit, pipes, and duct penetrations through fire rated walls and floors. Sealants and accessories shall have fire resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Acceptable Products:

a. Dow Corning "Fire Stop Foam", Dow Corning Corp.
b. "Hilti" Fire Stop Systems
c. "Fire Stop" Systems, Inc.

PART III - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

3.3 EXCAVATION

A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.

B. Install sediment and erosion control measures in accordance with local codes and ordinances.

C. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials.

2. Provide and establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

E. Trenching: Excavate trenches for electrical installations as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.

2. Excavate trenches to depth indicated or required.

3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree 2 C).

G. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under walks and pavements, use a combination of sub-base materials and excavated or borrowed materials.

2. Under building slabs, use drainage fill materials.

3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.

4. For raceways less than 30 inches below surface of roadways, provide 4-inch thick concrete base slab support. After installation of raceways, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway sub-base.

5. Other areas, use excavated or borrowed materials.

H. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and locations of underground utilities have been recorded.

2. Removal of concrete formwork.

3. Removal of shoring and bracing and backfilling of voids.

4. Removal of trash and debris.

I. Placement and Compaction: Place backfill and fill materials in layers of not more than eight (8) inches in loose depth for material compacted by heavy equipment, and not more than four (4) inches in loose depth for material compacted by hand operated tampers.

J. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

K. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

L. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture density relationship (cohesion-less soils).

2. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of material, or 95 percent relative density for cohesionless material.

a. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material or 95 percent relative density for cohesionless material.

b. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

3. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

4. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code".

3.5 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.

2. Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.

B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

C. Installation of Fire Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

END OF SECTION 16050

SECTION 16100 - RACEWAYS, BOXES AND CABINETS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Raceways, Fittings, Boxes, Enclosures and Cabinets for Electrical Wiring.

PART II - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1

B. Intermediate Metal Conduit: ANSI C80.6

C. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.

D. Flexible Metal Conduit: Zinc coated steel

E. Liquid tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

G. Non-Metallic Rigid Conduit: Schedule 40 pvc as where shown on the drawings.

H. "MC" type cable is not acceptable.

2.2 WIRE WAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.

C. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.

D. Wireway Covers: Match equipment specified.

E. Finish: Paint to match adjacent finish. Work shall be neat and subject to approval by the Architect/Engineer.

2.3 SURFACE RACEWAY

A. Types, sizes, and channels as indicated and required for each application with fittings that match and mate with raceway.

B. Surface Metal Raceway: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating suitable for painting.

2.4 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1

B. Cast Metal Boxes: NEMA FB 1, type FD, cast alloy box with gasketed cover

2.5 FLOOR BOXES

A. Floor Box: Cast metal, fully adjustable, rectangular. Size as required to provide the number of devices shown. Provide barriers for separation of power and data. Cover shall match the floor finish. Brass flip type only unless noted otherwise.

2.6 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

C. Pull Boxes: Code gauge steel with screw type removable cover. NEMA rated for the condition.

PART III - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 MINIMUM CONDUIT SIZE: (unless indicated otherwise) on the drawings conduit shall be sized as follows:

A. Indoors: The minimum conduit size shall be 1/2".

1. Flexible metal conduit may be used for tap connection to recessed lighting fixtures.

B. Outdoors: Branch circuit conduit installed below grade to exterior equipment shall be one (1) inch minimum unless noted otherwise.

3.3 WIRING METHODS: Unless noted otherwise on the drawings the following materials shall be used:

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid or intermediate metal conduit.

2. Concealed: Rigid or intermediate metal conduit.

3. Underground, Single Run: Rigid, encased in concrete conduit.

4. Underground, Grouped: Rigid metallic conduit or (non-metallic rigid conduit) where noted.

5. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid tight flexible metal conduit.

6. Boxes and Enclosures: NEMA Type 3R or Type 4.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquid tight flexible metal conduit.

2. Damp or Wet Locations: Rigid steel conduit.

3. Exposed: Electrical metallic tubing above 8 feet and rigid metallic conduit below eight (8) feet.

4. Concealed: Electrical metallic tubing, conduit (where allowed by the N.E.C.).

5. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 3R, unless otherwise noted.

3.4 INSTALLATION

A. Telephone/Data/Cable TV outlet boxes shall be 2 gang with appropriate trim and cover. Coordinate cover plates with Owner.

B. Provide insulated bushings for all conduit ends.

C. Conceal rigid conduit and EMT, unless otherwise indicated, within finished walls, ceilings, above attic space and below floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceway.

H. Protect stubs from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. **Where non-metallic conduit is shown to be used below the slab provide rigid conduit to turn up into the building space or at all exterior walls, poles or equipment.**

J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.

K. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated. Where the number of bends exceed the total number required by the N.E.C., provide pull boxes as required by code.

L. Install raceways parallel to or at right angles to surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

3. Provide expansion joint fittings where required for the raceway used.

N. IMC and GRC shall terminate with either a double locknut/bushing set or in a threaded hub.

O. Where conduit type "LB" fittings are used all conduits on conduits over 2" in size shall be "MOGAL" type.

P. "EMT" connectors shall be steel plated hexagonal compression type only. Do not use pot metal, set-screw, or indenter type connectors.

Q. Where concentric, eccentric, or oversized knockouts are encountered, a grounding-type insulated bushing shall be provided.

R. Where conduits of any type pass over a building expansion joint, a standard "expansion joint" fitting, compatible with the type raceway, shall be provided.

S. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

T. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

U. Install pull cords in all empty raceways. Use monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull cord.

V. Telephone and Signal System Raceways 2 Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Pull boxes shall be a minimum of 10" square x 6" deep with removable cover.

W. Install raceway sealing fittings at suitable, approved, accessible locations and fill them

with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous classified locations.

2. Where conduits pass from warm locations to cold locations, such as exterior spaces and air-conditioned spaces.

3. Where otherwise required by the NEC.

X. Stub-Up Connections: Extend conduits through concrete floor a minimum of 6" for connection to freestanding equipment. Extend conductors to equipment with flexible metal conduit. Where equipment connections are not made under this Contract verify the length of the flexible connectors.

Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor.

Z. Set floor boxes level and adjust to floor surface. Provide the proper trimming for the finished floor condition. Flip top brass type cover rings shall be provided for the device shown unless noted otherwise.

AA. Provide grounding connections for raceway, boxes and components. Tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

BB. All underground raceways shall be identified by "UNDERGROUND LINE MARKING TAPE" located directly above the raceway at 6" below finished grade. Tape shall be permanent, bright-colored, continuous, magnetic strip, printed, plastic tape compounded for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of the service it is marking. Provide sufficient tape not less than 2/3 of the width of the item marked for the full length of the Raceway.

CC. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the sub-up out of the slab or earth shall be rigid steel.

DD. Where shown to be used on the drawings PVC non-metallic conduit used exterior to the building for grouped circuits it shall be encased in a minimum of 3" of 3000 psi rated concrete. Concrete encased non-metallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Secure separators to the earth and to ducts to prevent floating during placement of concrete. Do not use steel or tie wires in such a way to form conductive or magnetic loops around ducts or duct groups.

EE. The Raceway System shall not be relied on for grounding continuity. See Section 16452 for Grounding and Bonding Requirements.

FF. Where non-metallic conduit is allowed on the drawings all bends and off-sets shall be made by approved mechanical benders per the manufacturers instruction. Any conduit not in compliance will be removed.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer

and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to paint finishes with matching touch-up coating recommended by the manufacturer.

3.6 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finish, including chips.

END OF SECTION 16100

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SECTION 16120 - WIRES AND CABLES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Building Wires and Cables and Associated Splices, Connectors and Terminations for Wiring Systems rated 600 Volts and Less.

PART II - PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.

B. Rubber Insulation: Conform to NEMA WC 3.

C. Thermoplastic Insulation: Conform to NEMA WC 5.

D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.

E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.

F. Solid conductor for 10 AWG and smaller: Stranded conductor for larger than 10 AWG.

2.2 CONNECTORS AND SPLICES

A. UL-listed factory fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

PART III - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Feeders and Branch Circuits: Type THHN\THWN or XHHW, copper conductor, in raceway.

B. Fire Alarm Signal Circuits: Power-limited fire protective signaling circuit cable.

C. Fire Alarm Notification Circuits: Type THHN/THWN, copper conductor, in raceway.

D. Switchboard Control circuits: Type SIS copper conductors, stranded, tin coated.

3.3 INSTALLATION

A. All conductors shall be copper.

B. Minimum conductor size for power and lighting circuits shall be #12 AWG. Maximum conductor size shall be 500 KCMIL AWG.

C. All power and lighting circuits #10 awg and smaller shall be solid copper conductors. Conductor sizes #8 awg and larger shall be Class "B" stranded copper conductors.

D. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.

E. Conductor Splices: Keep to minimum.

F. Wiring at Outlets: Install with at least 8 inches of slack conductor at each outlet.

G. Connect outlets and components to wiring and to ground as indicated. Tighten to UL Standard 486A.

H. Power and Lighting circuits will be allowed to be grouped where not more than three phase conductors and one common neutral are used, unless noted otherwise.

I. All power circuits noted for computer equipment with isolated grounding shall be individually installed in a separate conduit with separate phase, neutral conductor, grounding conductor, and isolated grounding conductor, unless noted otherwise.

J. In no case shall any wire installed to a device exceed the U.L. rating of the device.

3.4 SPLICING

A. Joints in solid conductors shall be using Idea "wire nuts", 3M Company "scotch lock", or "T&B" "PIGGY" connectors in junction boxes, outlet boxes and lighting fixtures.

B. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.

C. Joints in stranded conductors shall be spliced by approved mechanical connectors. Solderless mechanical connectors similar to "NSI" multi-cable connector blocks for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.

D. Conductors in all cases, shall be continuous from outlet to outlet unless "taps" are required and shall be made only within outlet, junction boxes, troughs and gutters.

3.5 VOLTAGE DROP

A. Where conductor length from the panel to the first outlet on a 120 volt circuit exceeds 100 feet, the branch circuit conductors from the panel to the first outlet shall be not smaller than #10 awg.

B. Where the conductor length from the panel to the first outlet on a 277 volt circuit exceeds 200 feet, the branch circuit conductor from the panel to the first outlet shall be not smaller than #10 awg.

3.6 FIELD QUALITY CONTROL

A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1.Procedures: Perform each Visual and Mechanical Inspection and Electrical Test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning products at site, where possible, and re-test to demonstrate compliance; otherwise, remove and replace with new units and re-test.

3.7 ELECTRICAL TESTING

A. Feeder Insulation Resistance Testing:

1. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:

2. Minimum readings shall be one million (1,000,000) or more ohms for wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductor and the grounding conductor.

3. After all devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from the neutral bar. Test each neutral conductor separately until the low readings are found. The Contractor shall correct troubles, reconnect and re-test until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

4. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.

5. At the final inspection, the Contractor shall furnish a megger and show the Engineers and SCO representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

END OF SECTION 16120

SECTION 16140 - WIRING DEVICES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes various types of receptacles, connectors, switches and finish plates.

1.3 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each product specified.

PART II - PRODUCTS

2.1 WIRING DEVICES

A. Comply with NEMA Standard WD 1-101968, "General Purpose Wiring Devices".

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color: Selected by Architect.

D. Duplex receptacles shall be of the grounding type arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20 amp, 125 volt and the face configuration shall conform to the NEMA Standard No. WDI.101968, and shall be approved third party listed. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct green insulated conductor connection to the equipment grounding system. Receptacles shall be specification grade mounted vertically.

E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicted, and with the following additional requirements:

1. Ground Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters" with integral NEMA 5-20R duplex receptacle. Design units for installation in a 2¾ inch (70-mm) deep outlet box without an adapter.

2. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.

a. Devices: Listed and labeled as isolated ground receptacles.

b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.

c. Color: Orange with "green" triangle.

F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles and Cable Connectors of the Pin and Sleeve type for Industrial Use".

G. Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.

H. Single pole and three/four-way toggle type Snap Switches: Shall be 20 amp 120/277v. a.c. rated, quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches" and with Federal Specification W-S-896. Color selected by Architect.

I. Dimmer Switches: Modular full-wave solid-state units with integral, quiet On/Off switches, and audible and electromagnetic noise filters. See plans for model numbers.

1. Wattage rating shall be 2000 watts minimum, except as otherwise indicted.

2. Control: Continuously adjustable slide or toggle. Single pole or 3-way switch to suit conditions.

J. Motion Sensor Switches

1. Single Pole-single switching- Hubbell Model LHMTS1

2. Single Pole-double switching-Hubbell Model LMHTD2

3. Switches shall be combination ultrasonic and passive infrared.

4. 100 square foot coverage, 180 degree.

5. 120 volt: 800 watt incandescent, 1000 watt fluorescent.

6. 277 volt, 1800 watt fluorescent.

7. 5 year warranty.

8. Equals by Wattstopper and Lutron.

K. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Material for Finished Spaces: 0.04 inch thick, type 302, satin finished stainless steel, intermediate jumbo size except as otherwise indicated.

2. Material for Unfinished Spaces: Galvanized cast ferrous steel, standard size.

3. Provide a quantity of 2% spare cover plates for each type of device cover used to the Owner.

2.2 FLOOR SERVICE OUTLET ASSEMBLIES

A. Types: Modular, above-floor, or recessed in floor, dual service units suitable for the wiring method indicated.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Die-cast aluminum, satin finished.

D. Power Receptacle: NEMA configuration 5-20R, ivory finish, except as otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.

2.3 MULTI-OUTLET ASSEMBLIES

A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings".

B. Components of Assemblies: Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

C. Raceway Material: Metal with manufacturer's standard corrosion-resistant finish.

PART III - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

1. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

C. Protect devices and assemblies during painting.

D. Adjust locations at which floor service outlets are installed to suit the indicated arrangement of partitions and furnishings.

E. Field verify the actual location of all outlet devices above equipment or counter tops before rough-in and installation. Any outlet installed in conflict with equipment or conditions that could have been avoided, will be corrected at the Contractor's expense.

F. Provide weatherproof cast aluminum cover plates for all devices exterior to the building or in "wet" locations, Hubbell WP26M or equal.

G. GFCI protection shall be provided for all receptacles exterior to the building, in restrooms or where required by Code.

H. Locate all receptacles in rated walls with 24" minimum horizontal separation. This includes devices located opposite each other in the walls.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification".

1. Switches: Where 3 or more switches are ganged and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of

plate and durable wire markers or tags within outlet boxes.

3.3 GROUNDING

A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of Electrical System.

3.3 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least six (6) times.

B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.

C. Replace damaged or defective components.

3.4 CLEANING

A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

SECTION 16190 - SUPPORTING DEVICES

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes secure support from the building structure for Electrical items by means of Hangers, Supports, Anchors, Sleeves, Inserts, Seals and Associated Fastenings.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

PART II - PRODUCTS

2.1 COATINGS

A. Coating: Supports, support hardware and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish and inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.2 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps.

1. Expansion Anchors: Carbon steel wedge or sleeve type.

2. Toggle Bolts: All steel spring-head type.

3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.

B. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps and cap screws.

C. U-Channel Systems: 16-gage steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.3 FABRICATED SUPPORTING DEVICES

A. General: Shop or field fabricated supports or manufactured supports assembled from U-Channel components.

B. Steel Brackets: Fabricated of angles, channels and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

C. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:

a. 3-inch and smaller: 20-gage
b. 4-inch to 6-inch: 16-gage
c. Over 6-inch: 14-gage

2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.

3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART III - EXECUTION

3.1 INSTALLATION

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

B. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC and the following requirements:

1. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.

2. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

3. Support parallel runs of horizontal raceways together on trapeze-type hangers.

4. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use ¼ inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

5. Space supports for raceway's types not covered by the above in accordance with NEC.

6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.

7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

8. In interior spaces provide a minimum of ¼ inch space for all conduits installed on the exterior building walls. Approved "clamp-back" or strut devices shall be used.

D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers and other devices.

E. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.

F. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire-rated wall or floor construction, apply UL- listed fire stopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with the UL requirements.

G. Conduit Seals: Install bushing seals for conduit penetrations of slabs on grade and exterior walls below grade. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

H. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, bus ways, cabinets, panelboards, transformers, boxes, disconnect switches and control components in accordance with the following:

1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

2. Holes cut to depth of more than 1½ inches in reinforced concrete beams or to depth of more than ¾ inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.

3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration and shock resistant fasteners for attachments to concrete slabs.

I. TESTS: The installation of any type support anchor system used on the project will be tested at the Engineers discretion.

J. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain the Structural Engineer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and re-test until satisfactory results are achieved.

END OF SECTION 16190

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes Identification of Electrical Materials, Equipment and Installations.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Ideal Industries, Inc.
2. National Band and Tag Co.
3. Panduit Corp.
4. Seton Name Plate Co.
5. Standard Signs, Inc.
6. W.H. Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width. Colors to match color schemes noted herein.

B. Underground Line Marking Tape: Permanent, bright colored, continuous printed, metallic strip, plastic tape compounded for direct burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

C. Wire/Cable Designation Tape Markers: Vinyl or vinyl cloth, self adhesive, wrap-around, cable/conductor markers with pre-printed numbers and letter.

D. Engraved, Plastic Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16th inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8th inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners. (Match face colors with the system equipment.) See color schemes.

E. Fasteners for Plastic Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

F. Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color coding.

PART III - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors and other designations used in Electrical Identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

C. Identify Raceways of Certain Systems with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be colored adhesive marking tape, (painting of conduit will not be allowed). Make each color band 3 inches wide, completely encircling conduit. Install bands at changes in direction, at penetrations of walls and floors, and at 25-foot maximum intervals in straight runs. Apply the following colors:

1. Data/Voice System: Yellow
2. Telephone System: Green

D. Identify Junction, Pull, and Connection Boxes: Install on outside of box cover. Label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels concealed boxes. Color code boxes as indicated below. Method shall be by colored adhesive not less than 4 square inches for 4" boxes and larger boxes. Permanent type "magic" markers are not accepted as a means of identification.

120/208 volt blue

E. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal and communications lines, install continuous underground plastic line marker, located directly above line at 6 inches below finished grade where multiple lines are installed in a common trench or concrete envelope. Provide marker tape to cover 2/3 of the overall width.

F. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

208/120 Volts	**Phase**
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

G. Use conductors with color factory-applied the entire length of the conductors except as follows:

1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.

a. Apply colored, pressure-sensitive plastic tape in half- lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration minimum width 2".

H. Tag or label conductors as follows:

1. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

2. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

I. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2 inch high lettering on 1½ inch high label (2 inch high where two lines are required), white lettering in blue field for normal power equipment other face colors shall match the equipment served. Text shall match terminology and numbering of the Contract Documents and shop drawings.

2. All Phenolic labels shall be securely attached to the equipment by self-tapping stainless steel screws.

3. Name plate colors shall be as follows:

....Blue surface with white core for 120/208 Volt Equipment.

....Orange surface with white core for all equipment related to Telephone Systems.

....Brown surface with white core for all equipment related to the Data Systems.

....Purple surface with white core for all equipment related to TV Systems.

J. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker. Pencil in all spare and leave spaces blank.

K. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

L. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by pressure sensitive label applied to the conduit or outlet; designate "use" and "location served".

END OF SECTION 16195

SECTION 16420 - SERVICE ENTRANCE

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. Extent of Service Entrance work is indicated by Drawings and Schedules.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data on Service Entrance equipment and accessories.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of service entrance equipment, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 5 years of successful installation experience with projects utilizing Service Entrance work similar to that required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC, including Articles 230, 250, and 338, as applicable to installation and construction of Service Entrances.

2. NEMA Compliance: Comply with applicable Construction and Installation Requirements of the following NEMA standards for Service Entrance Equipment and Accessories:

a. Stds. Pub/No. AB 1: Molded-Case Circuit Breakers.

b. Stds. Pub/No. AB 3: Molded-Case Circuit Breakers and their application.

c. Stds. Pub/No. PB 2: Dead-Front Distribution Switchboards.

d. UL Compliance: Comply with construction and installation requirements of the following UL standards for Service Entrance Equipment and Accessories:

e. UL 50: Electrical Cabinets and Boxes.

3. UL 489: Molded Case Circuit Breakers and Circuit Breaker Enclosures.

a. UL 869: Electrical Service Equipment.

4. Provide Service Entrance Equipment and Accessories which are UL-listed and labeled and marked, "SUITABLE FOR USE AS SERVICE EQUIPMENT".

5. IEEE Compliance: Comply with applicable requirements of IEEE Std 241 pertaining to Service Entrances.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver Service Entrance equipment components properly packaged and mounted on pallets or skids to facilitate handling of heavy items.

B. Store Service Entrance equipment in original packaging indoors until installation.

C. Handle Service Entrance equipment carefully. Do not install damaged equipment; remove from site and replace with new equipment.

1.6 SEQUENCING AND SCHEDULING

A. Schedule delivery of Service Entrance equipment that permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.

B. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.

C. Coordinate with other electrical work including raceways, electrical boxes and fittings and cabling/wiring work, as necessary to interface installation of Service Entrance work with other work.

D. Coordinate the available fault current at each point of Service Entrance device. Modify breaker as required from the minimum shown on the Plan and Schedules.

PART II - PRODUCTS

2.1 SERVICE ENTRANCE EQUIPMENT

A. General: Provide Service Entrance Equipment and Accessories of types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published product information and as required for complete installation and as herein specified.

B. Circuit Breakers: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

1. Molded-Case Circuit Breakers: Provide factory-assembled, molded-case circuit breaker of frame sizes indicated; see the main distribution panel schedule on the drawings for ratings and sizes of breakers required. Circuit breakers shall be rated not less than the minimum available at the secondary of the service

transformer. Coordinate with the utility company. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole. Construct with over-center, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated and with NEMA Type 1 general purpose enclosures.

Note: The Contractor shall coordinate with the utility company as to the fault current available at the service point and notify the Engineer, so that the breaker rating can be adjusted accordingly.

PART III - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Service Entrance equipment and components are to be installed and notify Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF SERVICE-ENTRANCE EQUIPMENT

A. Install Service Entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices to ensure that Service Entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA Standards.

B. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A and B and the National Electrical Code.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of Service Entrance equipment, check accessible connections for compliance to manufacturer's Torque Tightening Specifications.

B. Prior to energization of Service Entrance equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check circuitry for electrical continuity and for short circuits.

3.4 GROUNDING

A. Provide equipment grounding connections for Service Entrance equipment as indicated. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounding.

3.5 CIRCUIT BREAKER TESTS

A. For services 1,000 amperes and larger, perform the following tests on the service circuit breakers and the distribution circuit breakers. Testing shall be performed by a qualified factory Technician at the job site. All readings shall be tabulated.

B. Phase tripping tolerance (within 20% of U/L requirements).

C. Trip time (per phase) in seconds.

D. Instantaneous trip (amps) per phase.

E. Insulation resistance (Megohms) at 100 volts (phase to phase, and line to load).

3.6 GROUND FAULT PROTECTION SYSTEM

A. The ground fault protection of the new circuit breakers shall be performance tested in the field and properly calibrated and set in accordance with fault current available at the distribution service.

3.7 DOCUMENTATION

A. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.

B. At final inspection, the Contractor shall furnish a megger and show the Engineer's representative that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter, taking current and voltage readings as directed by the Engineer.

C. All required documentation of readings indicated shall be submitted to the Engineer prior to, and as one of the pre-requisites for, final acceptance of the project.

3.8 ADJUSTING AND CLEANING

A. Adjust operating mechanisms for free mechanical movement.

B. Touch up scratched or marred enclosure surfaces to match original finishes.

3.9 DEMONSTRATION

A. Upon completion of installation of Service Entrance equipment and electrical circuitry, energized circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then re-test to demonstrate compliance; otherwise, remove and replace with new units and re-test to demonstrate compliance.

END OF SECTION 16420

SECTION 16452 - GROUNDING

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Solid Grounding of Electrical Systems and Equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.3 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

PART II - PRODUCTS

2.1 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper

2.2 WIRE AND CABLE CONDUCTORS

A. General: Comply with Division 16 Section "Wires and Cables". Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Green insulated

C. Grounding Electrode Conductor: Stranded cable

D. Bare Copper Conductors: Conform to the following:

1.	Solid Conductors:	ASTM B-3
2.	Assembly of Stranded Conductors:	ASTM B-8
3.	Tinned Conductors:	ASTM B-33

2.3 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section, full-size rated.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.4 CONNECTOR PRODUCTS

A. General: Listed and labeled as Grounding Connectors for the materials used.

B. Pressure Connectors: High conductivity-plated units

C. Bolted Clamps: Heavy-duty units listed for the application

D. Exothermic Welded Connections: Provided in Kit Form and selected for the specific types, sizes and combinations of conductors and other items to be connected.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel with high strength steel core and electrolytic grade copper outer sheath, molten welded to core.

1. Size: 3/4 inch by 10 feet

PART III - EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. The raceway system shall not be relied on for ground continuity .Install an equipment ground conductor in all power related conduits. Size conductor as required by NEC Table 250-122. Data and Signal conduits do not require a separate grounding conductor unless required by the manufacturer of the equipment to be installed.

2. Install separate isolated equipment grounding conductors with circuit conductors for the following in addition to those locations where required by Code.

a. Isolated grounding type receptacles

B. Underground Conductors: Bare, stranded copper except as otherwise indicated.

C. Signal and Communications: For telephone, alarm, and communication systems, provide a #4 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal equipment location. Leave 3' pigtail wiring at termination point where equipment boards are shown. Make direct connection where equipment is provided.

D. Separately derived systems required by NEC to be grounded shall be grounded in accordance with NEC paragraph 250-26.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

B. The electrical service shall be grounded by three (3) means:

1. To the cold water main, if metallic and in direct contact with the earth for at least 10 feet as per the NEC Article 250-81.

2. To the steel frame of the building, provided the building frame is effectively grounded.

3. To ground rod(s)

C. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use ¾ inch by 10 ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated. All ground connections shall be accessible.

D. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.

E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.

2. Make connections with clean bare metal at points of contact.

3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.

4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

B. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.

E. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

3.4 FIELD QUALITY CONTROL

A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2 point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System".

B. Service Grounding Test

1. After completion of the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where test shown resistance-to-ground is over 25 ohms, provide additional ground rods until the minimum of 25 ohms is achieved.

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are detected that exceed those indicated the provisions of the Contract, covering changes will apply.

D. Report: Prepare test reports of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and re-establish original grades. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching.

END OF SECTION 16452

SECTION 16470 – PANEL BOARDS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Lighting and Power Panel Boards and Associated Auxiliary Equipment Rated 600 V or Less

1.3 DEFINITIONS

A. Panel Boards: A panel board with thermal magnetic circuit-breaker branches, designed for residential and light commercial projects, operating at 600 V and below, available in both single and 3-phase versions, and equipped with combination flush/surface mounting trim.

B. Over-current Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type panel board, accessory item, and component specified.

C. Shop Drawings from manufacturers of panel boards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features and voltage rating.

D. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code".

C. NEMA Standard: Comply with NEMA PB1, "Panel Boards".

D. UL Standards: Comply with UL 61, "Panel Boards", and UL 50, "Cabinets and Boxes".

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Cutler Hammer
2. Square D
3. Siemens

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Over-current Protective Devices (OCPDs): Provide type, rating, and features as indicated on the schedules. Tandem circuit breakers shall not be used. Multiple breakers shall have common trip.

B. Circuit Breakers shall be bolt-on type.

C. 100% rated copper Ground and Neutral Bus (unless noted otherwise).

D. Enclosures: Cabinets, flush or surface mounted as indicted. NEMA Type 1 enclosure.

E. Front: Secured to box with concealed trim clamps except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified.

F. Directory Frame: Metal, mounted inside each panel door.

G. Bus: Hard drawn copper of 98 percent conductivity

H. Main and Neutral Lugs: Bolt-on type

I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors.

K. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.

L. Feed-through panels are not permitted.

M The use of series breakers is not permitted.

N. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements.

2.3 IDENTIFICATION

A. Panel Board Nameplates: Engraved laminated plastic or metal nameplate for each panel board mounted with self-tapping stainless steel screws.

PART III - EXECUTION

3.1 INSTALLATION

A. General: Install panel boards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panel Boards Rated 600 Volts or Less" and manufacturers' written installation instructions.

B. Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.

D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing. Pencil all spares. Spaces shall be left blank.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panel Boards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future.

G. Wiring in Panel Gutters: Train conductors neatly in groups, bundle and wrap with wire ties after completion of load balancing.

3.2 GROUNDING

A. Connections: Make equipment grounding connections for panelboards as indicated.

B. Provide ground continuity to main electrical ground bus indicated.

3.3 CONNECTIONS

A. All connections shall be provided per UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Quality Control Program: Conform to the following:

1. Procedures: Field tests and Inspections will be made by the Engineer at time of completion of the work and in accordance these Specifications.

2. Schedule tests with at least one (1) week in advance notification.

B. Visual and Mechanical Inspection: Include the following inspections and related work:

1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date Drawings and Panel Board Schedules.

2. Exercise and perform of operational tests of all Mechanical components and other operable devices in accordance with manufacturer's Instruction Manual.

3. Check panel board mounting, area clearances and alignment and fit of components.

4. Check tightness of bolted electrical connections with calibrated torque wrench.

3.5 CLEANING

A. Upon completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16470

SECTION 16476 – DISCONNECTS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Equipment and Service disconnects.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for Switches and Accessories specified in this Section.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Cutler-Hammer Products; Eaton Corp.
2. Siemens
3. Square D Company

2.2 ENCLOSED SWITCHES

A. Enclosed Non-Fusible Switch: NEMA KS 1, Type HD, handle lockable with 2 padlocks.

B. Enclosed Fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

C. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

D. Outdoor Locations: Type 3R

E. Other Wet or Damp Indoor Locations: Type 4

F. All switches shall be "Heavy Duty" rated for the voltage required.

G. Coordinate all fuse rated switches with the equipment to be furnished. Furnish fuses.

H. Safety switches shall be third-party listed.

I. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the open position.

J. Switches shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlocks shall be provided for switches located in the public areas.

K. Switches shall have nonteasible, positive, quick make-quick-quick-break mechanisms.

L. Switches shall be properly labeled. See section 16195, Electrical Identification.

PART III - EXECUTION

3.1 INSTALLATION

A. Install enclosed switches level and plumb.

B. Where fuses are required, the fuses shall be matched with the equipment supplier's requirements.

C. Provide one additional set of fuses for each disconnect switch.

3.2 FIELD QUALITY CONTROL

A. Testing: After installing enclosed switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance. Otherwise, remove and replace with new units and re-test.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, construction debris and repair damaged finish including chips, scratches and abrasions.

END OF SECTION 16476

SECTION 16515 - INTERIOR LIGHTING

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:

1. Outline drawings of fixtures indicating dimensions and principal features.

2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.

3. Data on batteries and chargers of emergency lighting units.

4. Shop Drawings from manufacturers detailing non-standard fixtures and indicating dimensions, weights, methods of field assembly, components, features and accessories.

5. Non-returnable samples, when requested by Engineer, for verification purposes of specific individual fixtures.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide fixtures that are listed and labeled for their indicated use on the Project.

C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system. Provide plaster or sheet-rock trims when required on the project whether indicated or not at no additional cost to the Owner. Coordinate with Architectural Plans before ordering fixtures.

1.5 WARRANTY

A. Minimum warranty period on emergency lights shall be three (3) years from date acceptance. Warranty shall include all parts (less lamps).

B. All other lighting products shall be warranted for a period of not less than 1 year from date of acceptance. This warranty does not include miscellaneous parts which are external to the product (i.e. lamps) which are considered maintenance item.

PART II - PRODUCTS

2.1 FIXTURES - GENERAL

A. Comply with the requirements specified in the Articles below and the Lighting Fixture Schedule on the Drawings.

2.2 FIXTURE COMPONENTS - GENERAL

A. Metal Parts: Free from burrs and sharp corners and edges.

B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in the operating position. Light seal strips inside the fixture will not be allowed.

D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent
2. Specular Surfaces: 83 percent
3. Diffusing Specular Surfaces: 75 percent
4. Laminated Silver Metalized Film: 90 percent

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic

1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.
2. Lens Thickness: 0.125 inches minimum

2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: ½ inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, ½ inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

C. Rod Hangers: 3/16 inch diameter cadmium plated, threaded steel rod.

2.4 FLUORESCENT FIXTURES

A. Fixtures: Conform to UL 1570, "Fluorescent Lighting Fixtures".

B. Electronic Ballast:

1. Ballast to be "UL listed, Class P".

2. Ballast to be "Sound Rated A".

3. Ballast enclosure size shall be same as or smaller than, magnetic ballast.

4. Light regulation shall be +/- 10% input voltage variation.

5. Ballast shall have high power factor (minimum of 90%).

6. Lamp current crest factor shall be equal to, or less than, 1.7.

7. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets).

8. Flicker shall be 15% or less with any lamp suitable for the ballast.

9. Ballast design shall withstand line transients per IEEE 587, Category A.

10. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.

11. Ballast shall meet FCC Rules and Regulations, Part 18.

12. Parallel wiring between the ballast and fixture is recommended.

13. Minimum of five (5) years warranty is required with each electronic ballast.

14. The manufacturer shall have not less than 5 years of experience in manufacturing electronic ballast.

C. Low Temperature Ballast Minimum Starting Temperature: Minus 20 degrees C

D. Where compact fluorescent light fixtures are specified, "High Power Factor" electronic ballast shall be standard.

2.5 FLUORESCENT LAMPS

A. All fluorescent lamps to be {41} K-rated unless noted otherwise.

2.6 EXIT SIGNS

A. Conform to UL 924, "Emergency Lighting and Power Equipment".

1. Arrows: Include as indicated.

B. Emergency Exit Signs shall be of the "LED" style.

C. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.

D. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.

E. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

F. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

G. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

H. LED-The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

2.7 EMERGENCY LIGHTING UNITS

A. Conform to UL 924, "Emergency Lighting and Power Equipment" requirements for "Unit Equipment". Provide self-contained units with the following features and additional characteristics as indicated.

B. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.

C. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.

D. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

E. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

F . WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

2.8 FINISH

A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.

B. Paint parts after fabrication.

PART III – EXECUTION

3.1 INSTALLATION

A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved Shop Drawings.

B. Support For Recessed and Semi-Recessed Fixtures: Units shall be supported independent from suspended ceiling. Install fixture with support wires at 2 diagonal corners to the structure or building steel.

1. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two ¾ inch metal channels spanning and secured to the ceiling tees.

2. Install support clips or screws for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.

3. Support wires shall be not less than the support wires for the ceiling system.

C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single unit suspended fluorescent fixtures with twin stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

D. Lamping: See Schedule on Drawings, or provide standard lamp for the rating of the fixture.

E. Where mounting height for fixtures are not scheduled, coordinate with the Engineer before any installation.

3.2 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Emergency Battery Units Test: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy for a period of not less than 90 minutes to demonstrate proper operation of Emergency Lighting installation. Include the following in tests of emergency lighting equipment.

1. Duration of supply
2. Low battery voltage shut-down
3. Normal transfer to battery source and retransfer to normal
4. Low supply voltage transfer

C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

D. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced and tested again. Copy of the test report shall be sent to the State Construction Office.

3.3 ADJUSTING AND CLEANING

A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515

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DIVISION 17 - COMPENSATION FOR GENERAL CONSTRUCTION

SECTION 17100 - COMPENSATION FOR GENERAL CONSTRUCTION

1.01 COMPENSATION

A. The work of furnishing materials and constructing the Gaston County I-85 Weigh Station Buildings Northbound lane, consisting of the Scale Booth and the Scale Building, in accordance with the plans and specifications; completed and accepted, will be paid for at the contract unit prices for "General Construction of Gaston County I-85 Weigh Station". Such price and payment will be full compensation for all work of constructing Gaston County I-85 Weigh Station Scale Booth and Scale Building; including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Scale Building and Scale Booth: Complete General Construction and All Systems As Indicated" .....Lump Sum

SECTION 17200 - COMPENSATION FOR GENERAL CONSTRUCTION

1.01 COMPENSATION

A. The work of furnishing materials and constructing the Inspection Building of the Gaston County I-85 Weigh Station Northbound lane in accordance with the plans and specifications; completed and accepted, will be paid for at the contract unit prices for "General Construction of Gaston County I-85 Weigh Station". Such price and payment will be full compensation for all work of constructing Gaston County I-85 Weigh Station Inspection Building; including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Inspections Building: Complete General Construction and All Systems As Indicated" .....Lump Sum

Project I-4928 **Gaston/Cleveland Co.**

Project Special Provisions
Culvert

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For Polyurethane Grout Injection, see Geotechnical special provisions.

PROJECT SPECIAL PROVISIONS
CULVERT

PROJECT I-4928 **GASTON/CLEVELAND CO.**

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

   Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS (8-9-13)

1.0 GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the

contract. Make submittals that are not specifically noted in this provision directly to the Resident Engineer. Either the Structure Design Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Resident Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Resident Engineer, Structure Design Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

2.0 ADDRESSES AND CONTACTS

For submittals to the Structure Design Unit, use the following addresses:

Via US mail:

Mr. G. R. Perfetti, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Via other delivery service:

Mr. G. R. Perfetti, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

Submittals may also be made via email.

Send submittals to:

plambert@ncdot.gov (Paul Lambert)

Send an additional e-copy of the submittal to the following address:

jgaither@ncdot.gov (James Gaither)

jlbolden@ncdot.gov (James Bolden)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:

Mr. Eric Williams, P. E.
Western Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via other delivery service:

Mr. Eric Williams, P. E.
Western Region Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structure Design Unit can be viewed from the Unit's web site, via the "Contractor Submittal" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact:	Paul Lambert (919) 250 – 4082 facsimile plambert@ncdot.gov	(919) 707 – 6407
Secondary Structures Contacts:	James Gaither	(919) 707 – 6409
	James Bolden	(919) 707 – 6408

Eastern Regional Geotechnical Contact (Divisions 1-7):

K. J. Kim	(919) 662 – 4710
(919) 662 – 3095 facsimile	
kkim@ncdot.gov	

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
(704) 455 – 8912 facsimile
ewilliams@ncdot.gov

3.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Resident Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structure Design Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Structure Design Unit. The second table in this section covers "Geotechnical Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structure Design Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"

Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms [2] (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Optional Disc Bearings [4]	8	0	"Optional Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions

Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structure Design Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structure Design Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.

2. Submit one hard copy of submittal to the Resident or Bridge Maintenance Engineer. Submit a second copy of submittal electronically (PDF via email) or by facsimile, US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.

3. The Pile Driving Equipment Data Form is available from:
   www.ncdot.org/doh/preconstruct/highway/geotech/formdet/
   See second page of form for submittal instructions.

4. Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY (8-15-05)

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

Submit all items listed below to the Engineer prior to beginning crane operations involving critical lifts. A critical lift is defined as any lift that exceeds 75 percent of the manufacturer's crane chart capacity for the radius at which the load will be lifted or requires the use of more than one crane. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.

C. **Cr ane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.

D. **Certifications:** **By July 1, 2006**, crane operators performing critical lifts shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. All crane operators shall also have a current CDL medical card. Submit a list of anticipated critical lifts and corresponding crane operator(s). Include current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES 9-30-11

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in

accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance,

oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer's recommendations unless directed otherwise by the Engineer. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 2-18-14) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DENR State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by * are the responsibility of the Department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-13 of the *2012 Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the waters or wetlands provided that activities outside those areas is done in such a manner as to not affect the waters or wetlands.

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U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID. **2010-00031** County: **Gaston**

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Property Owner / Authorized Agent: **North Carolina Department of Transportation**
Attn: Mr. Phil Harris
Address: **1598 Mail Service Center**
Raleigh, North Carolina 27699-1598
Telephone No.: **919-707-6103**

Size and location of property (water body, road name/number, town, etc.): **The project is located on I-85 Northbound from SR 1302 to SR 1307 near Bessemer City in Gaston County, North Carolina.**

Description of projects area and activity: **In order to build a new weigh station, the permittee is authorized to impact waters of the U.S. as follows:**

Summary of Authorized Impacts and Required Mitigation

Impact ID #	NWP / GP #	Open Water (ac)		Wetland (ac)		Stream (lf)	
		Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Site 1 (unnamed tributary to Abernathy Creek)	**13, 23, and 33**					**27 (dewater)**	**30 (fill/culvert)**
Site 1A (unnamed tributary to Abernathy Creek)	**13, 23, and 33**						**18 (fill/stabilization)**
Site 2 (unnamed tributary to Abernathy Creek)	**13, 23, and 33**					**65 (dewater)**	**92 (fill/culvert)**
Site 2A (unnamed tributary to Abernathy Creek)	**13, 23, and 33**						**40 (fill/stabilization)**
Site 3 (unnamed tributary to Crowders Creek)	**13, 23, and 33**					**18 (dewater)**	**16 (fill/culvert)**
Site 3A (unnamed tributary to Crowders Creek)	**13, 23, and 33**						**27 (fill/energy dissipater)**
Impact Totals							
Total Loss of Waters of the U.S. (ac)				Total Loss of Waters of the U.S. (lf)			**138**
Required Wetland Mitigation (ac)				Required Stream Mitigation (lf)			**303**

Applicable Law: ☒ Section 404 (Clean Water Act, 33 USC 1344)
☐ Section 10 (Rivers and Harbors Act, 33 USC 403)
Authorization: Regional General Permit Number:
Nationwide Permit Number: **13, 23, and 33**

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached conditions, your submitted plans, and the following special conditions:

Special Conditions

1. All work must be performed in strict compliance with the description of work and plans in the application dated July 5, 2013. Any modification to the description of work and/or the permit plans must be approved by the USACE prior to implementation.

2. In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

3. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this authorization letter in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this authorization letter, all conditions, and any authorized modifications. A copy of this authorization letter, all conditions, and any authorized modifications, shall be available at the project site during construction and maintenance of this project.

4. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area.

5. The permittee will report any violation of these conditions or violations of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act in writing to the Wilmington District, U. S Army Corps of Engineers, within 24 hours of the permittee's discovery of the violation.

Any violation of the noted conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Quality (telephone 919-807-6300) to determine Section 401 requirements.

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits.

If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact Lori Beckwith at 828-271-7980.

Corps Regulatory Official: Lori Beckwith

Date: **August 20, 2013** Expiration Date of Verification: **March 18, 2017**

Determination of Jurisdiction:

A. ☐ Based on preliminary information, there appear to be waters of the US including wetlands within the above described project area. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).

B. ☐ There are Navigable Waters of the United States within the above described project area subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

C. ☐ There are waters of the US and/or wetlands within the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

D. ☒ The jurisdictional areas within the above described project area have been identified under a previous action. Please reference jurisdictional determination issued on June 26, 2012, under Action ID number SAW-2010-00031. This determination expires five years from issue date.

Attention USDA Program Participants
This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Corps Regulatory Official: **Lori Beckwith**

SURVEY PLATS, FIELD SKETCH, WETLAND DELINEATION FORMS, PROJECT PLANS, ETC., MUST BE ATTACHED TO THE FILE COPY OF THIS FORM, IF REQUIRED OR AVAILABLE.

Copy Furnished: By e-mail - NCDOT Mr. Bill Barrett

R-5

Permit Number: 2010-00031

Permit Type: NW13, 23, and 33

Name of County: Gaston

Name of Permittee: North Carolina Department of Transportation, Attn: Mr. Phil Harris

Date of Issuance: August 20, 2013

Project Manager: Lori Beckwith

X Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers
Attention: CESAW-RG-A
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee Date

Compensatory Mitigation Responsibility Transfer Form

Permittee: North Carolina Department of Transportation **Action ID:** SAW-2010-00031
Project Name: TIP No. I-4928 **County:** Gaston

Instructions to Permittee: The Permittee must provide a copy of this form to the Mitigation Sponsor, either an approved Mitigation Bank or the North Carolina Ecosystem Enhancement Program (NCEEP), who will then sign the form to verify the transfer of the mitigation responsibility. Once the Sponsor has signed this form, it is the Permittee's responsibility to ensure that to the U.S. Army Corps of Engineers (USACE) Project Manager identified on page two is in receipt of a signed copy of this form before conducting authorized impacts, unless otherwise specified below. If more than one mitigation Sponsor will be used to provide the mitigation associated with the permit, or if the impacts and/or the mitigation will occur in more than one 8-digit Hydrologic Unit Code (HUC), multiple forms will be attached to the permit, and the separate forms for each Sponsor and/or HUC must be provided to the appropriate mitigation Sponsors.

Instructions to Sponsor: The Sponsor must verify that the mitigation requirements shown below are available at the identified site. By signing below, the Sponsor is accepting full responsibility for the identified mitigation, regardless of whether or not they have received payment from the Permittee. Once the form is signed, the Sponsor must update the appropriate ledger and provide a copy of the signed form to the Permittee and to the USACE Bank/In-Lieu Fee Program Manager. The Sponsor must also comply with all reporting requirements established in their authorizing instrument.

Permitted Impacts and Compensatory Mitigation Requirements:

Permitted Impacts Requiring Mitigation* **8-digit HUC and Basin:** 03050101, Catawba River Basin

Stream Impacts (linear feet)			Wetland Impacts (acres)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-riverine	Non-Riparian	Coastal
165						

*If more than one mitigation sponsor will be used for the permit, only include impacts to be mitigated by this sponsor.

Compensatory Mitigation Requirements: **8-digit HUC and Basin:** 03050101, Catawba River Basin

Stream Mitigation (credits)			Wetland Mitigation (credits)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-riverine	Non-Riparian	Coastal
303						

Mitigation Site Debited: NCEEP
(List the name of the bank to be debited. For umbrella banks, also list the specific site. For NCEEP, list NCEEP. If the NCEEP acceptance letter identifies a specific site, also list the specific site to be debited).

Section to be completed by the Mitigation Sponsor

Statement of Mitigation Liability Acceptance: I, the undersigned, verify that I am authorized to approve mitigation transactions for the Mitigation Sponsor shown below, and I certify that the Sponsor agrees to accept full responsibility for providing the mitigation identified in this document (see the table above), associated with the USACE Permittee and Action ID number shown. I also verify that released credits (and/or advance credits for NCEEP), as approved by the USACE, are currently available at the mitigation site identified above. Further, I understand that if the Sponsor fails to provide the required compensatory mitigation, the USACE Wilmington District Engineer may pursue measures against the Sponsor to ensure compliance associated with the mitigation requirements.

Mitigation Sponsor Name: _____

Name of Sponsor's Authorized Representative: _____

_____ _____

Signature of Sponsor's Authorized Representative **Date of Signature**

Conditions for Transfer of Compensatory Mitigation Credit:

- Once this document has been signed by the Mitigation Sponsor and the USACE is in receipt of the signed form, the Permittee is no longer responsible for providing the mitigation identified in this form, though the Permittee remains responsible for any other mitigation requirements stated in the permit conditions.
- Construction within jurisdictional areas authorized by the permit identified on page one of this form can begin only after the USACE is in receipt of a copy of this document signed by the Sponsor, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein. For authorized impacts conducted by the North Carolina Department of Transportation (NCDOT), construction within jurisdictional areas may proceed upon permit issuance; however, a copy of this form signed by the Sponsor must be provided to the USACE within 30 days of permit issuance. NCDOT remains fully responsible for the mitigation until the USACE has received this form, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein.
- Signed copies of this document must be retained by the Permittee, Mitigation Sponsor, and in the USACE administrative records for both the permit and the Bank/ILF Instrument. It is the Permittee's responsibility to ensure that the USACE Project Manager (address below) is provided with a signed copy of this form.
- If changes are proposed to the type, amount, or location of mitigation after this form has been signed and returned to the USACE, the Sponsor must obtain case-by-case approval from the USACE Project Manager and/or North Carolina Interagency Review Team (NCIRT). If approved, higher mitigation ratios may be applied, as per current District guidance and a new version of this form must be completed and included in the USACE administrative records for both the permit and the Bank/ILF Instrument.

Comments/Additional Conditions:

138' @ 2:1 = 276

27' @ 1:1 – 27

Total = 303

This form is not valid unless signed by the mitigation Sponsor and USACE Project Manager. For questions regarding this form or any of the conditions of the permit authorization, contact the Project Manager at the address below.

USACE Project Manager: Lori Beckwith
USACE Field Office: Asheville Regulatory Field Office
US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006
Email: loretta.a.beckwith@usace.army.mil

Lori Beckwith
USACE Project Manager Signature

August 20, 2013
Date of Signature

Current Wilmington District mitigation guidance, including information on mitigation ratios, functional assessments, and mitigation bank location and availability, and credit classifications (including stream temperature and wetland groupings) is available at http://ribits.usace.army.mil.

NATIONWIDE PERMIT 13
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FINAL NOTICE OF ISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS
FEDERAL REGISTER
AUTHORIZED MARCH 19, 2012

Bank Stabilization. Bank stabilization activities necessary for erosion prevention, provided the activity meets all of the following criteria:

(a) No material is placed in excess of the minimum needed for erosion protection;

(b) The activity is no more than 500 feet in length along the bank, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;

(c) The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;

(d) The activity does not involve discharges of dredged or fill material into special aquatic sites, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;

(e) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the United States;

(f) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and,

(g) The activity is not a stream channelization activity.

This NWP also authorizes temporary structures, fills, and work necessary to construct the bank stabilization activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Invasive plant species shall not be used for bioengineering or vegetative bank stabilization.

* Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the bank stabilization activity: (1) involves discharges into special aquatic sites; or (2) is in excess of 500 feet in length; or (3) will involve the discharge of greater than an average of one cubic yard per running foot along the bank below the plane of the ordinary high water mark or the high tide line. (See general condition 31.) (Sections 10 and 404)

NATIONWIDE PERMIT 23
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FINAL NOTICE OF ISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS
FEDERAL REGISTER
AUTHORIZED MARCH 19, 2012

Approved Categorical Exclusions. Activities undertaken, assisted, authorized, regulated, funded, or financed, in whole or in part, by another Federal agency or department where:

(a) That agency or department has determined, pursuant to the Council on Environmental Quality's implementing regulations for the National Environmental Policy Act (40 CFR part 1500 et seq.), that the activity is categorically excluded from environmental documentation, because it is included within a category of actions which neither individually nor cumulatively have a significant effect on the human environment; and

(b) The Office of the Chief of Engineers (Attn: CECW-CO) has concurred with that agency's or department's determination that the activity is categorically excluded and approved the activity for authorization under NWP 23.

The Office of the Chief of Engineers may require additional conditions, including pre-construction notification, for authorization of an agency's categorical exclusions under this NWP.

* Notification: Certain categorical exclusions approved for authorization under this NWP require the permittee to submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 31). The activities that require pre-construction notification are listed in the appropriate Regulatory Guidance Letters. (Sections 10 and 404)

Note: The agency or department may submit an application for an activity believed to be categorically excluded to the Office of the Chief of Engineers (Attn: CECW-CO). Prior to approval for authorization under this NWP of any agency's activity, the Office of the Chief of Engineers will solicit public comment. As of the date of issuance of this NWP, agencies with approved categorical exclusions are the: Bureau of Reclamation, Federal Highway Administration, and U.S. Coast Guard. Activities approved for authorization under this NWP as of the date of this notice are found in Corps Regulatory Guidance Letter 05-07, which is available at: http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/GuidanceLetters.aspx . Any future approved categorical exclusions will be announced in Regulatory Guidance Letters and posted on this same web site.

NATIONWIDE PERMIT 33
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FINAL NOTICE OF ISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS
FEDERAL REGISTER
AUTHORIZED MARCH 19, 2012

Temporary Construction, Access, and Dewatering. Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites, provided that the associated primary activity is authorized by the Corps of Engineers or the U.S. Coast Guard. This NWP also authorizes temporary structures, work, and discharges, including cofferdams, necessary for construction activities not otherwise subject to the Corps or U.S. Coast Guard permit requirements. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. The use of dredged material may be allowed if the district engineer determines that it will not cause more than minimal adverse effects on aquatic resources. Following completion of construction, temporary fill must be entirely removed to an area that has no waters of the United States, dredged material must be returned to its original location, and the affected areas must be restored to pre-construction elevations. The affected areas must also be revegetated, as appropriate. This permit does not authorize the use of cofferdams to dewater wetlands or other aquatic areas to change their use. Structures left in place after construction is completed require a separate section 10 permit if located in navigable waters of the United States. (See 33 CFR part 322.)

* Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 31). The pre-construction notification must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions. (Sections 10 and 404)

NATIONWIDE PERMIT CONDITIONS

The following General Conditions must be followed in order for any authorization by a NWP to be valid:

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address ESA compliance for the NWP activity, or whether additional ESA consultation is necessary.

* (c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed work or that utilize the designated critical habitat that might be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. FWS or the NMFS, The Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.noaa.gov/fisheries.html respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for obtaining any "take" permits required under the U.S. Fish and Wildlife Service's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the U.S. Fish and Wildlife Service to determine if such "take" permits are required for a particular activity.

20. Historic Properties. (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address section 106 compliance for the NWP activity, or whether additional section 106 consultation is necessary.

* (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties on which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA

section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 31, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal, and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in minimal adverse effects on the aquatic environment.

(2) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

(3) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) – (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(4) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(5) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream rehabilitation, enhancement, or preservation, to ensure that the activity results in minimal adverse effects on the aquatic environment.

(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of

the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the restoration or establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to establish a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or establishing a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____

(Transferee)

_____

(Date)

* 30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the work and mitigation.

* 31. Pre-Construction Notification. (a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 20 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause, including the anticipated amount of loss of water of the United States expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(4) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(5) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse effects are minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(2) For all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States, for NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of intermittent and ephemeral stream bed, and for all NWP 48 activities that require pre-construction notification, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(4) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

D. District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. For a linear project, this determination will include an evaluation of the individual crossings to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings authorized by NWP. If an applicant requests a waiver of the 300 linear foot limit on impacts to intermittent or ephemeral streams or of an otherwise applicable limit, as provided for in NWPs 13, 21, 29, 36, 39, 40, 42, 43, 44, 50, 51 or 52, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in minimal adverse effects. When making minimal effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. The district engineer will also consider site specific factors, such as the environmental setting in the

vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

2. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

3. If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either: (a) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or (c) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period, with activity-specific

conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation or a requirement that the applicant submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

FURTHER INFORMATION

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project.

DEFINITIONS

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence

of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities eligible for exemptions under Section 404(f) of the Clean Water Act are not considered when calculating the loss of waters of the United States.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. The definition of a wetland can be found at 33 CFR 328.3(b). Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of standing or

flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas (see 33 CFR 328.3(e)).

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through

which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent

mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a wetland (i.e., water of the United States) that is inundated by tidal waters. The definitions of a wetland and tidal waters can be found at 33 CFR 328.3(b) and 33 CFR 328.3(f), respectively. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line, which is defined at 33 CFR 328.3(d).

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a jurisdictional water of the United States. If a jurisdictional wetland is adjacent – meaning bordering, contiguous, or neighboring – to a waterbody determined to be a water of the United States under 33 CFR 328.3(a)(1)-(6), that waterbody and its adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

Final Regional Conditions 2012

NOTICE ABOUT WEB LINKS IN THIS DOCUMENT:
The web links (both internal to our District and any external links to collaborating agencies) in this document are valid at the time of publication. However, the Wilmington District Regulatory Program web page addresses, as with other agency web sites, may change over the timeframe of the five-year Nationwide Permit renewal cycle, in response to policy mandates or technology advances. While we will make every effort to check on the integrity of our web links and provide re-direct pages whenever possible, we ask that you report any broken links to us so we can keep the page information current and usable. We apologize in advanced for any broken links that you may encounter, and we ask that you navigate from the regulatory home page (wetlands and stream permits) of the Wilmington District Corps of Engineers, to the "Permits" section of our web site to find links for pages that cannot be found by clicking directly on the listed web link in this document.

Final 2012 Regional Conditions for Nationwide Permits (NWP) in the Wilmington District

1.0 Excluded Waters

The Corps has identified waters that will be excluded from the use of all NWP's during certain timeframes. These waters are:

1.1 Anadromous Fish Spawning Areas

Waters of the United States identified by either the North Carolina Division of Marine Fisheries (NCDMF) or the North Carolina Wildlife Resources Commission (NCWRC) as anadromous fish spawning areas are excluded during the period between February 15 and June 30, without prior written approval from NCDMF or NCWRC and the Corps.

1.2 Trout Waters Moratorium

Waters of the United States in the twenty-five designated trout counties of North Carolina are excluded during the period between October 15 and April 15 without prior written approval from the NCWRC. (See Section 2.7 for a list of the twenty-five trout counties).

1.3 Sturgeon Spawning Areas as Designated by the National Marine Fisheries Service (NMFS)

Waters of the United States designated as sturgeon spawning areas are excluded during the period between February 1 and June 30, without prior written approval from the NMFS.

*** 2.0 Waters Requiring Additional Notification**

The Corps has identified waters that will be subject to additional notification requirements for activities authorized by all NWP's. These waters are:

*** 2.1 Western NC Counties that Drain to Designated Critical Habitat**

For proposed activities within Waters of the U.S. that require a Pre-Construction Notification pursuant to General Condition 31 (PCN) and are located in the sixteen counties listed below, applicants must provide a copy of the PCN to the US Fish and Wildlife Service, 160 Zillicoa Street, Asheville, North Carolina 28801. This PCN must be sent concurrently to the US Fish and Wildlife Service and the Corps Asheville Regulatory Field Office. Please see General Condition 18 for specific notification requirements related to Federally Endangered Species and the following website for information on the location of designated critical habitat.

Counties with tributaries that drain to designated critical habitat that require notification to the Asheville US Fish and Wildlife Service: Avery, Cherokee, Forsyth, Graham, Haywood, Henderson, Jackson, Macon Mecklenburg, Mitchell, Stokes, Surry, Swain, Transylvania, Union and Yancey.

Website and office addresses for Endangered Species Act Information:

The Wilmington District has developed the following website for applicants which provides guidelines on how to review linked websites and maps in order to fulfill NWP general condition 18 requirements: http://www.saw.usace.army.mil/wetlands/ESA

Applicants who do not have internet access may contact the appropriate US Fish and Wildlife Service offices listed below or the US Army Corps of Engineers at (910) 251- 4633:

US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Telephone: (828) 258-3939

Asheville US Fish and Wildlife Service Office counties: All
counties west of and including Anson, Stanly, Davidson, Forsyth and Stokes Counties

US Fish and Wildlife Service
Raleigh Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Telephone: (919) 856-4520

Raleigh US Fish and Wildlife Service Office counties: all counties east of and including Richmond, Montgomery, Randolph, Guilford, and Rockingham Counties.

* **2.2 Special Designation Waters**

Prior to the use of any NWP in any of the following identified waters and contiguous wetlands in North Carolina, applicants must comply with Nationwide Permit General Condition 31 (PCN). The North Carolina waters and contiguous wetlands that require additional notification requirements are:

"Outstanding Resource Waters" (ORW) or "High Quality Waters" (HQW) as designated by the North Carolina Environmental Management Commission; "Inland Primary Nursery Areas" (IPNA) as designated by the NCWRC; "Contiguous Wetlands" as defined by the North Carolina Environmental Management Commission; or "Primary Nursery Areas" (PNA) as designated by the North Carolina Marine Fisheries Commission.

2.3 Coastal Area Management Act (CAMA) Areas of Environmental Concern

Non-federal applicants for any NWP in a designated "Area of Environmental Concern" (AEC) in the twenty (20) counties of Eastern North Carolina covered by the North Carolina Coastal Area Management Act (CAMA) must also obtain the required CAMA permit. Development activities for non-federal projects may not commence until a copy of the approved CAMA permit is furnished to the appropriate Wilmington District Regulatory Field Office (Wilmington Field Office – 69 Darlington Avenue, Wilmington, NC 28403 or Washington Field Office – 2407 West 5th Street, Washington, NC 27889).

* **2.4 Barrier Islands**

Prior to the use of any NWP on a barrier island of North Carolina, applicants must comply with Nationwide Permit General Condition 31 (PCN).

* **2.5 Mountain or Piedmont Bogs**

Prior to the use of any NWP in a Bog classified by the North Carolina Wetland Assessment Methodology (NCWAM), applicants shall comply with Nationwide Permit General Condition 31 (PCN). The latest version of NCWAM is located on the NC DWQ web site at: http://portal.ncdenr.org/web/wq/swp/ws/pdu/ncwam .

* **2.6 Animal Waste Facilities**

Prior to use of any NWP for construction of animal waste facilities in waters of the US, including wetlands, applicants shall comply with Nationwide Permit General Condition 31 (PCN).

* **2.7 Trout Waters**

Prior to any discharge of dredge or fill material into streams or waterbodies within the twenty-five (25) designated trout counties of North Carolina, the applicant shall comply with Nationwide Permit General Condition 31 (PCN). The applicant shall also provide a copy of the notification to the appropriate NCWRC office to facilitate the determination of any potential

impacts to designated Trout Waters. Notification to the Corps of Engineers will include a statement with the name of the NCWRC biologist contacted, the date of the notification, the location of work, a delineation of wetlands, a discussion of alternatives to working in the mountain trout waters, why alternatives were not selected, and a plan to provide compensatory mitigation for all unavoidable adverse impacts to mountain trout waters.

NCWRC and NC Trout Counties

Western Piedmont Region Coordinator	Alleghany	Caldwell	Watauga
20830 Great Smoky Mtn. Expressway	Ashe	Mitchell	Wilkes
Waynesville, NC 28786	Avery	Stokes	
Telephone: (828) 452-2546	Burke	Surry	

Mountain Region Coordinator	Buncombe	Henderson	Polk
20830 Great Smoky Mtn. Expressway	Cherokee	Jackson	Rutherford
Waynesville, NC 28786	Clay	Macon	Swain
Telephone: (828) 452-2546	Graham	Madison	Transylvania
Fax: (828) 452-7772	Haywood	McDowell	Yancey

3.0 List of Corps Regional Conditions for All Nationwide Permits

The following conditions apply to all Nationwide Permits in the Wilmington District:

3.1 Limitation of Loss of Perennial Stream Bed

NWPs may not be used for activities that may result in the loss or degradation of greater than 300 total linear feet of perennial, intermittent or ephemeral stream, unless the District Commander has waived the 300 linear foot limit for ephemeral and intermittent streams on a case-by-case basis and he determines that the proposed activity will result in minimal individual and cumulative adverse impacts to the aquatic environment. Loss of stream includes the linear feet of stream bed that is filled, excavated, or flooded by the proposed activity. Waivers for the loss of ephemeral and intermittent streams must be in writing and documented by appropriate/accepted stream quality assessments*. This waiver only applies to the 300 linear feet threshold for NWPs.

*NOTE: Applicants should utilize the most current methodology prescribed by Wilmington District to assess stream function and quality. Information can be found at:

http://www.saw.usace.army.mil/wetlands/permits/nwp/nwp2012 (see "Quick Links")

3.2 Mitigation for Loss of Stream Bed

For any NWP that results in a loss of more than 150 linear feet of perennial and/or ephemeral/intermittent stream, the applicant shall provide a mitigation proposal to compensate for more than minimal individual and cumulative adverse impacts to the aquatic environment. For stream losses less than 150 linear feet, that require a PCN, the District Commander may determine, on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effect on the aquatic environment.

3.3 Pre-construction Notification for Loss of Streambed Exceeding 150 Feet.

Prior to use of any NWP for any activity which impacts more than 150 total linear feet of perennial stream or ephemeral/ intermittent stream, the applicant must comply with Nationwide Permit General Condition 31 (PCN). This applies to NWPs that do not have specific notification requirements. If a NWP has specific notification requirements, the requirements of the NWP should be followed.

3.4 Restriction on Use of Live Concrete

For all NWPs which allow the use of concrete as a building material, live or fresh concrete, including bags of uncured concrete, may not come into contact with the water in or entering into waters of the US. Water inside coffer dams or casings that has been in contact with wet concrete shall only be returned to waters of the US when it is no longer poses a threat to aquatic organisms.

3.5 Requirements for Using Riprap for Bank Stabilization

For all NWPs that allow for the use of riprap material for bank stabilization, the following measures shall be applied:

3.5.1. Filter cloth must be placed underneath the riprap as an additional requirement of its use in North Carolina waters.

3.5.2. The placement of riprap shall be limited to the areas depicted on submitted work plan drawings.

3.5.3. The riprap material shall be clean and free from loose dirt or any pollutant except in trace quantities that would not have an adverse environmental effect.

3.5.4. It shall be of a size sufficient to prevent its movement from the authorized alignment by natural forces under normal conditions.

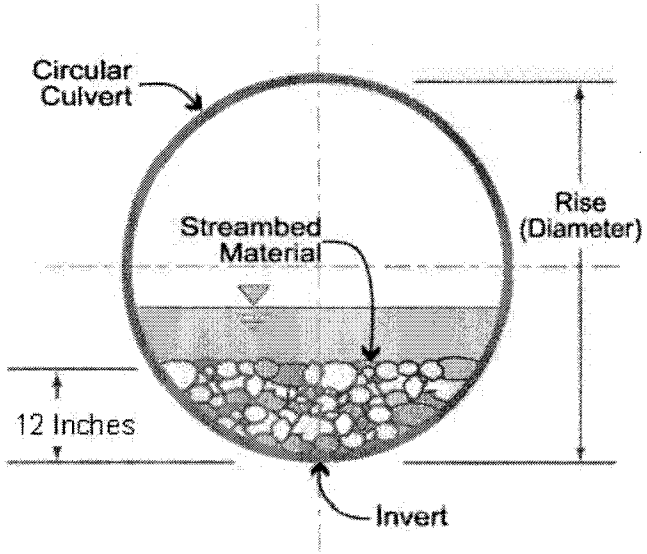
3.5.5. The riprap material shall consist of clean rock or masonry material such as, but not limited to, granite, marl, or broken concrete.

3.5.6. A waiver from the specifications in this Regional Condition may be requested in writing. The waiver will only be issued if it can be demonstrated that the impacts of complying with this Regional condition would result in greater adverse impacts to the aquatic environment.

3.6 Safe Passage Requirements for Culvert Placement

For all NWPs that involve the construction/installation of culverts, measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert should be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gage data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

In the twenty (20) counties of North Carolina designated as coastal counties by the Coastal Area Management Act (CAMA): All pipes/culverts must be sufficiently sized to allow for the burial of the bottom of the pipe/culvert at least one foot below normal bed elevation when they are placed within the Public Trust Area of Environmental Concern (AEC) and/or the Estuarine Waters AEC as designated by CAMA, and/or all streams appearing as blue lines on United States Geological Survey (USGS) 7.5-minute quadrangle maps.



In all other counties: Culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter or less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain the existing channel slope. The bottom of the culvert must be placed at a

depth below the natural stream bottom to provide for passage during drought or low flow conditions.

Culverts are to be designed and constructed in a manner that minimizes destabilization and head cutting. Destabilizing the channel and head cutting upstream should be considered and appropriate actions incorporated in the design and placement of the culvert.

A waiver from the depth specifications in this condition may be requested in writing. The waiver will be issued if it can be demonstrated that the proposal would result in the least impacts to the aquatic environment.

All counties: Culverts placed within riparian and/or riverine wetlands must be installed in a manner that does not restrict the flow and circulation patterns of waters of the United States. Culverts placed across wetland fills purely for the purposes of equalizing surface water do not have to be buried.

3.7 Notification to NCDENR Shellfish Sanitation Section

Applicants shall notify the NCDENR Shellfish Sanitation Section prior to dredging in or removing sediment from an area closed to shell fishing where the effluent may be released to an area open for shell fishing or swimming in order to avoid contamination from the disposal area and cause a temporary shellfish closure to be made. Such notification shall also be provided to the appropriate Corps of Engineers Regulatory Field Office. Any disposal of sand to the ocean beach should occur between November 1 and April 30 when recreational usage is low. Only clean sand should be used and no dredged sand from closed shell fishing areas may be used. If beach disposal were to occur at times other than stated above or if sand from a closed shell fishing area is to be used, a swimming advisory shall be posted, and a press release shall be issued by the permittee.

3.8 Preservation of Submerged Aquatic Vegetation

Adverse impacts to Submerged Aquatic Vegetation (SAV) are not authorized by any NWP within any of the twenty coastal counties defined by North Carolina's Coastal Area Management Act of 1974 (CAMA).

3.9 Sedimentation and Erosion Control Structures and Measures

3.9.1. All PCNs will identify and describe sedimentation and erosion control structures and measures proposed for placement in waters of the US. The structures and measures should be depicted on maps, surveys or drawings showing location and impacts to jurisdictional wetlands and streams.

4.0 NWP # 13 – Bank Stabilization

4.0.1. Unanchored trees, treetops, or debris may not be used as stream bank stabilization material.

4.0.2. Properly anchored and cabled structural stabilization techniques, such as timber crib structures, revetments, and root wads, are acceptable materials to stabilize stream banks.

4.0.3. If riprap stabilization is needed, it should be placed only on the stream banks, or, if it is necessary to be placed in the stream bed, the finished top elevation of the riprap should not exceed that of the original stream bed.

4.1 NWP #23 – Approved Categorical Exclusions

No development activities authorized by this NWP may begin until the permittee obtains a consistency concurrence or a CAMA permit from the North Carolina Division of Coastal Management, if either is required.

4.2 NWP #33 – Temporary Construction, Access and Dewatering

The required restoration plan must include a timetable for restoration activities.

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North Carolina Department of Environment and Natural Resources
Division of Water Resources
Water Quality Programs
Thomas A. Reeder
Director

Pat McCrory
Governor

John E. Skvarla, III
Secretary

September 3, 2013
Gaston County
NCDWR Project No. 13-0722
TIP I-4928

Dr. Gregory Thorpe, Ph.D.
Manager, PDEA
1598 Mail Service Center
Raleigh, NC 27699

APPROVAL of 401 WATER QUALITY CERTIFICATION, with ADDITIONAL CONDITIONS
Weigh Station, I-85

Dear Dr. Thorpe:

You have our approval, in accordance with the conditions listed below, for the following impacts at the subject site located on I-85 in Gaston County:

Stream Impacts in the Catawba River Basin

Site	Permanent Impact Perennial Stream (linear ft)	Temporary Impact Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	30	27	57	30
1 stabilization	18		18	
2	92	65	157	92
2 stabilization	40		40	
3	16	18	34	16
3 dissipater	27		27	27
Total	**223**	**110**	**333**	165

Total Stream Impact for Project: 333 linear feet.

The project shall be constructed in accordance with your application dated /received July 5, 2013, and subsequent information submitted on August 30, 2013, and received by the Division of Water Resources on July 10, 2013 and August 30, 2013, respectively. After reviewing your application, we have decided that these impacts are covered by General Water Quality Certification Numbers 3885, 3891, and 3893. These certifications correspond to the Nationwide Permits 13, 23, and 33 issued by the Corps of Engineers. In addition, you should acquire any other federal, state or local permits before you proceed with your project including (but not limited to) Sediment and Erosion Control, Non-Discharge and Water Supply Watershed regulations. This approval will expire with the accompanying 404 permit.

Transportation and Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6492
Internet: www.ncwaterquality.org

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This approval is valid solely for the purpose and design described in your application (unless modified below). Should your project change, you must notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. For this approval to remain valid, you must adhere to the conditions listed in the attached certification(s) and any additional conditions listed below.

1. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by the NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required.

2. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

3. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.

4. The dimension, pattern, and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.

5. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

* 6. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

7. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of the NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

8. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.

9. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

10. Discharging hydroseed mixtures and washing out hydro-seeders and other equipment in or adjacent to surface waters is prohibited.

11. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If the NCDWR determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the NCDWR may reevaluate and modify this certification.

12. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.

13. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.

14. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

15. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery.

* 16. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer or authorized agent shall complete and return the enclosed "Certification of Completion Form" to notify the NCDWR when all work included in the 401 Certification has been completed.

17. Native riparian vegetation (ex. list herbaceous, trees, and shrubs native to your geographic region) must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction.

18. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

19. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919)-431-3000, Facsimile: (919)-431-3100

A copy of the petition must also be served on DENR as follows:

Mr. Lacy Presnell, General Counsel
Department of Environment and Natural Resources
1601 Mail Service Center

This letter completes the review of the Division of Water Resources under Section 401 of the Clean Water Act. If you have any questions, please contact Alan Johnson at 704-663-1699 or alan.johnson@ncdenr.gov.

Sincerely,

for Thomas A. Reeder

cc: Trish Beam, Division 12, Environmental Officer
Elizabeth Lusk, PDEA Unit, (electronic copy)
Steve Kichefski, US Army Corps of Engineers, Asheville (electronic copy only)
Sonia Carrillo, Wetlands Transportation Unit

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Water Quality Certification No. 3885

GENERAL CERTIFICATION FOR STREAM RESTORATION, ENHANCEMENT AND STABILIZATION PROJECTS AND WETLAND AND RIPARIAN RESTORATION AND CREATION ACTIVITIES INCLUDING THOSE ELIGIBLE FOR U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBERS 13 (BANK STABILIZATION) AND 27 (WETLAND AND RIPARIAN RESTORATION AND CREATION), AND REGIONAL PERMIT 197800080 (BULKHEADS AND RIPRAP) AND RIPARIAN AREA PROTECTION RULES (BUFFER RULES)

Water Quality Certification Number 3885 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to waters as described in 33 CFR 330 Appendix A (B) (13 and 27) and Regional Permit 197800080 and for the Riparian Area Protection Rules (Buffer Rules) in 15A NCAC 02B .0200.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Quality (the "Division"):

* a) All proposed fill or modification of wetlands and/or waters, including streams and streambanks, regardless of the purpose of the restoration, enhancement, stabilization, or creation activity, except for single and independent projects involving in-stream structures for the sole purpose of streambank stabilization, which are designed based on current natural channel techniques, and do not exceed a total of three structures within 100 feet or less of streambank; or

b) Any stream relocation; or

c) Bank Stabilization projects qualifying for Nationwide Permit 13 for erosion protection which utilize non-natural armoring such as riprap, gabion baskets, deflection walls etc of greater than 150 feet in streambank length; or

d) Bank Stabilization projects qualifying for Nationwide Permit 13 for erosion protection which utilize natural streambank sloping, vegetation, and other natural channel protection techniques of greater than 500 feet of streambank length; or

e) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of DWQ Wetland Rules (15A NCAC 02H .0500), Isolated Wetland Rules (15A NCAC 02H .1300), DWQ Surface Water or Wetland Standards, or Riparian Buffer Rules (15A NCAC 02B .0200); or

* f) Any impacts to streams and/or buffers in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan or Goose Creek Watersheds (or any other basin or watershed with Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless* the activities are listed as "EXEMPT" from these rules or a Buffer Authorization Certificate is issued through N.C. Division of Coastal Management (DCM) delegation for "ALLOWABLE" activities.

* In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. If a project also requires a CAMA Permit, then one payment to both agencies shall be submitted and will be the higher of the two fees.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval from the Division as long as they comply with the Conditions of Certification listed below. If any of these Conditions cannot be met, then written approval from the Division is required.

Conditions of Certification:

1. Activities shall meet the definitions, design, and monitoring protocols specified within the US Army Corps of Engineers Wilmington District *Regulatory Guidance Letter* (RGL02-02) and the *Stream Mitigation Guidelines* (April 2003) or any subsequent updates to these documents.

2. No Impacts Beyond those Authorized in the Written Approval or Beyond the Threshold of Use of this Certification

   No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the Pre-Construction Notification, as authorized in the written approval from the Division or beyond the thresholds established for use of this Certification without written authorization, including incidental impacts. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control Best Management Practices shall be performed so that no violations of state water quality standards, statutes, or rules occur. Approved plans and specifications for this project are incorporated by reference and are enforceable parts of this permit.

3. Standard Erosion and Sediment Control Practices

   Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices and if applicable, comply with the specific conditions and requirements of the NPDES Construction Stormwater Permit issued to the site:

   a. Design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.

   b. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*

   c. Reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

   d. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

   e. If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality (HQW), or Outstanding Resource (ORW) waters, then the sedimentation and erosion control designs must comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds.*

4. No Sediment and Erosion Control Measures in Wetlands or Waters

Sediment and erosion control measures shall not be placed in wetlands or waters. Exceptions to this condition require application submittal to and written approval by the Division. If placement of sediment and erosion control devices in wetlands and waters is unavoidable, then design and placement of temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands, stream beds, or banks, adjacent to or upstream and downstream of the above structures. All sediment and erosion control devices shall be removed and the natural grade restored within two (2) months of the date that the Division of Land Resources (DLR) or locally delegated program has released the specific area within the project.

5. Construction Stormwater Permit NCG010000

An NPDES Construction Stormwater Permit is required for construction projects that disturb one (1) or more acres of land. This Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If your project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. A copy of the general permit (NCG010000), inspection log sheets, and other information may be found at http://portal.ncdenr.org/web/wq/ws/su/npdessw#tab-w .

The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit.

6. Construction Moratoriums and Coordination

If activities must occur during periods of high biological activity (i.e. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities.

All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) to lessen impacts on trout, anadromous fish, larval/post-larval fishes and crustaceans, or other aquatic species of concern shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium.

Work within the twenty-five (25) designated trout counties or identified state or federal endangered or threatened species habitat shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

7. Work in the Dry

All work in or adjacent to stream waters shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the NC Sediment and Erosion Control Manual, or the NC DOT Construction and Maintenance Activities Manual, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application submittal to and written approval by the Division.

8. Riparian Area Protection (Buffer) Rules

   Activities located in the protected riparian areas (whether jurisdictional wetlands or not), within the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan, or Goose Creek Watersheds (or any other basin or watershed with buffer rules) shall be limited to "uses" identified within and constructed in accordance with 15A NCAC 02B .0233, .0259, .0243, .0250, .0267 and .0605, and shall be located, designed, constructed, and maintained to have minimal disturbance to protect water quality to the maximum extent practicable through the use of best management practices. All buffer rule requirements, including diffuse flow requirements, must be met.

9. If concrete is used during the construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state due to the potential for elevated pH and possible aquatic life/ fish kills.

10. All temporary fill and culverts shall be removed and the impacted area returned to natural conditions within 60 days of the determination that the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, plan form pattern, and longitudinal bed and bed profile, and the various sites shall be stabilized with natural woody vegetation (except for the approved maintenance areas) and restored to prevent erosion.

11. All temporary pipes/ culverts/ riprap pads etc, shall be installed in all streams as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* so as not to restrict stream flow or cause dis-equilibrium during use of this General Certification.

12. Any riprap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall buried and/or "keyed in" such that the original stream elevation and streambank contours are restored and maintained. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area.

13. Any rip-rap used for stream stabilization shall be of a size and density so as not to be able to be carried off by wave, current action, or stream flows and consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures.

14. A one-time application of fertilizer to re-establish vegetation is allowed in disturbed areas including riparian buffers, but is restricted to no closer than 10 feet from top of bank of streams. Any fertilizer application must comply with all other Federal, State and Local regulations.

15. Applications for riprap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Riprap Groins in Estuarine and Public Trust Waters) must meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

16. Compensatory Mitigation

In accordance with 15A NCAC 02H .0506 (h), compensatory mitigation may be required for losses of equal to or greater than 150 linear feet of streams (intermittent and perennial) and/or equal to or greater than one (1) acre of wetlands. For linear public transportation projects, impacts equal to or exceeding 150 linear feet per stream shall require mitigation.

Buffer mitigation may be required for any project with Buffer Rules in effect at the time of application for activities classified as "Allowable with Mitigation" or "Prohibited" within the Table of Uses.

A determination of buffer, wetland, and stream mitigation requirements shall be made for any General Water Quality Certification for this Nationwide and/or Regional General Permit. Design and monitoring protocols shall follow the US Army Corps of Engineers Wilmington District *Stream Mitigation Guidelines* (April 2003) or its subsequent updates. Compensatory mitigation plans shall be submitted to the Division for written approval as required in those protocols. The mitigation plan must be implemented and/or constructed before any impacts occur on site. Alternatively, the Division will accept payment into an in-lieu fee program or a mitigation bank. In these cases, proof of payment shall be provided to the Division before any impacts occur on site.

* 17. If an environmental document is required under the National or State Environmental Policy Act (NEPA or SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse.

18. In the twenty (20) coastal counties, the appropriate DWQ Regional Office must be contacted to determine if Coastal Stormwater Regulations will be required.

19. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals.

20. The applicant/permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If the Division determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then the Division may reevaluate and modify this General Water Quality Certification.

* 21. When written authorization is required for use of this certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return the certificate of completion attached to the approval. One copy of the certificate shall be sent to the DWQ Central Office in Raleigh at 1650 Mail Service Center, Raleigh, NC, 27699-1650.

22. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards.

23. This certification grants permission to the director, an authorized representative of the Director, or DENR staff, upon the presentation of proper credentials, to enter the property during normal business hours.

Water Quality Certification No. 3885

This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification.

Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

The Director of the North Carolina Division of Water Quality may require submission of a formal application for Individual Certification for any project in this category of activity if it is determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the wetland or downstream waters are precluded.

Public hearings may be held for specific applications or group of applications prior to a Certification decision if deemed in the public's best interest by the Director of the North Carolina Division of Water Quality.

Effective date: March 19, 2012

DIVISION OF WATER QUALITY

By

Matt Matthews for

Charles Wakild, P.E.

Director

History Note: Water Quality Certification (WQC) Number 3885 issued March 19, 2012 replaces WQC Number 3689 issued November 1, 2007; WQC Number 3626 issued March, 2007; WQC Number 3495 issued December 31, 2004; and WQC Number 3399 issued March 2003. This General Certification is rescinded when the Corps of Engineers reauthorizes any of the corresponding Nationwide and/or Regional General Permits and/or when deemed appropriate by the Director of the Division of Water Quality.

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Water Quality Certification No. 3891

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER 23 (APPROVED CATEGORICAL EXCLUSIONS) AND RIPARIAN AREA PROTECTION RULES (BUFFER RULES)

Water Quality Certification Number 3891 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to waters and wetland areas as described in 33 CFR 330 Appendix A (B) (23) and for the Riparian Area Protection Rules (Buffer Rules) in 15A NCAC 02B .0200.

The category of activities shall include only Federally-approved Categorical Exclusion projects.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Quality (the "Division"):

a) Stream impacts (temporary or permanent) equal or greater than 40 linear feet; or
b) Any stream relocation; or
c) Impacts equal to or greater than one-tenth (1/10) acre of wetlands or open waters; or
d) Any impacts to wetlands adjacent to waters designated as: ORW, SA, WS-I, WS-II, or Trout, or wetlands contiguous to waters designated as a North Carolina or National Wild and Scenic River.
e) Any impacts to coastal wetlands [15A NCAC 7H .0205)], or Unique Wetlands (UWL) [15A NCAC 2H .0506].
f) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of DWQ Wetland Rules (15A NCAC 02H .0500), Isolated Wetland Rules (15A NCAC 02H .1300), DWQ Surface Water or Wetland Standards, or Riparian Buffer Rules (15A NCAC 02B .0200); or
* g) Any impacts to streams and/or buffers in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan or Goose Creek Watersheds (or any other basin or watershed with Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless* the activities are listed as "EXEMPT" from these rules or a Buffer Authorization Certificate is issued through N.C. Division of Coastal Management (DCM) delegation for "ALLOWABLE" activities.

* In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. If a project also requires a CAMA Permit, then one payment to both agencies shall be submitted and will be the higher of the two fees.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval from the Division as long as they comply with the Conditions of Certification listed below. If any of these Conditions cannot be met, then written approval from the Division is required.

Conditions of Certification:

1. No Impacts Beyond those Authorized in the Written Approval or Beyond the Threshold of Use of this Certification

   No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the Pre-Construction Notification, as

authorized in the written approval from the Division or beyond the thresholds established for use of this Certification without written authorization, including incidental impacts. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control Best Management Practices shall be performed so that no violations of state water quality standards, statutes, or rules occur. Approved plans and specifications for this project are incorporated by reference and are enforceable parts of this permit.

2. Standard Erosion and Sediment Control Practices

   Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices and if applicable, comply with the specific conditions and requirements of the NPDES Construction Stormwater Permit issued to the site:

   a. Design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.

   b. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*

   c. Reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

   d. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

   e. If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality (HQW), or Outstanding Resource (ORW) waters, then the sedimentation and erosion control designs must comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds.*

3. No Sediment and Erosion Control Measures in Wetlands or Waters

   Sediment and erosion control measures shall not be placed in wetlands or waters. Exceptions to this condition require application submittal to and written approval by the Division. If placement of sediment and erosion control devices in wetlands and waters is unavoidable, then design and placement of temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands, stream beds, or banks, adjacent to or upstream and downstream of the above structures. All sediment and erosion control devices shall be removed and the natural grade restored within two (2) months of the date that the Division of Land Resources (DLR) or locally delegated program has released the specific area within the project.

4. Construction Stormwater Permit NCG010000

An NPDES Construction Stormwater Permit is required for construction projects that disturb one (1) or more acres of land. This Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If your project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. A copy of the general permit (NCG010000), inspection log sheets, and other information may be found at http://portal.ncdenr.org/web/wq/ws/su/npdessw#tab-w .

The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit.

5. Construction Moratoriums and Coordination

If activities must occur during periods of high biological activity (i.e. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities.

All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) to lessen impacts on trout, anadromous fish, larval/post-larval fishes and crustaceans, or other aquatic species of concern shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium.

Work within the twenty-five (25) designated trout counties or identified state or federal endangered or threatened species habitat shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

6. Work in the Dry

All work in or adjacent to stream waters shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the NC Sediment and Erosion Control Manual, or the NC DOT Construction and Maintenance Activities Manual, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application submittal to and written approval by the Division.

7. Riparian Area Protection (Buffer) Rules

Activities located in the protected riparian areas (whether jurisdictional wetlands or not), within the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan, or Goose Creek Watersheds (or any other basin or watershed with buffer rules) shall be limited to "uses" identified within and constructed in accordance with 15A NCAC 02B .0233, .0259, .0243, .0250, .0267 and .0605, and shall be located, designed, constructed, and maintained to have minimal disturbance to protect water quality to the maximum extent practicable through the use of best management practices. All buffer rule requirements, including diffuse flow requirements, must be met.

8. If concrete is used during the construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state due to the potential for elevated pH and possible aquatic life/ fish kills.

9. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices*. Exceptions to this condition require written approval by the Division.

10. Relocated stream designs should include the same dimensions, patterns, and profiles as the existing channel (or a stable reference reach if the existing channel is unstable), to the maximum extent practical. The new channel should be constructed in the dry and water shall not be turned into the new channel until the banks are stabilized. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30-foot wide wooded and an adjacent 20-foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating appropriate erosion control matting materials and seedling establishment is allowable, however matting that incorporates plastic mesh and/or plastic twine shall not be used in wetlands, riparian buffers or floodplains as recommended by the North Carolina Sediment and Erosion Control Manual. Rip-rap, A-Jacks, concrete, gabions or other hard structures may be allowed if it is necessary to maintain the physical integrity of the stream; however, the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage. Please note that if the stream relocation is conducted as a stream restoration as defined in the US Army Corps of Engineers Wilmington District, April 2003 *Stream Mitigation Guidelines* (or its subsequent updates), the restored length may be used as compensatory mitigation for the impacts resulting from the relocation.

11. Placement of Culverts and Other Structures in Waters and Wetlands

    Culverts required for this project shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. Existing stream dimensions (including the cross section dimensions, pattern, and longitudinal profile) must be maintained above and below locations of each culvert.

    Placement of culverts and other structures in waters and streams must be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

    When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/ connectivity has been provided when possible (rock ladders, crossvanes, etc). Notification to the Division including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations shall be provided to the Division 60 days prior to the installation of the culvert.

    When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification to the Division including supporting documentation such as, but not limited to, a location map of the culvert, geotechnical reports, photographs, etc shall be provided to the Division a minimum of 60 days prior to the installation of the culvert. If bedrock is discovered during construction, then the Division shall be notified by phone or email within 24 hours of discovery.

    If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application submittal to, and written approval by, the Division of Water Quality, regardless of the total impacts to streams or wetlands from the project.

Installation of culverts in wetlands must ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. Additionally, when roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges must be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native, woody vegetation and other soft stream bank stabilization techniques must be used where practicable instead of riprap or other bank hardening methods.

* 12. Compensatory Mitigation

In accordance with 15A NCAC 02H .0506 (h), compensatory mitigation may be required for losses of equal to or greater than 150 linear feet of streams (intermittent and perennial) and/or equal to or greater than one (1) acre of wetlands. For linear public transportation projects, impacts equal to or exceeding 150 linear feet per stream shall require mitigation.

Buffer mitigation may be required for any project with Buffer Rules in effect at the time of application for activities classified as "Allowable with Mitigation" or "Prohibited" within the Table of Uses.

A determination of buffer, wetland, and stream mitigation requirements shall be made for any General Water Quality Certification for this Nationwide and/or Regional General Permit. Design and monitoring protocols shall follow the US Army Corps of Engineers Wilmington District *Stream Mitigation Guidelines* (April 2003) or its subsequent updates. Compensatory mitigation plans shall be submitted to the Division for written approval as required in those protocols. The mitigation plan must be implemented and/or constructed before any impacts occur on site. Alternatively, the Division will accept payment into an in-lieu fee program or a mitigation bank. In these cases, proof of payment shall be provided to the Division before any impacts occur on site.

* 13. If an environmental document is required under the National or State Environmental Policy Act (NEPA or SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse.

14. In the twenty (20) coastal counties, the appropriate DWQ Regional Office must be contacted to determine if Coastal Stormwater Regulations will be required.

15. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals.

16. The applicant/permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If the Division determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then the Division may reevaluate and modify this General Water Quality Certification.

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* 17. When written authorization is required for use of this certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return the certificate of completion attached to the approval. One copy of the certificate shall be sent to the DWQ Central Office in Raleigh at 1650 Mail Service Center, Raleigh, NC, 27699-1650.

18. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards.

19. This certification grants permission to the director, an authorized representative of the Director, or DENR staff, upon the presentation of proper credentials, to enter the property during normal business hours.

This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification.

Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

The Director of the North Carolina Division of Water Quality may require submission of a formal application for Individual Certification for any project in this category of activity if it is determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the wetland or downstream waters are precluded.

Public hearings may be held for specific applications or group of applications prior to a Certification decision if deemed in the public's best interest by the Director of the North Carolina Division of Water Quality.

Effective date: March 19, 2012

DIVISION OF WATER QUALITY

By

Charles Wakild, P.E.

Director

History Note: Water Quality Certification (WQC) Number 3891 issued March 19, 2012 replaces WQC 3701 issued November 1, 2007; WQC Number 3632 issued March 2007; WQC Number 3403 issued March 2003; WQC Number 3361 issued March 18, 2002; WQC Number 3107 issued February 11, 1997; WQC Number 2734 issued May 1 1993; and WQC Number 2670 issued on January 21, 1992. This General Certification is rescinded when the Corps of Engineers reauthorizes any of the corresponding Nationwide and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Quality.

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Water Quality Certification No. 3893

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER 33 (TEMPORARY CONSTRUCTION, ACCESS AND DEWATERING) AND RIPARIAN AREA PROTECTION RULES (BUFFER RULES)

Water Quality Certification Number 3893 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to waters and wetland areas as described in 33 CFR 330 Appendix A (B) (33) and for the Riparian Area Protection Rules (Buffer Rules) in 15A NCAC 02B .0200.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Quality (the "Division"):

a. Any stream relocation; or
b. Any impact associated with a Notice of Violation or an enforcement action for violation(s) of DWQ Wetland Rules (15A NCAC 02H .0500), Isolated Wetland Rules (15A NCAC 02H .1300), DWQ Surface Water or Wetland Standards, or Riparian Buffer Rules (15A NCAC 02B .0200); or
* c. Any impacts to streams and/or buffers in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan or Goose Creek Watersheds (or any other basin or watershed with Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless* the activities are listed as "EXEMPT" from these rules or a Buffer Authorization Certificate is issued through N.C. Division of Coastal Management (DCM) delegation for "ALLOWABLE" activities.

* In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. If a project also requires a CAMA Permit, then one payment to both agencies shall be submitted and will be the higher of the two fees.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval from the Division as long as they comply with the Conditions of Certification listed below. If any of these Conditions cannot be met, then written approval from the Division is required.

Conditions of Certification:

1. No Impacts Beyond those Authorized in the Written Approval or Beyond the Threshold of Use of this Certification

   No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the Pre-Construction Notification, as authorized in the written approval from the Division or beyond the thresholds established for use of this Certification without written authorization, including incidental impacts. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control Best Management Practices shall be performed so that no violations of state water quality standards, statutes, or rules occur. Approved plans and specifications for this project are incorporated by reference and are enforceable parts of this permit.

2. Standard Erosion and Sediment Control Practices

   Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices and if applicable, comply with the specific conditions and requirements of the NPDES Construction Stormwater Permit issued to the site:

   a. Design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.

   b. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.

   c. Reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

   d. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

   e. If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality (HQW), or Outstanding Resource (ORW) waters, then the sedimentation and erosion control designs must comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds*.

3. No Sediment and Erosion Control Measures in Wetlands or Waters

   Sediment and erosion control measures shall not be placed in wetlands or waters. Exceptions to this condition require application submittal to and written approval by the Division. If placement of sediment and erosion control devices in wetlands and waters is unavoidable, then design and placement of temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands, stream beds, or banks, adjacent to or upstream and downstream of the above structures. All sediment and erosion control devices shall be removed and the natural grade restored within two (2) months of the date that the Division of Land Resources (DLR) or locally delegated program has released the specific area within the project.

4. Construction Stormwater Permit NCG010000

   An NPDES Construction Stormwater Permit is required for construction projects that disturb one (1) or more acres of land. This Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If your project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. A copy of the general permit (NCG010000), inspection log sheets, and other information may be found at http://portal.ncdenr.org/web/wq/ws/su/npdesswf#tab-w .

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit.

5. Construction Moratoriums and Coordination

   If activities must occur during periods of high biological activity (i.e. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities.

   All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) to lessen impacts on trout, anadromous fish, larval/post-larval fishes and crustaceans, or other aquatic species of concern shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium.

   Work within the twenty-five (25) designated trout counties or identified state or federal endangered or threatened species habitat shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

6. Work in the Dry

   All work in or adjacent to stream waters shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the NC Sediment and Erosion Control Manual, or the NC DOT Construction and Maintenance Activities Manual, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application submittal to and written approval by the Division.

7. Riparian Area Protection (Buffer) Rules

   Activities located in the protected riparian areas (whether jurisdictional wetlands or not), within the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman, Jordan, or Goose Creek Watersheds (or any other basin or watershed with buffer rules) shall be limited to "uses" identified within and constructed in accordance with 15A NCAC 02B .0233, .0259, .0243, .0250, .0267 and .0605, and shall be located, designed, constructed, and maintained to have minimal disturbance to protect water quality to the maximum extent practicable through the use of best management practices. All buffer rule requirements, including diffuse flow requirements, must be met.

8. If concrete is used during the construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state due to the potential for elevated pH and possible aquatic life/ fish kills.

9. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices*. Exceptions to this condition require written approval by the Division.

10. Placement of culverts and other structures in Waters and Wetlands

    Culverts required for this project shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. Existing stream dimensions (including the cross section dimensions, pattern, and longitudinal profile) must be maintained above and below locations of each culvert.

Placement of culverts and other structures in waters and streams must be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/ connectivity has been provided when possible (rock ladders, crossvanes, etc). Notification to the Division including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations shall be provided to the Division 60 days prior to the installation of the culvert.

When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification to the Division including supporting documentation such as, but not limited to, a location map of the culvert, geotechnical reports, photographs, etc shall be provided to the Division a minimum of 60 days prior to the installation of the culvert. If bedrock is discovered during construction, then the Division shall be notified by phone or email within 24 hours of discovery.

If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application submittal to, and written approval by, the Division of Water Quality, regardless of the total impacts to streams or wetlands from the project.

Installation of culverts in wetlands must ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. Additionally, when roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges must be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native, woody vegetation and other soft stream bank stabilization techniques must be used where practicable instead of riprap or other bank hardening methods.

* 11. Compensatory Mitigation

In accordance with 15A NCAC 02H .0506 (h), compensatory mitigation may be required for losses of equal to or greater than 150 linear feet of streams (intermittent and perennial) and/or equal to or greater than one (1) acre of wetlands. For linear public transportation projects, impacts equal to or exceeding 150 linear feet per stream shall require mitigation.

Buffer mitigation may be required for any project with Buffer Rules in effect at the time of application for activities classified as "Allowable with Mitigation" or "Prohibited" within the Table of Uses.

A determination of buffer, wetland, and stream mitigation requirements shall be made for any General Water Quality Certification for this Nationwide and/or Regional General Permit. Design and monitoring protocols shall follow the US Army Corps of Engineers Wilmington District *Stream Mitigation Guidelines* (April 2003) or its subsequent updates. Compensatory mitigation plans shall be submitted to the Division for written approval as required in those protocols. The mitigation plan must be implemented and/or constructed before any impacts occur on site. Alternatively, the Division will accept payment into an in-lieu fee program or a mitigation bank. In these cases, proof of payment shall be provided to the Division before any impacts occur on site.

12. Relocated stream designs should include the same dimensions, patterns, and profiles as the existing channel (or a stable reference reach if the existing channel is unstable), to the maximum extent practical. The new channel should be constructed in the dry and water shall not be turned into the new channel until the banks are stabilized. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30-foot wide wooded and an adjacent 20-foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating appropriate erosion control matting materials and seedling establishment is allowable, however matting that incorporates plastic mesh and/or plastic twine shall not be used in wetlands, riparian buffers or floodplains as recommended by the North Carolina Sediment and Erosion Control Manual. Rip-rap, A-Jacks, concrete, gabions or other hard structures may be allowed if it is necessary to maintain the physical integrity of the stream; however, the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage. Please note that if the stream relocation is conducted as a stream restoration as defined in the US Army Corps of Engineers Wilmington District, April 2003 *Stream Mitigation Guidelines* (or its subsequent updates), the restored length may be used as compensatory mitigation for the impacts resulting from the relocation.

13. All temporary fill and culverts shall be removed and the impacted area returned to natural conditions within 60 days of the determination that the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, plan form pattern, and longitudinal bed and bed profile, and the various sites shall be stabilized with natural woody vegetation (except for the approved maintenance areas) and restored to prevent erosion.

14. Pipes shall be installed under the road or causeway in all streams to carry at least the 25-year storm event as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* so as not to restrict stream flow during use of this General Certification.

* 15. If an environmental document is required under the National or State Environmental Policy Act (NEPA or SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse.

16. In the twenty (20) coastal counties, the appropriate DWQ Regional Office must be contacted to determine if Coastal Stormwater Regulations will be required.

17. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals.

18. The applicant/permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If the Division determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then the Division may reevaluate and modify this General Water Quality Certification.

* 19. When written authorization is required for use of this certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return the certificate of completion attached to the approval. One copy of the certificate shall be sent to the DWQ Central Office in Raleigh at 1650 Mail Service Center, Raleigh, NC, 27699-1650.

20. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards.

21. This certification grants permission to the director, an authorized representative of the Director, or DENR staff, upon the presentation of proper credentials, to enter the property during normal business hours.

This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification.

Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

The Director of the North Carolina Division of Water Quality may require submission of a formal application for Individual Certification for any project in this category of activity if it is determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the wetland or downstream waters are precluded.

Public hearings may be held for specific applications or group of applications prior to a Certification decision if deemed in the public's best interest by the Director of the North Carolina Division of Water Quality.

Effective date: March 19, 2012

DIVISION OF WATER QUALITY

By

Max Martin for

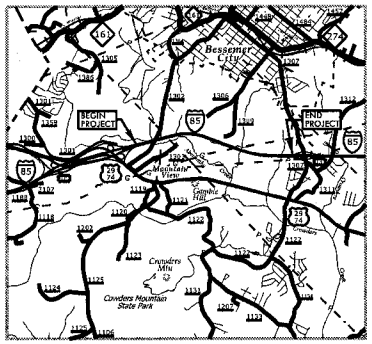
Charles Wakild, P.E.

Director

History Note: Water Quality Certification (WQC) Number 3893 issued March 19, 2012 replaces WQC Number 3688 issued November 1, 2007; WQC Number 3634 issued March 19, 2007; WQC Number 3366 issued March 18, 2002; WQC Number 3114 issued February 11, 1997; and WQC Number 2727 issued May 1, 1992. This General Certification is rescinded when the Corps of Engineers reauthorizes any of the corresponding Nationwide and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Quality.

CONTRACT: TIP PROJECT: I-4928

See Sheet 1-A For Index of Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GASTON COUNTY

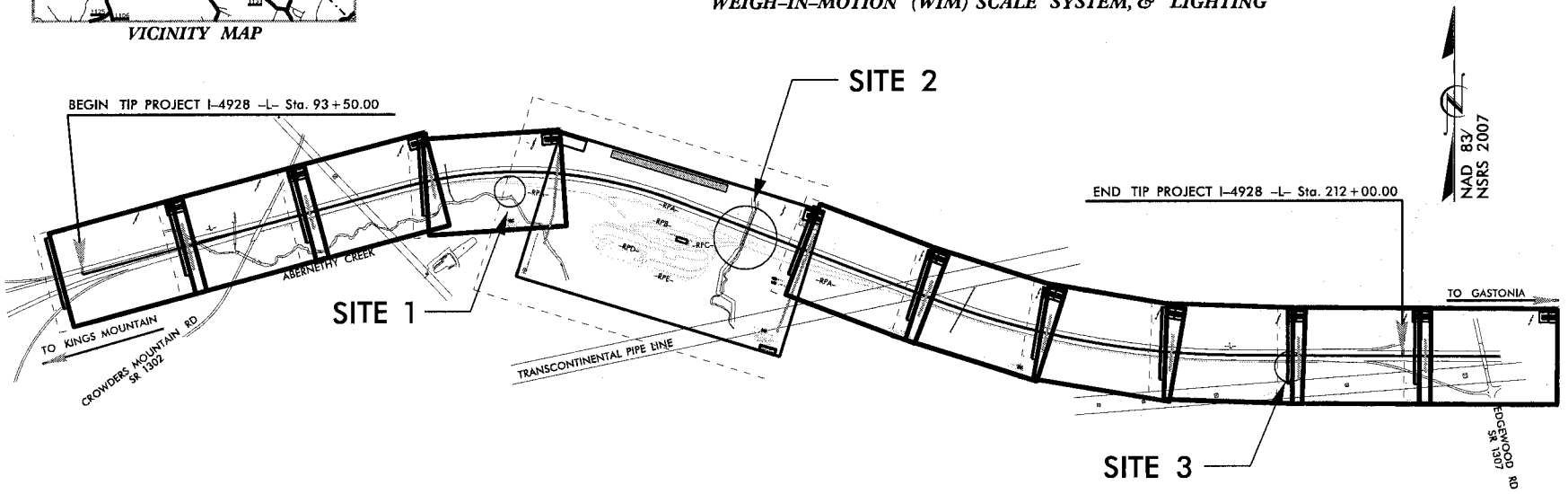
PERMIT DRAWING SHEET __ OF __ 1

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C. 13	I-4928	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
41188.1.1	IMS-85-1(106)3	P.E.
41188.2.1		R/W
41188.3.1		CONST.

LOCATION: *NEW I-85 NBL WEIGH STATION FROM SR 1302 (CROWDERS MOUNTAIN RD) TO SR 1307 (EDGEWOOD ROAD)*

TYPE OF WORK: *GRADING, PAVING, DRAINAGE, STRUCTURES, WIDENING, PAVEMENT, SIGNING, WEIGH STATION BUILDINGS, STATIC SCALES, COMMERCIAL VEHICLE INFORMATION SYSTEMS NETWORKS (CVISN) WEIGH-IN-MOTION (WIM) SCALE SYSTEM, & LIGHTING*



NOTE:
THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

PLANS 40 20 0 40 80
PROFILE (HORIZONTAL) 40 20 0 40 80
PROFILE (VERTICAL) 8 0 8 16

DESIGN DATA

ADT 2014 =	74,224
ADT 2035 =	98,500
DHV =	10 %
D =	55 %
T =	23 % *
V =	70 MPH

* TTST 18% DUAL 5 %

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-4928 = 2.244 MILES
TOTAL LENGTH TIP PROJECT I-4928 = 2.244 MILES

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: September 20, 2012

LETTING DATE: February 18, 2014

Christopher K. Haire, PE
PROJECT ENGINEER

Mohammed E. Mahjoub, EI
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

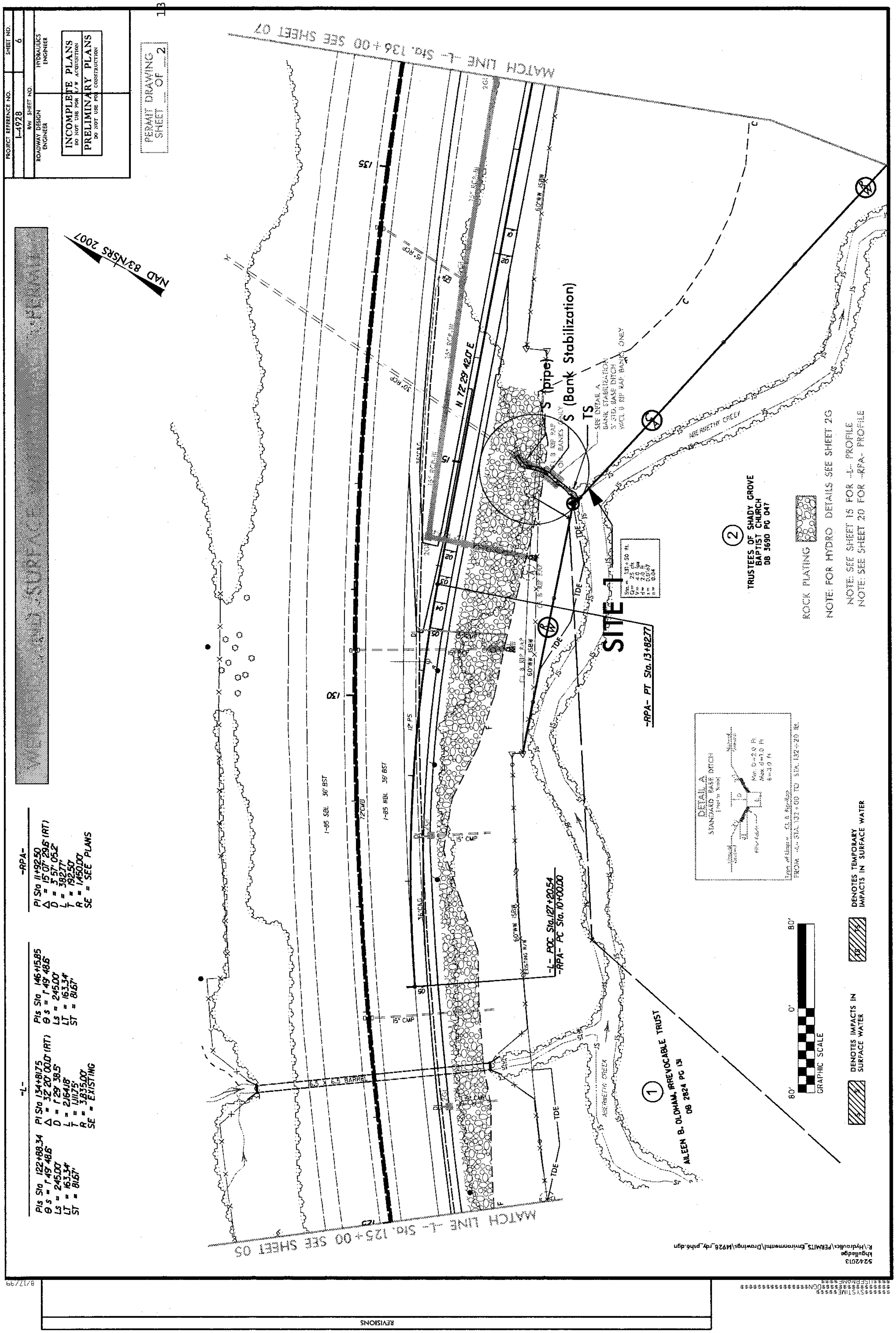
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE HIGHWAY DESIGN ENGINEER

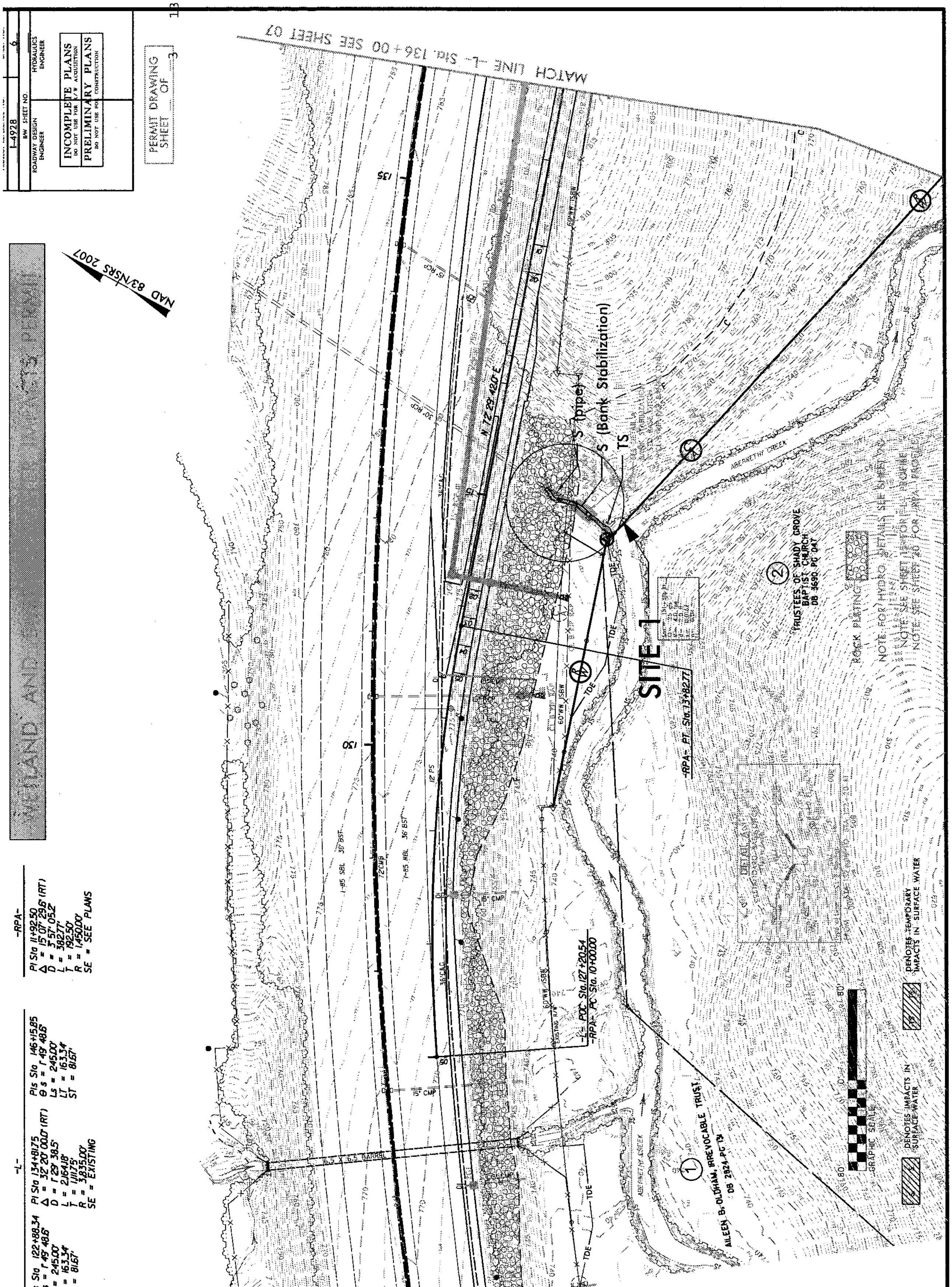
C203357

R-57

R-58

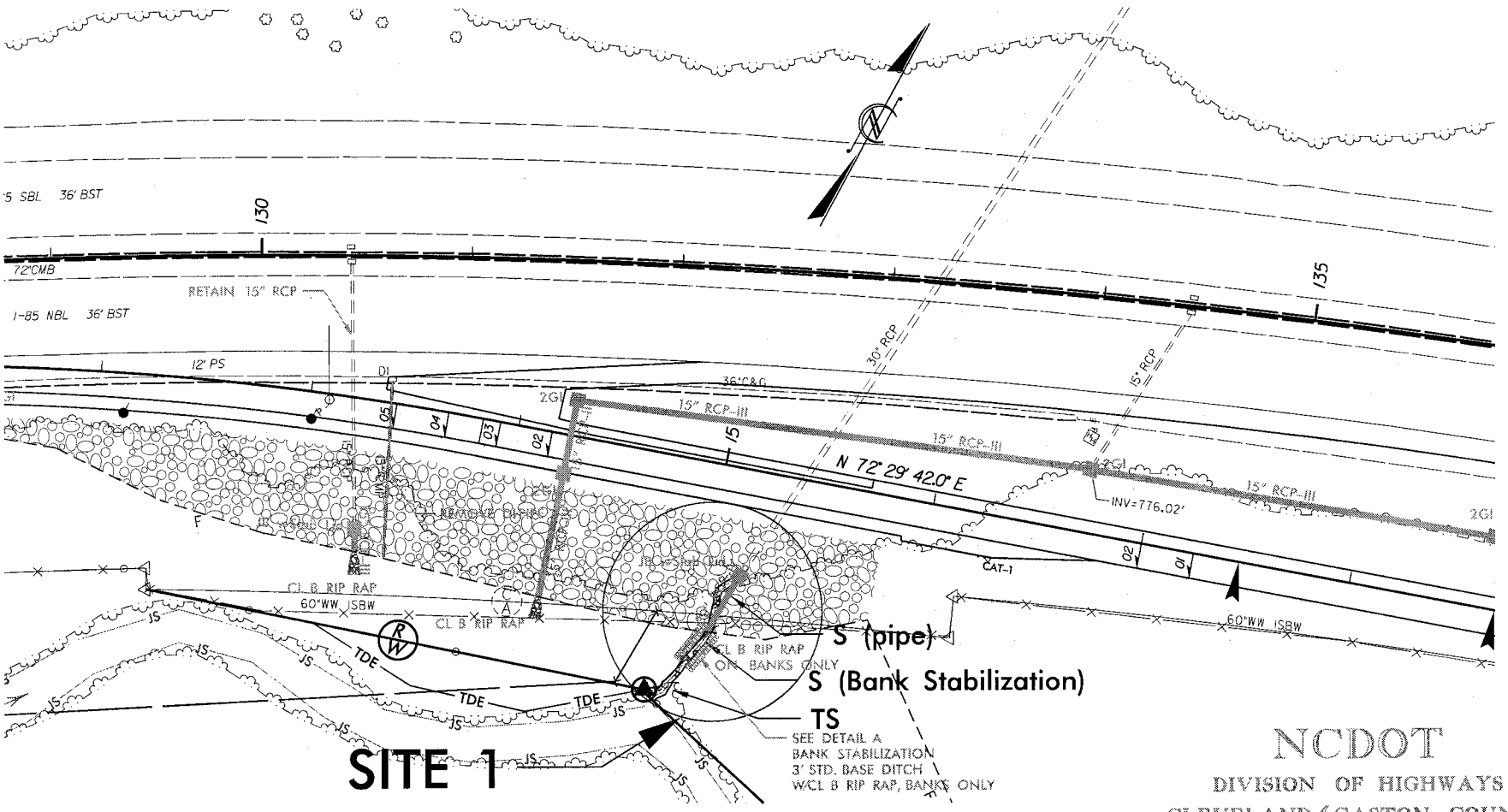


PROJECT REFERENCE NO. I-4928
SHEET NO. 6
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
PERMIT DRAWING SHEET 1 OF 2
NAD 83/NSRS 2007
MATCH LINE -L- Sta. 136+00 SEE SHEET 07
MATCH LINE -L- Sta. 125+00 SEE SHEET 05
SITE 1
S (pipe)
S (Bank Stabilization)
TS
-RPA- PT Sta. 13+82.77
-L- POC Sta. 127+20.54
-RPA- PC Sta. 10+00.00
TRUSTEES OF SHADY GROVE BAPTIST CHURCH DB 3690 PG 047
AILEEN B. OLDHAM, IRREVOCABLE TRUST DB 2824 PG 131
ROCK PLATING
NOTE: FOR HYDRO DETAILS SEE SHEET 2G
NOTE: SEE SHEET 15 FOR -L- PROFILE
NOTE: SEE SHEET 20 FOR -RPA- PROFILE
DETAIL A STANDARD BASE DITCH
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
6.5' X 6.5' BARREL
I-85 SBL 36' BST
I-85 NBL 36' BST
15" CMP
REVISIONS


MATCH LINE -L- Sta. 136+00 SEE SHEET 07
MATCH LINE -L- Sta. 125+00 SEE SHEET 05
I-4928
INCOMPLETE PLANS
PRELIMINARY PLANS
PERMIT DRAWING SHEET
NAD 83/NSRS 2007
S (Pipe)
S (Bank Stabilization)
TS
SITE 1
ABERNETHY CREEK
TRUSTEES OF SHADY GROVE BAPTIST CHURCH DB 3690 PG 047
AILEEN B. OLDHAM, IRREVOCABLE TRUST DB 2824 PG 174
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
REVISIONS

WETLAND AND SURFACE WATER IMPACTS PERMIT

PERMIT DRAWING
SHEET 4 OF 13



ENLARGEMENT SITE 1

STREAM / SURFACE WATER IMPACTS

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

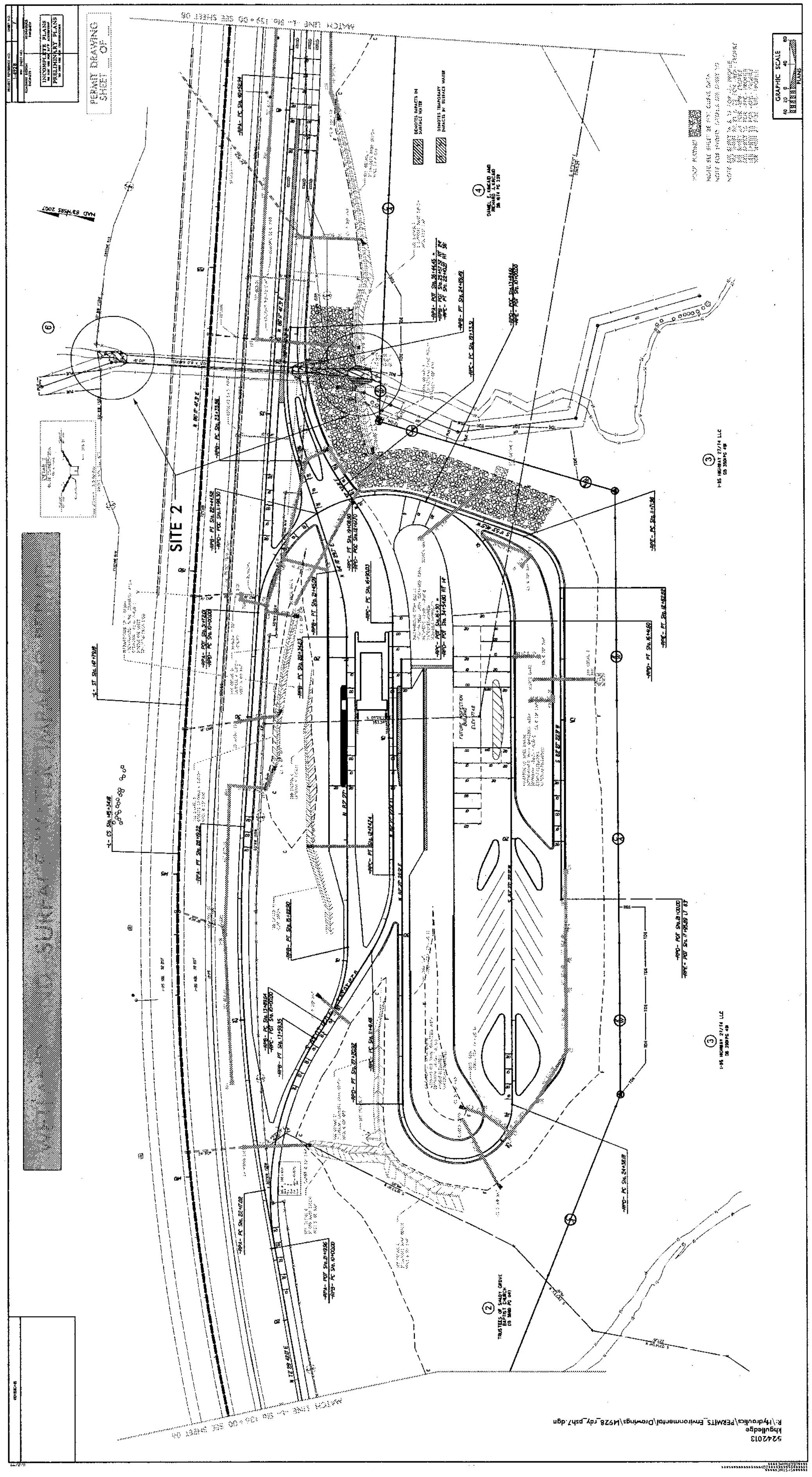
50' 0' 50'
GRAPHIC SCALE

NCDOT
DIVISION OF HIGHWAYS
CLEVELAND / GASTON COUNTY
WBS NO.: 41188.1.1 (I-4928)
GASTONIA - NEW I-85 NBL
WEIGH STATION FROM SR1302
(CROWDERS MTN RD) TO
SR 1307 (EDGEWOOD RD)

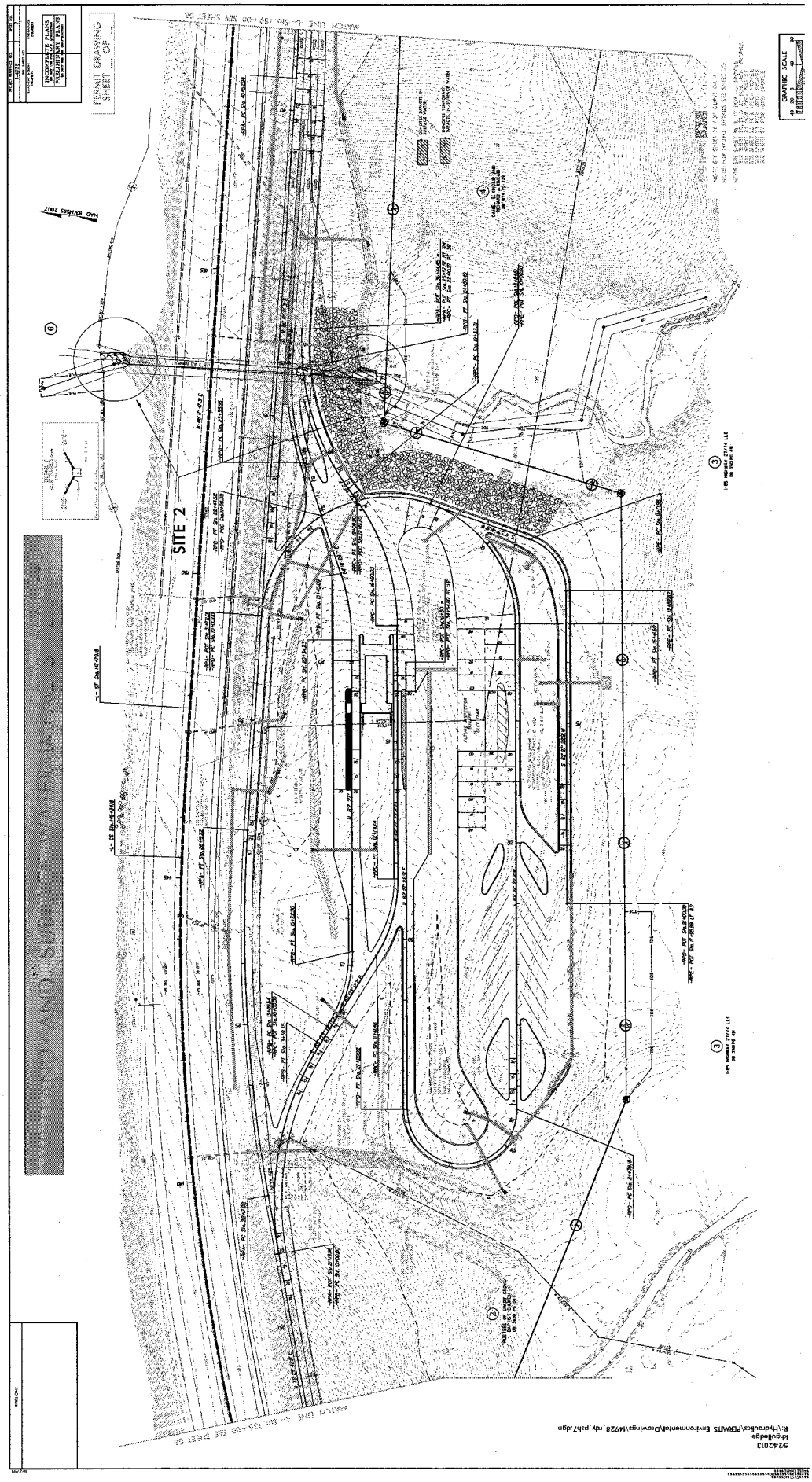
R-60

5/24/2013
khgulledge
R:\Hydraulics\PERMITS_Environmental\Drawings\I4928_Hyd_prm_wet_Site1.dgn

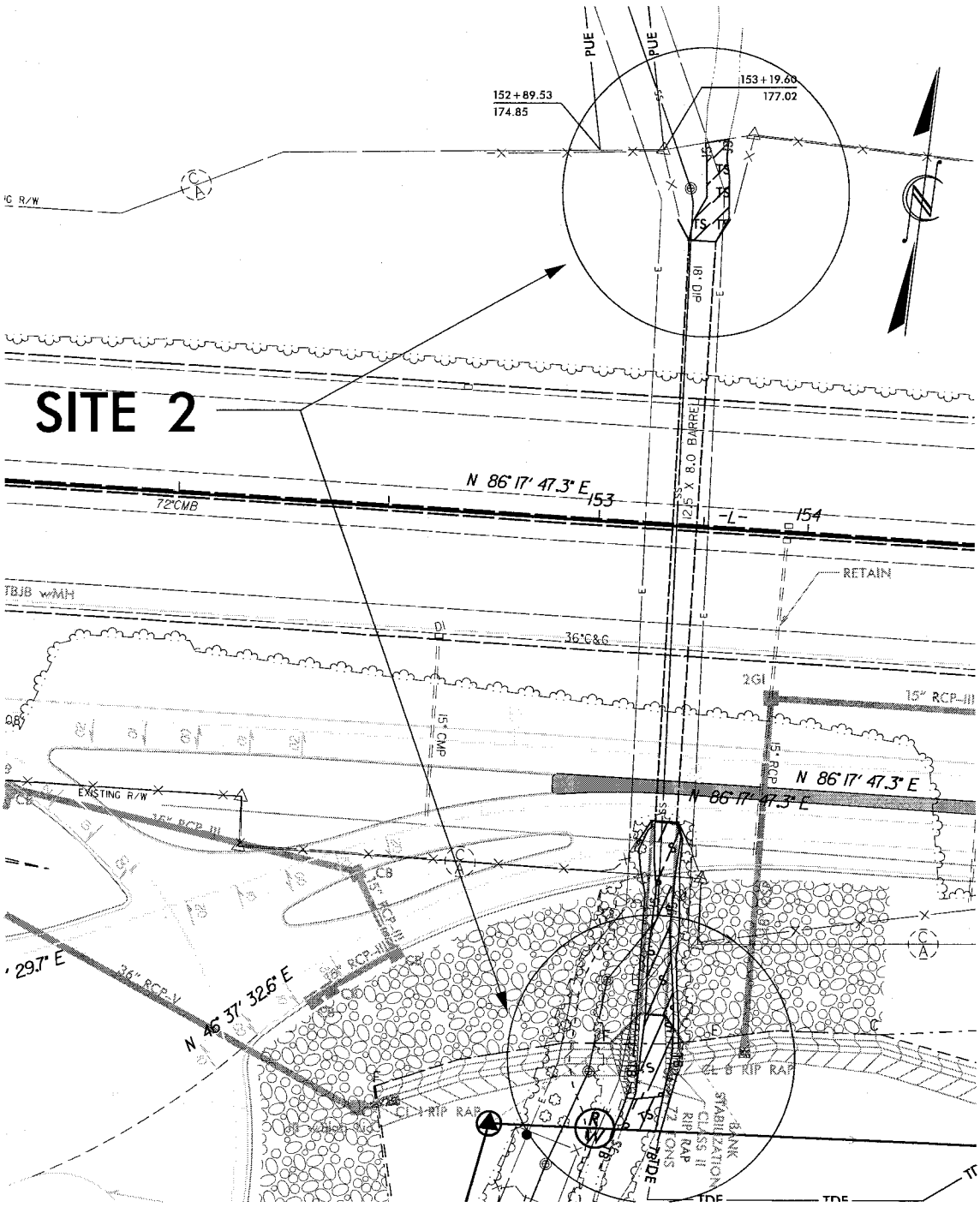
R-61



R-62



ENLARGEMENT SITE 2
STREAM / SURFACE WATER IMPACTS



PERMIT DRAWING
SHEET 7 OF 13

NCDOT

DIVISION OF HIGHWAYS
CLEVELAND / GASTON COUNTY
WBS NO.: 41188.1.1 (I-4928)

GASTONIA - NEW I-85 NBL WEIGH STATION FROM SR1302 (CROWDERS MTN RD) TO SR1307 (EDGEWOOD RD)

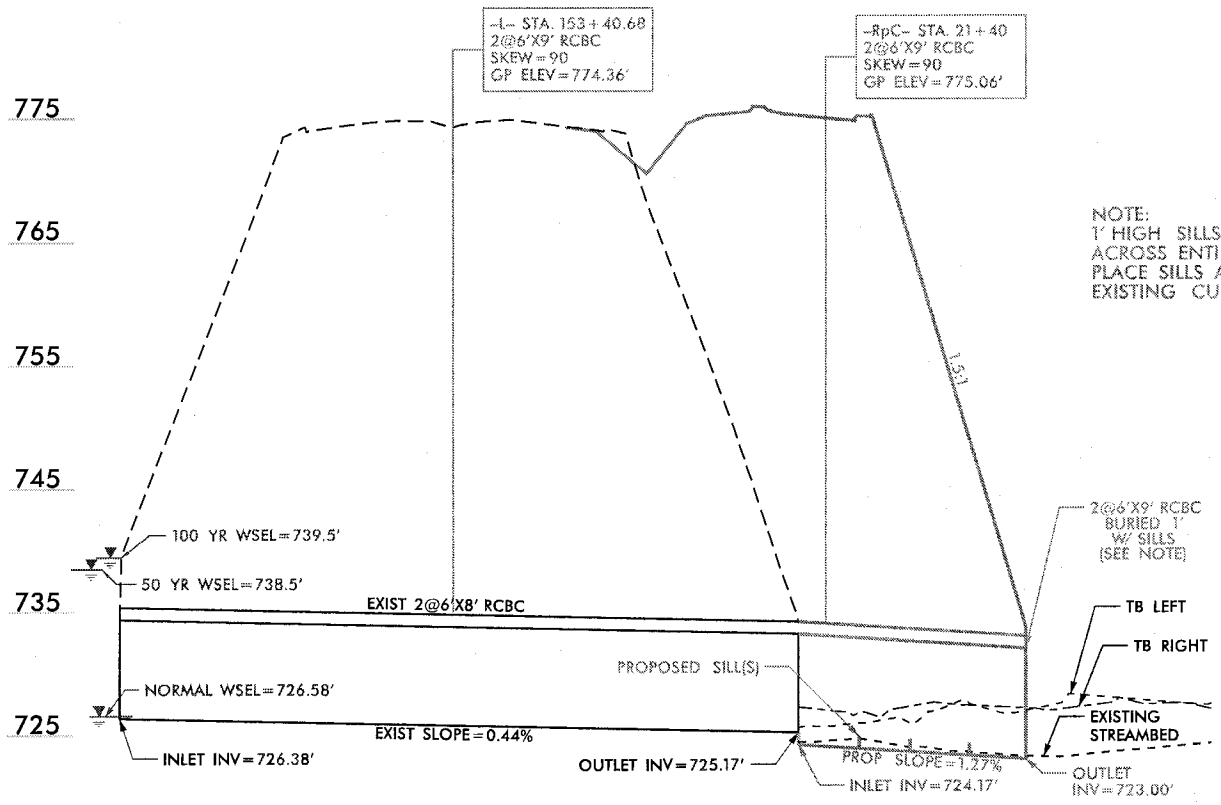
S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50'
GRAPHIC SCALE

WETLAND AND SURFACE WATER IMPACTS PERMIT

PERMIT DRAWING
SHEET 8 OF 13



NOTE:
1' HIGH SILLS TO BE USED IN NEW EXTENSION ONLY, ACROSS ENTIRE WIDTH OF BOTH CULVERT BARRELS. PLACE SILLS AT +25', +45', AND +70' FROM END OF EXISTING CULVERT. NO SILL AT OUTLET.

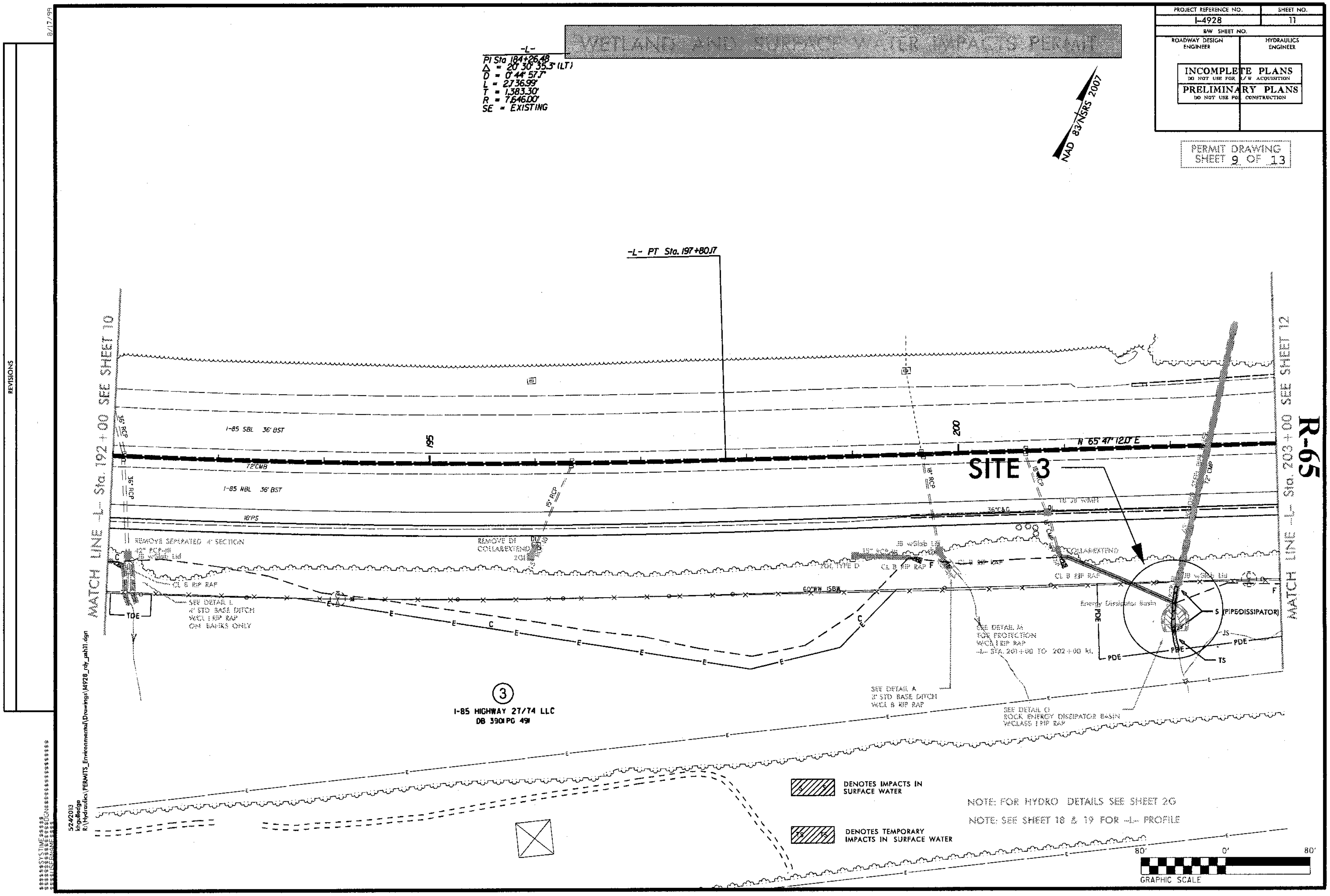
SITE 2 - PROFILE VIEW

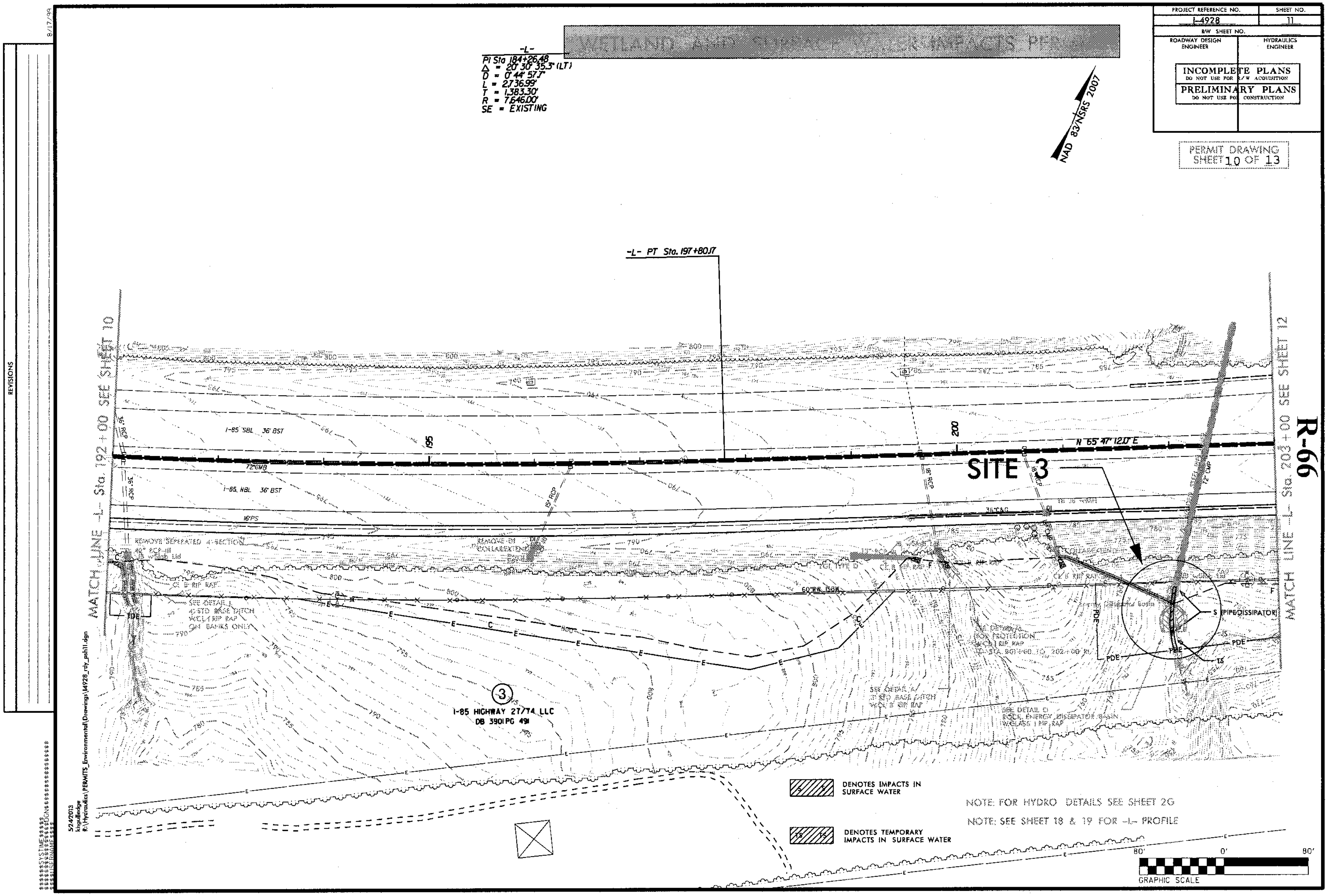
R-64

5/24/2013
khgulledge
R:\Hydraulics\PERMITS_Environmental\Drawings\I-4928_Hyd_rpt_cul_profile.dgn

NCDOT
DIVISION OF HIGHWAYS
CLEVELAND / GASTON COUNTY
WBS NO.: 41188.1.1 (I-4928)

GASTONIA - NEW I-85 NBL
WEIGH STATION FROM SR1302
(CROWDERS MTN RD) TO
SR 1307 (EDGEWOOD RD)


R-65
PROJECT REFERENCE NO. I-4928
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWING SHEET 9 OF 13
WETLAND AND SURFACE WATER IMPACTS PERMIT
NAD 83/NSRS 2007
-L-
PI Sta 184+26.48
Δ = 20° 30' 35.3" (LT)
D = 0° 44' 57.7"
L = 2,736.99'
T = 1,383.30'
R = 7,646.00'
SE = EXISTING
-L- PT Sta. 197+80.17
MATCH LINE -L- Sta. 192+00 SEE SHEET 10
MATCH LINE -L- Sta. 203+00 SEE SHEET 12
N 65° 47' 12.0" E
SITE 3
195
200
I-85 SBL 36' BST
I-85 NBL 36' BST
72'CMB
16'PS
36'C&G
36" RCP
15" RCP
18" RCP
72" CMP
REMOVE SEPARATED 4' SECTION
CL B RIP RAP
SEE DETAIL L
4' STD BASE DITCH
W/CL I RIP RAP
ON BANKS ONLY
TDE
REMOVE DI
COLLAR/EXTEND
JB w/Slab Lid
SEE DETAIL A
3' STD BASE DITCH
W/CL B RIP RAP
SEE DETAIL M
TOE PROTECTION
W/CL I RIP RAP
-L- STA. 201+00 TO 202+00 Rt.
SEE DETAIL O
ROCK ENERGY DISSIPATOR BASIN
W/CLASS I RIP RAP
Energy Dissipator Basin
S (PIPEDISSIPATOR)
PDE
TS
60"WW ISBW
3
I-85 HIGHWAY 27/74 LLC
DB 3901 PG 491
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NOTE: FOR HYDRO DETAILS SEE SHEET 2G
NOTE: SEE SHEET 18 & 19 FOR -L- PROFILE
80' 0' 80'
GRAPHIC SCALE
REVISIONS
8/17/99
5/24/2013
R:\Hydraulics\PERMITS_Environmental\Drawings\I4928_rdy_psh11.dgn


R-66
PROJECT REFERENCE NO. I-4928
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWING
SHEET 10 OF 13
NAD 83/NSRS 2007
-L-
PI Sta 184+26.48
Δ = 20° 30' 35.3" (LT)
D = 0° 44' 57.7"
L = 2,736.99'
T = 1,383.30'
R = 7,646.00'
SE = EXISTING
-L- PT Sta. 197+80.17
MATCH LINE -L- Sta. 192+00 SEE SHEET 10
MATCH LINE -L- Sta. 203+00 SEE SHEET 12
SITE 3
N 65° 47' 12.0" E
I-85 SBL 36' BST
I-85 NBL 36' BST
72" CMP
36" RCP
18" RCP
15" RCP
16' PS
S (PIPE DISSIPATOR)
PDE
1-85 HIGHWAY 27/74 LLC
DB 3901 PG 491
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NOTE: FOR HYDRO DETAILS SEE SHEET 2G
NOTE: SEE SHEET 18 & 19 FOR -L- PROFILE
80' 0' 80'
GRAPHIC SCALE
REVISIONS
8/17/99
5/24/2013
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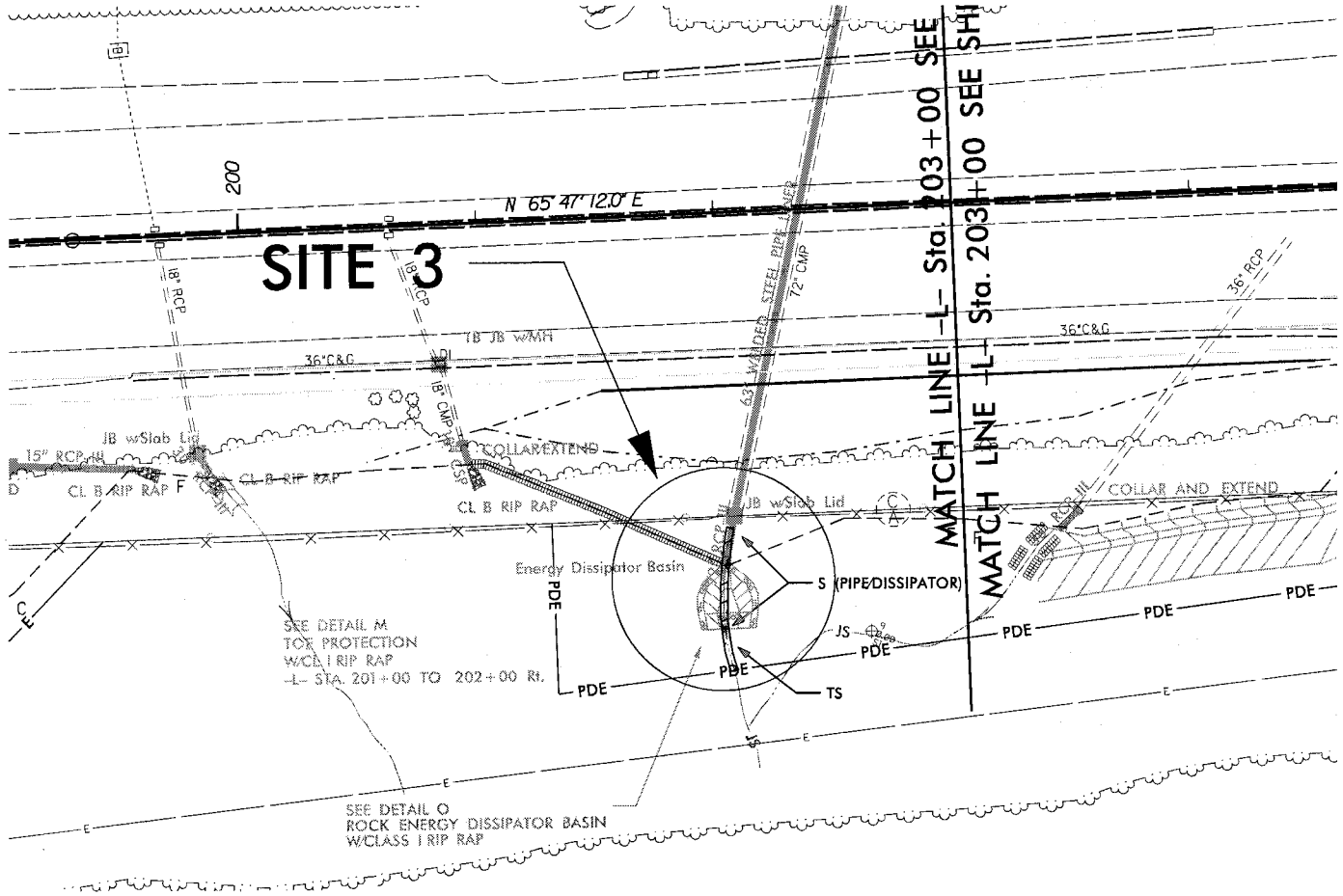
WETLAND AND SURFACE WATER IMPACTS PERMIT

PERMIT DRAWING SHEET 11 OF 13



ENLARGEMENT - SITE 3

STREAM/SURFACE WATER IMPACTS

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

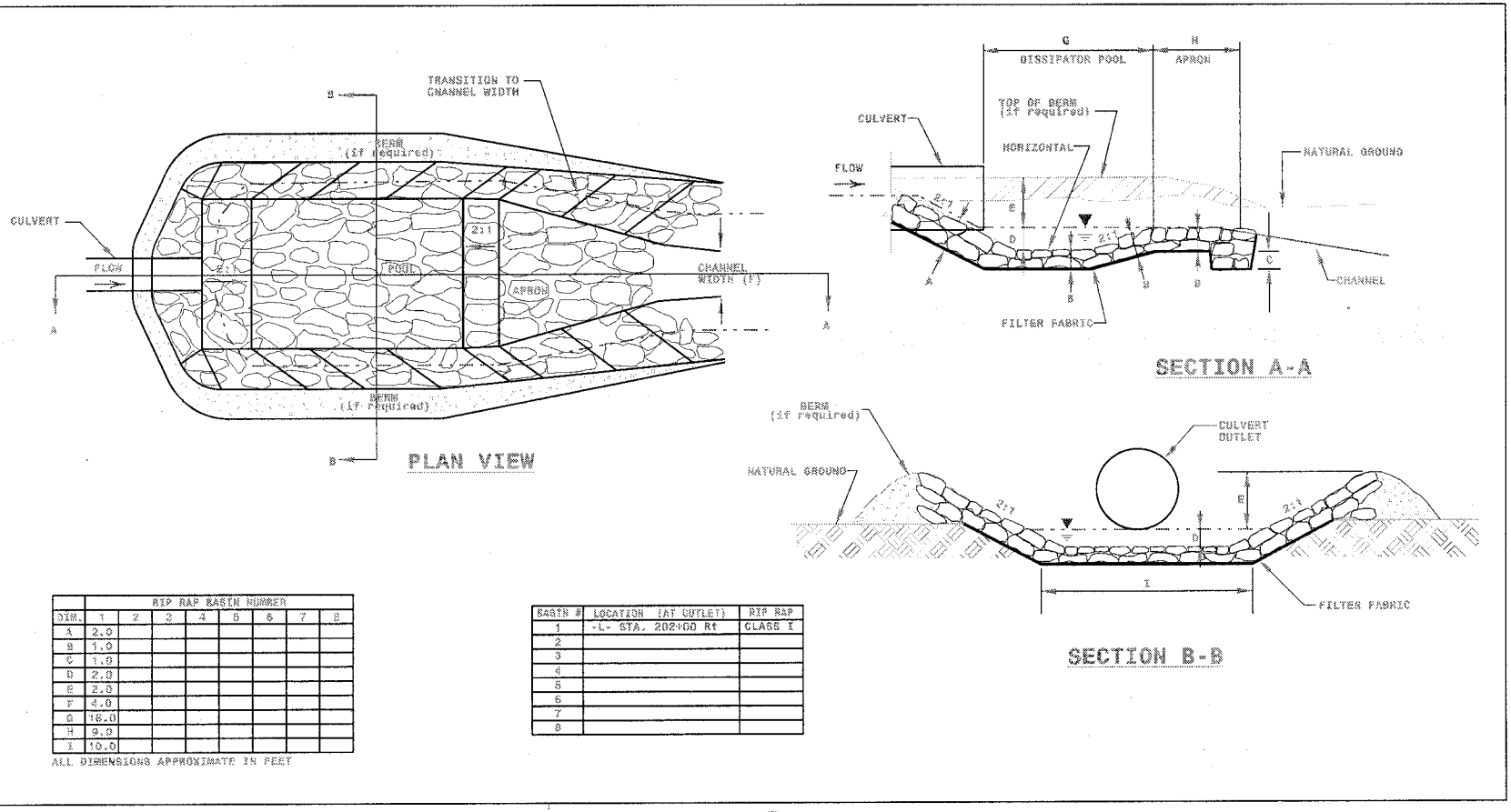
S S DENOTES IMPACTS IN SURFACE WATER

50' 0' 50'
GRAPHIC SCALE

NCDOT
DIVISION OF HIGHWAYS
CLEVELAND/GASTON COUNTY
WBS NO.: 41188.1.1 (I-4928)
GASTONIA - NEW I-85 NBL
WEIGH STATION FROM SR1302
(CROWDERS MTN RD) TO
SR1307 (EDGEWOOD RD)

R-67

5242013
khgulledge
R:\Hydraulics\PERMITS_Environmental\Drawings\I4928_Hyd_prm_wet_Site3.dgn



	RIP RAP BASIN NUMBER							
DIM.	1	2	3	4	5	6	7	8
A	2.0							
B	1.0							
C	1.0							
D	2.0							
E	2.0							
F	4.0							
G	16.0							
H	9.0							
I	10.0							

ALL DIMENSIONS APPROXIMATE IN FEET

BASIN #	LOCATION (AT OUTLET)	RIP RAP
1	-L- STA. 202+00 Rt	CLASS I
2		
3		
4		
5		
6		
7		
8		

DETAIL O

ROCK ENERGY DISSIPATOR BASIN DETAIL

NOT TO SCALE

WETLAND PERMIT IMPACT SUMMARY SHEET 1 OF 1

				WETLAND IMPACTS					SURFACE WATER IMPACTS					
Feature	Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)	Notes
	1	132+40 -L-	30" RCP						<0.01	<0.01	30	27		
			Bank Stabilization								18			
	2	153+40 -L-	Prop. 2@6'X9' RCBC						0.02	0.02	92	65		Temp Impacts North of RCBC are for temporary const. impacts (dewatering).
			Bank Stabilization								40			
	3	202+00 -L-	72" RCP						<0.01	<0.01	16	18		
			Energy Dissipator						<0.01		27			
TOTAL SHEET 1:									0.03	0.02	223	110		

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
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

Restricted Noxious **Weed**	Limitations per Lb. Of Seed	Restricted Noxious **Weed**	Limitations per Lb. of Seed
Blessed Thistle	4 seeds	Cornflower (Ragged Robin)	27 seeds
Cocklebur	4 seeds	Texas Panicum	27 seeds
Spurred Anoda	4 seeds	Bracted Plantain	54 seeds
Velvetleaf	4 seeds	Buckhorn Plantain	54 seeds
Morning-glory	8 seeds	Broadleaf Dock	54 seeds
Corn Cockle	10 seeds	Curly Dock	54 seeds
Wild Radish	12 seeds	Dodder	54 seeds
Purple Nutsedge	27 seeds	Giant Foxtail	54 seeds
Yellow Nutsedge	27 seeds	Horsenettle	54 seeds
Canada Thistle	27 seeds	Quackgrass	54 seeds
Field Bindweed	27 seeds	Wild Mustard	54 seeds
Hedge Bindweed	27 seeds		

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed shall not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet – Strain R
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass
Crownvetch
Pensacola Bahiagrass
Creeping Red Fescue
Japanese Millet
Reed Canary Grass
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

STANDARD SPECIAL PROVISION

ERRATA

(1-17-12) (Rev. 1-21-14) Z-4

Revise the *2012 Standard Specifications* as follows:

Division 2

Page 2-7, line 31, Article 215-2 Construction Methods, replace "Article 107-26" with "Article 107-25".

Page 2-17, Article 226-3, Measurement and Payment, line 2, delete "pipe culverts,".

Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows: Line 1, replace "(4) Buffer Zone" with "(c) Buffer Zone"; **Line 12,** replace "(5) Evaluation for Potential Wetlands and Endangered Species" with "(d) Evaluation for Potential Wetlands and Endangered Species"; and **Line 33,** replace "(6) Approval" with "(4) Approval".

Division 3

Page 3-1, after line 15, Article 300-2 Materials, replace "1032-9(F)" with "1032-6(F)".

Division 4

Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping, replace "sheet pile" with "reinforcement".

Division 6

Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments, replace "30" with "45".

Page 6-10, line 42, Subarticle 609-6(C)(2), replace "Subarticle 609-6(E)" with "Subarticle 609-6(D)".

Page 6-11, Table 609-1 Control Limits, replace "Max. Spec. Limit" for the Target Source of $P_{0.075}/P_{be}$ Ratio with "1.0".

Page 6-40, Article 650-2 Materials, replace "Subarticle 1012-1(F)" with "Subarticle 1012-1(E)"

Division 8

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

Division 12

Page 12-7, Table 1205-3, add "FOR THERMOPLASTIC" to the end of the title.

Page 12-8, Subarticle 1205-5(B), line 13, replace "Table 1205-2" with "Table 1205-4".

Page 12-8, Table 1205-4 and 1205-5, replace "THERMOPLASTIC" in the title of these tables with "POLYUREA".

Page 12-9, Subarticle 1205-6(B), line 21, replace "Table 1205-4" with "Table 1205-6".

Page 12-11, Subarticle 1205-8(C), line 25, replace "Table 1205-5" with "Table 1205-7".

Division 15

Page 15-4, Subarticle 1505-3(F) Backfilling, line 26, replace "Subarticle 235-4(C)" with "Subarticle 235-3(C)".

Page 15-6, Subarticle 1510-3(B), after line 21, replace the allowable leakage formula with the following: $\boldsymbol{W = LD\sqrt{P} \div 148,000}$

Page 15-6, Subarticle 1510-3(B), line 32, delete "may be performed concurrently or" and replace with "shall be performed".

Page 15-17, Subarticle 1540-3(E), line 27, delete "Type 1".

Division 17

Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation, replace "1633.01" with "1631.01".

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES
(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)

(3-18-03) (Rev. 10-15-13) Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-733-6932, or *http://www.ncagr.gov/plantind/* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed or other noxious weeds.

STANDARD SPECIAL PROVISION

AWARD OF CONTRACT

(6-28-77) Z-6

"The North Carolina Department of Transportation, in accordance with the provisions of *Title VI of the Civil Rights Act of 1964* (78 Stat. 252) and the Regulations of the Department of Transportation (*49 C.F.R., Part 21*), issued pursuant to such act, hereby notifies all bidders that it will affirmatively insure that the contract entered into pursuant to this advertisement will be awarded to the lowest responsible bidder without discrimination on the ground of race, color, or national origin".

STANDARD SPECIAL PROVISION

MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS

Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project or the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations *in 41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

Area 023 29.7%
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%
Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%
Buncombe County
Madison County

Area 030 6.3%
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%
Currituck County

Area 9200 20.7%
Brunswick County
New Hanover County

Area 2560 24.2%
Cumberland County

Area 6640 22.8%
Durham County
Orange County
Wake County

Area 1300 16.2%
Alamance County

Area 3120 16.4%
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%
Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION

REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS

FHWA - 1273 Electronic Version - May 1, 2012 Z-8

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

ATTACHMENTS

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

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

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

II. NONDISCRIMINATION

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

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

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

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

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

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

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

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
b. The contractor will accept as its operating policy the following statement:
"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

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

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
   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.

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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 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).
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.

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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.

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XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

(10-16-07) (Rev. 5-21-13) Z-10

Description

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

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

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

Minorities and Women

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

Assigning Training Goals

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

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC140090 01/03/2014 NC90

Z-90

Date: January 3, 2014

General Decision Number: NC140090 01/03/2014 NC90

Superseded General Decision Numbers: NC20130090

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

Anson
Cabarrus
Gaston
Mecklenburg
Union

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

Modification Number	Publication Date
0	01/03/2014

SUNC2011-071 09/16/2011

	Rates	Fringes
CARPENTER (Form Work Only)	14.70	
CEMENT MASON/CONCRETE FINISHER		
Anson, Cabarrus, and Gaston Counties	12.87	
Mecklenburg County	12.62	
Union County	12.75	
INSTALLER (Guardrail) (includes Guardrail/Post Driver Work)	11.16	
IRONWORKER (Reinforcing)	14.88	
LABORER		
Asphalt, Asphalt Distributor, Raker, and Spreader	11.78	
Common or General		
Anson and Cabarrus Counties	11.14	
Gaston County	10.63	
Mecklenburg County	11.55	
Union County	10.32	
Concrete Saw	14.26	
Landscape	10.35	
Luteman	12.88	
Mason Tender (Cement/Concrete)	11.25	
Pipelayer	12.93	
Traffic Control (Cone Setter)	12.53	
Traffic Control (Flagger)	9.99	

	Rates	Fringes
POWER EQUIPMENT OPERATORS		
Backhoe/Excavator/Trackhoe		
Anson, Cabarrus, and Gaston Counties	14.21	
Mecklenburg County	13.79	
Union County	14.53	
Broom/Sweeper	13.97	
Bulldozer		
Anson, Cabarrus, and Gaston Counties	15.46	
Mecklenburg County	15.90	
Union County	14.96	
Crane	19.11	
Curb Machine	14.43	
Distributor	14.99	
Drill	16.68	
Grader/Blade		
Anson, Cabarrus, Gaston, and Union Counties	17.99	
Mecklenburg County	18.65	
Loader		
Anson, Cabarrus, Gaston, and Union Counties	14.46	
Mecklenburg County	14.43	
Mechanic	17.13	
Milling Machine	15.80	
Oiler	14.36	
Paver	16.65	
Roller		
Anson, Cabarrus, Gaston, and Union Counties	13.22	
Mecklenburg County	13.29	
Scraper	15.85	
Screed	15.23	
Tractor	14.47	
TRUCK DRIVER		
4 Axle Truck	11.90	
Distributor	16.75	
Dump Truck		
Anson, Cabarrus, and Gaston Counties	13.46	
Mecklenburg County	13.79	
Union County	13.49	
Flatbed Truck	15.02	
Lowboy Truck		
Anson, Cabarrus, Gaston, and Mecklenburg Counties	15.26	
Union County	15.23	
Off the Road Truck	15.00	
Single Axle Truck	12.13	
Tack Truck	16.52	
Water Truck	13.16	

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

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

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

Administrative Review Board
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200 Constitution Avenue, N.W.
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4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC140031 01/03/2014 NC31

Z-31

Date: January 3, 2014

General Decision Number: NC140031 01/03/2014 NC31

Superseded General Decision Numbers: NC20130031

State: North Carolina

Construction Type: BUILDING

COUNTIES:

Gaston

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Modification Number	Publication Date
0	01/03/2014

* ELEC0379-009 09/02/2013

	Rates	Fringes
ELECTRICIAN.....	$ 23.40	13%+5.70

On smokestacks where electrical work performed is above 40 ft. from the ground: $0.50 per hour additional.

Work from swinging scaffolds, bosun chairs, or raw structural steel: $0.50 per hour additional.

IRON0848-005 12/01/2012

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	$ 21.80	9.75

PLUM0421-002 07/01/2013

	Rates	Fringes
PLUMBER/PIPEFITTER (Excluding HVAC System Installation).....	$ 24.85	9.65

SUNC2011-012 08/24/2011

	Rates	Fringes
BRICKLAYER.....	$ 19.76	9.18
CARPENTER, Excludes Drywall Hanging, and Form Work.	$ 15.57	0.00
CEMENT MASON/CONCRETE FINISHER...	$ 16.41	0.00
DRYWALL HANGER.....	$ 13.83	0.00

FORM WORKER.....	$ 14.09	0.00
HVAC MECHANIC (Installation of HVAC Unit Only, Excludes Installation of HVAC Pipe and Duct).....	$ 17.36	2.23
LABORER: Common or General.....	$ 11.88	2.15
LABORER: Landscape & Irrigation.....	$ 9.13	0.28
LABORER: Pipelayer.....	$ 13.35	2.80
LABORER: Mason Tender-Brick/Cement/Concrete	$ 12.00	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	$ 16.00	2.48
OPERATOR: Bulldozer.....	$ 16.00	1.87
OPERATOR: Crane.....	$ 19.77	4.48
OPERATOR: Forklift.....	$ 13.86	0.00
OPERATOR: Grader/Blade.....	$ 15.72	1.49
OPERATOR: Loader.....	$ 16.17	0.25
PAINTER: Brush, Roller and Spray.....	$ 14.13	2.88
ROOFER.....	$ 12.50	0.81
SHEET METAL WORKER (HVAC Duct Installation Only).	$ 17.32	1.56
SHEET METAL WORKER, Excludes HVAC Duct and Unit Installation	$ 15.96	1.01
SPRINKLER FITTER (Fire Sprinklers).....	$ 15.52	0.00

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U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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END OF GENERAL DECISION

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum	L.S.	
0003	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM INSPECTIONS BUILDING: COMPLETE GENERAL CONSTRUCTION & ALL SYSTEMS AS INDICATED	Lump Sum	L.S.	
0004	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM SCALE BUILDING & SCALE BOOTH: COMPLETE GEN. CONST. & ALL SYSTEMS AS INDICATED	Lump Sum	L.S.	
0005	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0006	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	3 ACR		
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	210,900 CY		
0008	0036000000-E	225	UNDERCUT EXCAVATION	3,500 CY		
0009	0106000000-E	230	BORROW EXCAVATION	225,000 CY		
0010	0134000000-E	240	DRAINAGE DITCH EXCAVATION	1,840 CY		
0011	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	15,330 SY		
0012	0192000000-N	260	PROOF ROLLING	15 HR		
0013	0195000000-E	265	SELECT GRANULAR MATERIAL	3,500 CY		
0014	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	8,900 SY		
0015	0223000000-E	275	ROCK PLATING	8,500 SY		
0016	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	628 TON		
0017	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	2,080 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	0354000000-E	310	****" RC PIPE CULVERTS, CLASS ***** (12", V)	116 LF		
0019	0354000000-E	310	****" RC PIPE CULVERTS, CLASS ***** (36", V)	272 LF		
0020	0360000000-E	310	12" RC PIPE CULVERTS, CLASS III	488 LF		
0021	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	3,368 LF		
0022	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	240 LF		
0023	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	396 LF		
0024	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	8 LF		
0025	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	20 LF		
0026	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	4 LF		
0027	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	24 LF		
0028	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	120 LF		
0029	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	32 LF		
0030	0546000000-E	310	**" CAA PIPE CULVERTS, ******" THICK (4", 0.064")	56 LF		
0031	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	90 LF		
0032	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	520 LF		
0033	0986000000-E	SP	GENERIC PIPE ITEM NCDOT APPROVED PIPE LINER	253 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0034	0995000000-E	340	PIPE REMOVAL	295 LF		
0035	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0036	1044000000-E	501	LIME TREATED SOIL (SLURRY METHOD)	29,870 SY		
0037	1066000000-E	501	LIME FOR LIME TREATED SOIL	300 TON		
0038	1099500000-E	505	SHALLOW UNDERCUT	1,500 CY		
0039	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	3,000 TON		
0040	1110000000-E	510	STABILIZER AGGREGATE	500 TON		
0041	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	4,000 SY		
0042	1121000000-E	520	AGGREGATE BASE COURSE	394 TON		
0043	1176000000-E	542	SOIL CEMENT BASE	29,870 SY		
0044	1187000000-E	542	PORTLAND CEMENT FOR SOIL CEMENT BASE	822 TON		
0045	1209000000-E	543	ASPHALT CURING SEAL	8,970 GAL		
0046	1220000000-E	545	INCIDENTAL STONE BASE	500 TON		
0047	1330000000-E	607	INCIDENTAL MILLING	800 SY		
0048	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	5,910 TON		
0049	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	12,190 TON		
0050	1508000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0D	5,760 TON		
0051	1524200000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5D	9,310 TON		

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0052	1525000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	2,480 TON		
0053	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	1,225 TON		
0054	1577000000-E	620	POLYMER MODIFIED ASPHALT BINDER FOR PLANT MIX	535 TON		
0055	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	300 TON		
0056	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	24,000 LF		
0057	1858000000-E	710	******" PORT CEM CONC PAVEMENT, RAMPS (WITH DOWELS) (11-1/2")	41,250 SY		
0058	1891000000-E	SP	GENERIC PAVING ITEM NONWOVEN GEOTEXTILE INTERLAYER	11,000 SY		
0059	1902000000-N	710	SURFACE TESTING CONCRETE PAVEMENT	Lump Sum	L.S.	
0060	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum	L.S.	
0061	2000000000-N	806	RIGHT OF WAY MARKERS	13 EA		
0062	2022000000-E	815	SUBDRAIN EXCAVATION	168 CY		
0063	2033000000-E	815	SUBDRAIN FINE AGGREGATE	168 CY		
0064	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	1,000 LF		
0065	2070000000-N	815	SUBDRAIN PIPE OUTLET	2 EA		
0066	2077000000-E	815	6" OUTLET PIPE	12 LF		
0067	2099000000-E	816	SHOULDER DRAIN	5,000 LF		
0068	2110000000-E	816	4" SHOULDER DRAIN PIPE	5,000 LF		
0069	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	260 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0070	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	6 EA		
0071	2143000000-E	818	BLOTTING SAND	15 TON		
0072	2209000000-E	838	ENDWALLS	7 CY		
0073	2253000000-E	840	PIPE COLLARS	6 CY		
0074	2264000000-E	840	PIPE PLUGS	1 CY		
0075	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	68 EA		
0076	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	11.8 CY		
0077	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	42 LF		
0078	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	9 EA		
0079	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	21 EA		
0080	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	2 EA		
0081	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	9 EA		
0082	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	5 EA		
0083	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	9 EA		
0084	2396000000-N	840	FRAME WITH COVER, STD 840.54	3 EA		
0085	2462000000-E	SP	**" SLUICE GATE (18")	2 EA		
0086	2462000000-E	SP	**" SLUICE GATE (24")	1 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0087	2462000000-E	SP	**" SLUICE GATE (36")	1 EA		
0088	2473000000-N	SP	GENERIC DRAINAGE ITEM OIL / WATER SEPARATOR	1 EA		
0089	2535000000-E	846	**"X **" CONCRETE CURB (9" X 18")	860 LF		
0090	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	1,790 LF		
0091	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	5,310 LF		
0092	2591000000-E	848	4" CONCRETE SIDEWALK	230 SY		
0093	2627000000-E	852	4" CONCRETE ISLAND COVER	250 SY		
0094	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	80 LF		
0095	2753000000-E	846	GENERIC PAVING ITEM SPECIAL SHOULDER BERM GUTTER	1,963 LF		
0096	2910000000-N	SP	CONVERT EXISTING TRAFFIC BEARING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	1 EA		
0097	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	1 EA		
0098	3030000000-E	862	STEEL BM GUARDRAIL	8,550 LF		
0099	3045000000-E	862	STEEL BM GUARDRAIL, SHOP CURVED	750 LF		
0100	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	15 EA		
0101	3165000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (350, TL-2)	2 EA		
0102	3210000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE CAT-1	12 EA		
0103	3270000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE 350	10 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0104	3285000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE M-350	2 EA		
0105	3317000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE B-77	4 EA		
0106	3360000000-E	863	REMOVE EXISTING GUARDRAIL	5,400 LF		
0107	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	10,270 LF		
0108	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	649 EA		
0109	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	155 EA		
0110	3628000000-E	876	RIP RAP, CLASS I	1,600 TON		
0111	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	3,030 SY		
0112	3659000000-N	SP	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	2 EA		
0113	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	8 CY		
0114	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	2 CY		
0115	4057000000-E	SP	OVERHEAD FOOTING	84 CY		
0116	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	7,812 LB		
0117	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	1,207 LB		
0118	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	1,034 LF		
0119	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	2 EA		
0120	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (107+50 -L-)	Lump Sum	L.S.	
0121	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (119+44 -L-)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0122	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (135+90 -L-)	Lump Sum	L.S.	
0123	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (182+30 -L-)	Lump Sum	L.S.	
0124	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (AT 74 WEST EXIT)	Lump Sum	L.S.	
0125	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (NORTH OF 74 EAST EXIT)	Lump Sum	L.S.	
0126	4096000000-N	904	SIGN ERECTION, TYPE D	22 EA		
0127	4102000000-N	904	SIGN ERECTION, TYPE E	21 EA		
0128	4108000000-N	904	SIGN ERECTION, TYPE F	2 EA		
0129	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	2 EA		
0130	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	2 EA		
0131	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	12 EA		
0132	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	7 EA		
0133	4114000000-N	904	SIGN ERECTION, MILEMARKERS	2 EA		
0134	4116100000-N	904	SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (B)	2 EA		
0135	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	2 EA		
0136	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	3 EA		

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0137	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	2 EA		
0138	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	4 EA		
0139	4158000000-N	907	DISPOSAL OF SIGN SYSTEM, WOOD	2 EA		
0140	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	4 EA		
0141	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	683 SF		
0142	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	636 SF		
0143	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	40 SF		
0144	4415000000-N	1115	FLASHING ARROW BOARD	3 EA		
0145	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	2 EA		
0146	4430000000-N	1130	DRUMS	400 EA		
0147	4435000000-N	1135	CONES	215 EA		
0148	4445000000-E	1145	BARRICADES (TYPE III)	32 LF		
0149	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	3 EA		
0150	4480000000-N	1165	TMA	3 EA		
0151	4485000000-E	1170	PORTABLE CONCRETE BARRIER	10,000 LF		
0152	4510000000-N	SP	LAW ENFORCEMENT	150 HR		
0153	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	650 EA		
0154	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	660 LF		
0155	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	23,823 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0156	4690000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 120 MILS)	6,991 LF		
0157	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	3,107 LF		
0158	4702000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 120 MILS)	1,081 LF		
0159	4721000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (120 MILS)	4 EA		
0160	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	9 EA		
0161	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	8,533 LF		
0162	4815000000-E	1205	PAINT PAVEMENT MARKING LINES (6")	107,600 LF		
0163	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	1,020 LF		
0164	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	72 LF		
0165	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	2 EA		
0166	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	53,000 LF		
0167	4905000000-N	1253	SNOWPLOWABLE PAVEMENT MARKERS	478 EA		
0168	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA		
0169	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA		
0170	5070000000-N	1405	STANDARD FOUNDATION ********* (R1)	12 EA		
0171	5070000000-N	1405	STANDARD FOUNDATION ********* (R2)	3 EA		
0172	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	165 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0173	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")	245 LF		
0174	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (6")	325 LF		
0175	5185000000-E	1410	** #2 W/G FEEDER CIRCUIT (4)	770 LF		
0176	5190000000-E	1410	********** FEEDER CIRCUIT (4 - #1 W/G)	1,275 LF		
0177	5190000000-E	1410	********** FEEDER CIRCUIT (4 - #2/0 W/G)	1,335 LF		
0178	5220000000-E	1410	** #2 W/G FEEDER CIRCUIT IN ******" CONDUIT (4, 2)	8,210 LF		
0179	5225000000-E	1410	** #1 W/G FEEDER CIRCUIT IN ******" CONDUIT (4, 2)	6,825 LF		
0180	5230000000-E	1410	********** FEEDER CIRCUIT IN ** CONDUIT (4 - #2/0 W/G, 3")	3,215 LF		
0181	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC30)	13 EA		
0182	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC36)	9 EA		
0183	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B PIT ELECTRICAL WORK	Lump Sum	L.S.	
0184	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B STATIC SCALE PLATFORM	Lump Sum	L.S.	
0185	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B STATIC SCALE SYSTEM	Lump Sum	L.S.	
0186	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C PIT ELECTRICAL WORK	Lump Sum	L.S.	
0187	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C STATIC SCALE PLATFORM	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0188	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C STATIC SCALE SYSTEM	Lump Sum	L.S.	
0189	5262000000-E	SP	GENERIC LIGHTING ITEM HIGH MOUNT FOUNDATIONS	21 CY		
0190	5270000000-N	SP	GENERIC LIGHTING ITEM 1 POLE, 120VAC EQUIPMENT DIS-CONNECT	8 EA		
0191	5270000000-N	SP	GENERIC LIGHTING ITEM 15KVA POWER TRANSFORMER	1 EA		
0192	5270000000-N	SP	GENERIC LIGHTING ITEM 2 POLE, 240VAC EQUIPMENT DIS-CONNECT	1 EA		
0193	5270000000-N	SP	GENERIC LIGHTING ITEM HIGH MOUNT LUMINAIRE - LED	18 EA		
0194	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE WS, 120/208V	1 EA		
0195	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT STANDARD, TYPE MLTS, 35' MH, 6'SA	15 EA		
0196	5270000000-N	SP	GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMI-NAIRE-LED	15 EA		
0197	5691700000-E	1520	18" SANITARY GRAVITY SEWER	554 LF		
0198	5775000000-E	1525	4' DIA UTILITY MANHOLE	2 EA		
0199	5811000000-E	1530	ABANDON 18" UTILITY PIPE	570 LF		
0200	5816000000-N	1530	ABANDON UTILITY MANHOLE	3 EA		
0201	5836400000-E	1540	36" ENCASEMENT PIPE	390 LF		
0202	5872400000-E	1550	TRENCHLESS INSTALLATION OF 36" IN SOIL	160 LF		
0203	5872410000-E	1550	TRENCHLESS INSTALLATION OF 36" NOT IN SOIL	160 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0204	6000000000-E	1605	TEMPORARY SILT FENCE	1,200 LF		
0205	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	770 TON		
0206	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	4,400 TON		
0207	6012000000-E	1610	SEDIMENT CONTROL STONE	2,935 TON		
0208	6015000000-E	1615	TEMPORARY MULCHING	58 ACR		
0209	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	3,500 LB		
0210	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEED-ING	18.5 TON		
0211	6024000000-E	1622	TEMPORARY SLOPE DRAINS	3,500 LF		
0212	6029000000-E	SP	SAFETY FENCE	1,500 LF		
0213	6030000000-E	1630	SILT EXCAVATION	16,200 CY		
0214	6036000000-E	1631	MATTING FOR EROSION CONTROL	52,000 SY		
0215	6037000000-E	SP	COIR FIBER MAT	650 SY		
0216	6042000000-E	1632	1/4" HARDWARE CLOTH	3,500 LF		
0217	6070000000-N	1639	SPECIAL STILLING BASINS	4 EA		
0218	6071010000-E	SP	WATTLE	3,400 LF		
0219	6071020000-E	SP	POLYACRYLAMIDE (PAM)	1,875 LB		
0220	6071030000-E	1640	COIR FIBER BAFFLE	4,200 LF		
0221	6071050000-E	SP	**" SKIMMER (1-1/2")	14 EA		
0222	6071050000-E	SP	**" SKIMMER (2")	4 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0223	6084000000-E	1660	SEEDING & MULCHING	60 ACR		
0224	6087000000-E	1660	MOWING	20 ACR		
0225	6090000000-E	1661	SEED FOR REPAIR SEEDING	600 LB		
0226	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	2 TON		
0227	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	1,425 LB		
0228	6108000000-E	1665	FERTILIZER TOPDRESSING	42.75 TON		
0229	6111000000-E	SP	IMPERVIOUS DIKE	270 LF		
0230	6114500000-N	1667	SPECIALIZED HAND MOWING	70 MHR		
0231	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	100 EA		
0232	7060000000-E	1705	SIGNAL CABLE	260 LF		
0233	7279000000-E	1715	TRACER WIRE	7,955 LF		
0234	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	115 LF		
0235	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	620 LF		
0236	7301000000-E	1715	DIRECTIONAL DRILL (**********) (4, 2")	45 LF		
0237	7312000000-N	1716	JUNCTION BOX (**********) (SPECIAL-SIZED)	8 EA		
0238	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	32 EA		
0239	7360000000-N	1720	WOOD POLE	1 EA		
0240	7420000000-E	1722	2" RISER WITH WEATHERHEAD	6 EA		
0241	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	458 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0242	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (36)	8,200 LF		
0243	7540000000-N	1731	SPLICE ENCLOSURE	8 EA		
0244	7552000000-N	1731	INTERCONNECT CENTER	12 EA		
0245	7566000000-N	1733	DELINEATOR MARKER	16 EA		
0246	7613000000-N	SP	SOIL TEST	9 EA		
0247	7614100000-E	SP	DRILLED PIER FOUNDATION	45 CY		
0248	7901000000-N	1753	CABINET BASE EXTENDER	3 EA		
0249	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	26 EA		
0250	7980000000-N	SP	GENERIC SIGNAL ITEM AVI ANTENNA	6 EA		
0251	7980000000-N	SP	GENERIC SIGNAL ITEM AVI READER	6 EA		
0252	7980000000-N	SP	GENERIC SIGNAL ITEM BASE MOUNTED EQUIPMENT CABINET	3 EA		
0253	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CABINET	5 EA		
0254	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	5 EA		
0255	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY (FIXED MOUNT)	3 EA		
0256	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	5 EA		
0257	7980000000-N	SP	GENERIC SIGNAL ITEM COMPUTER WORKSTATION (INSTALL)	4 EA		
0258	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL HARDWARE VIDEO ENCODER	8 EA		

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0259	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL TYPE STRUCTURE	1 EA		
0260	7980000000-N	SP	GENERIC SIGNAL ITEM ENCLOSED COMMUNICATIONS RACK	3 EA		
0261	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET FOUNDATION	3 EA		
0262	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	13 EA		
0263	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (OVER-SIZED)	27 EA		
0264	7980000000-N	SP	GENERIC SIGNAL ITEM LANE CONTROL SIGNAL	4 EA		
0265	7980000000-N	SP	GENERIC SIGNAL ITEM MANAGED ETHERNET SWITCH	1 EA		
0266	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM	5 EA		
0267	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM DESIGN	5 EA		
0268	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE	2 EA		
0269	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE DESIGN	2 EA		
0270	7980000000-N	SP	GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (OVER-HEAD)	1 EA		
0271	7980000000-N	SP	GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (UNDER-GROUND)	1 EA		
0272	7980000000-N	SP	GENERIC SIGNAL ITEM OVER-HEIGHT VEHICLE DETECTION SYSTEM	2 EA		
0273	7980000000-N	SP	GENERIC SIGNAL ITEM PATCH PANEL (ETHERNET)	12 EA		

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0274	7980000000-N	SP	GENERIC SIGNAL ITEM PIEZOELECTRIC AXLE SENSOR	6 EA		
0275	7980000000-N	SP	GENERIC SIGNAL ITEM PIEZOELECTRIC QUARTZ SENSOR SET	6 EA		
0276	7980000000-N	SP	GENERIC SIGNAL ITEM POLE MOUNTED EQUIPMENT CABINET	5 EA		
0277	7980000000-N	SP	GENERIC SIGNAL ITEM PRINTER (INSTALL)	1 EA		
0278	7980000000-N	SP	GENERIC SIGNAL ITEM SERVER (INSTALL)	2 EA		
0279	7980000000-N	SP	GENERIC SIGNAL ITEM SERVICE DISCONNECT	4 EA		
0280	7980000000-N	SP	GENERIC SIGNAL ITEM SPLICE CENTER (36-FIBER)	1 EA		
0281	7980000000-N	SP	GENERIC SIGNAL ITEM STEEL PEDESTAL POLE	3 EA		
0282	7980000000-N	SP	GENERIC SIGNAL ITEM UPS	6 EA		
0283	7980000000-N	SP	GENERIC SIGNAL ITEM VEHICLE SIGNAL HEAD (12" 2-SECTION, RED-GREEN)	6 EA		
0284	7980000000-N	SP	GENERIC SIGNAL ITEM WALL-MOUNTED COMMUNICATIONS RACK	1 EA		
0285	7985000000-N	SP	GENERIC SIGNAL ITEM ADVANCE LOCATION WIM ELECTRON-ICS	Lump Sum	L.S.	
0286	7985000000-N	SP	GENERIC SIGNAL ITEM ALPR SYSTEM	Lump Sum	L.S.	
0287	7985000000-N	SP	GENERIC SIGNAL ITEM CCTV SOFTWARE	Lump Sum	L.S.	
0288	7985000000-N	SP	GENERIC SIGNAL ITEM CENTRAL CONTROL SOFTWARE	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0289	7985000000-N	SP	GENERIC SIGNAL ITEM COMPLIANCE LOCATION WIM ELECTRONICS	Lump Sum	L.S.	
0290	7985000000-N	SP	GENERIC SIGNAL ITEM DMS	Lump Sum	L.S.	
0291	7985000000-N	SP	GENERIC SIGNAL ITEM NETWORK MANAGEMENT SOFTWARE	Lump Sum	L.S.	
0292	7985000000-N	SP	GENERIC SIGNAL ITEM OPEN/CLOSED DMS PANEL	Lump Sum	L.S.	
0293	7985000000-N	SP	GENERIC SIGNAL ITEM SCALE HOUSE WIM ELECTRONICS	Lump Sum	L.S.	
0294	7985000000-N	SP	GENERIC SIGNAL ITEM SYSTEM WARRANTY	Lump Sum	L.S.	
0295	7985000000-N	SP	GENERIC SIGNAL ITEM TRAINING	Lump Sum	L.S.	
0296	7990000000-E	SP	GENERIC SIGNAL ITEM DROP CABLE (6 FIBER)	1,819 LF		
0297	7990000000-E	SP	GENERIC SIGNAL ITEM ETHERNET CABLE	955 LF		
0298	7990000000-E	SP	GENERIC SIGNAL ITEM FOUR-WIRE COPPER FEEDER CONDUCTORS	2,536 LF		
0299	7990000000-E	SP	GENERIC SIGNAL ITEM LEAD-IN CABLE	228 LF		
0300	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (1, 2")	559 LF		
0301	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (2, 2")	5,649 LF		
0302	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (3, 2")	1,917 LF		
0303	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (4, 2")	85 LF		
0304	7992000000-E	SP	GENERIC SIGNAL ITEM DMS OVERHEAD FOOTINGS	8 CY		

County : Gaston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0305	8881000000-E	SP	GENERIC STRUCTURE ITEM CLASS AA CONCRETE (WEIGH BRIDGE - STATIC SCALE)	509 CY		
0306	8889000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATED REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	35,037 LB		
0307	8889000000-E	SP	GENERIC STRUCTURE ITEM REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	37,175 LB		
0308	8892000000-E	SP	GENERIC STRUCTURE ITEM GROOVING CONCRETE SLABS	6,422 SF		
			CULVERT ITEMS			
0309	8126000000-N	414	CULVERT EXCAVATION, STA ****** (153+40.68 -L-)	Lump Sum	L.S.	
0310	8133000000-E	414	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	170 TON		
0311	8196000000-E	420	CLASS A CONCRETE (CULVERT)	224.6 CY		
0312	8245000000-E	425	REINFORCING STEEL (CULVERT)	29,302 LB		
0313	8889000000-E	SP	GENERIC STRUCTURE ITEM POLYURETHANE GROUT INJECTION	12,500 LB		

Vendor 1 of 5: SLOAN CONSTRUCTION A DIVISION OF REEVES CONSTRUCTION COMPANY (3747)
Call Order 018 (Proposal: C203357)

Bid Information

County: GASTON
Address: 250 Plemmons Road
Duncan , SC , 29334
Signature Check: A_Scott_Fant_3747
Time Bid Received: March 18, 2014 01:33 PM
Amendment Count: 0

Bid Checksum: FD56E00D
Bid Total: $19,732,258.32
Items Total: $19,732,258.32
Time Total: $0.00

Bidding Errors:
None.

DBE Goal Set 12.0
DBE Goal Met 12.0

Vendor 1 of 5: SLOAN CONSTRUCTION A DIVISION OF REEVES CONSTRUCTION COMPANY (3747)
Call Order 018 (Proposal: C203357)

Bid Bond Information

Projects:		**Bond Maximum:**	
Counties:		**State of Incorporation:**	
Bond ID:	F71C-1JEJ-LJQH-47Y6	**Agency Execution Date:**	2/18/2014
Paid by Check:	No	**Surety Name:**	SurePathNetwork
Bond Percent:	5%	**Bond Agency Name:**	Liberty Mutual Insurance Company

Vendor 3747's Bid Information for Call 018, Letting L140318, 03/18/14

SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO (3747)
Call Order 018 (Proposal ID C203357)

LIST OF DBE PARTICIPANTS

VENDOR NUMBER	DBE NAME / ADDRESS	WORK CODE	TYPE OF WORK	CERT TYPE	AMOUNT	
3553 MB	DRIGGERS ELECTRIC & CONTROL CO 634 PHILLIP DAVIS DRIVE , CHARLOTTE, NC 28217			Sub	1,576,346.38	Committed
3080 WB	CURTIN TRUCKING & DRAINAGE, INC POST OFFICE BOX 38220 , CHARLOTTE, NC 282781003			Sub	266,590.00	Committed
12802 WB	NICKELSTON INDUSTRIES, INC. POST OFFICE BOX 133 , LAWSONVILLE, NC 27022			Sub	187,760.00	Committed
3765 WB	STAY ALERT SAFETY SERVICES INC POST OFFICE BOX 467 , KERNERSVILLE, NC 27285			Sub	101,971.85	Committed
5659 WB	SOUTHERN CONCRETE & CONSTRUCTIO P.O. BOX 1673 , ANDERSON, SC 29622			Sub	221,480.00	Committed
4247 WB	SEAL BROTHERS CONTRACTING LLC 131 W. CLEVE STREET , MOUNT AIRY, NC 27030			Sub	35,223.60	Committed
				TOTAL:	$2,389,371.83 12.11%	

Vendor 3747's Bid Information for Call 018, Letting L140318, 03/18/14

SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO (3747)
Call Order 018 (Proposal ID C203357)

Miscelleneous Data Info - Contractor Responses:

NON-COLLUSION AND DEBARMENT CERTIFICATION

Explanation of the prospective bidder that is unable to certify to any of the statements in this certification:

Explanation:
NOT ANSWERED
NOT ANSWERED
NOT ANSWERED
NOT ANSWERED

AWARD LIMITS ON MULTIPLE PROJECTS

By answering YES to this statement, the bidder acknowleges that they are using the award limits on multiple projects. No

It is the desire of the Bidder to be awarded contracts, the value of which will not exceed a total of NOT ANSWERED for those projects indicated herein, for which bids will be opened on (MM/DD/YY)

The Award Limits shall apply to the following projects:

Contract Number	County
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	

NOT ANSWERED
NOT ANSWERED

Bid Bond Data Info - Contractor Responses:
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BondID: F71C-1JEJ-LJQH-47Y6
Surety Registry Agency: SurePathNetwork
Verified?: Yes
Surety Agency: Liberty Mutual Insurance Company
Bond Execution Date: 2/18/2014
Bond Amount: $986,612.92 (Five Percent of Bid)

Contract ID: C203357 Project(s): IMS-085-1(106)3
Letting Date: 03-18-14 Call Order: 018
Bidder: 3747 - SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO

Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
Section 0001	ROADWAY ITEMS					
	Alt Group					
0001	0000100000-N MOBILIZATION	LUMP	LUMP		921,000.00	
0002	0000400000-N CONSTRUCTION SURVEYING	LUMP	LUMP		325,000.00	
0003	0000900000-N GENERIC MISCELLANEOUS ITEM INSPECTIONS BUILDING: COMPLETEGENERAL CONSTRUCTION & ALL SYSTEMS AS INDICATED	LUMP	LUMP		600,000.00	
0004	0000900000-N GENERIC MISCELLANEOUS ITEM SCALE BUILDING & SCALE BOOTH: COMPLETE GEN. CONST. & ALL SYSTEMS AS INDICATED	LUMP	LUMP		900,000.00	
0005	0001000000-E CLEARING & GRUBBING .. ACRE(S)	LUMP	LUMP		395,000.00	
0006	0008000000-E SUPPLEMENTARY CLEARING & GRUB-BING	3.000 ACR	5,000.00000		15,000.00	
0007	0022000000-E UNCLASSIFIED EXCAVATION	210,900.000 CY	4.40000		927,960.00	
0008	0036000000-E UNDERCUT EXCAVATION	3,500.000 CY	5.60000		19,600.00	
0009	0106000000-E BORROW EXCAVATION	225,000.000 CY	8.00000		1,800,000.00	

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0010	0134000000-E DRAINAGE DITCH EXCAVATION	1,840.000 CY	5.56000		10,230.40	
0011	0156000000-E REMOVAL OF EXISTING ASPHALT PAVEMENT	15,330.000 SY	3.00000		45,990.00	
0012	0192000000-N PROOF ROLLING	15.000 HR	310.00000		4,650.00	
0013	0195000000-E SELECT GRANULAR MATERIAL	3,500.000 CY	25.00000		87,500.00	
0014	0196000000-E GEOTEXTILE FOR SOIL STABILIZA-TION	8,900.000 SY	2.35000		20,915.00	
0015	0223000000-E ROCK PLATING	8,500.000 SY	60.00000		510,000.00	
0016	0318000000-E FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES	628.000 TON	35.00000		21,980.00	
0017	0320000000-E FOUNDATION CONDITIONING GEO-TEXTILE	2,080.000 SY	3.00000		6,240.00	
0018	0354000000-E ***" RC PIPE CULVERTS, CLASS ***** (12", V)	116.000 LF	35.00000		4,060.00	
0019	0354000000-E ***" RC PIPE CULVERTS, CLASS ***** (36", V)	272.000 LF	75.00000		20,400.00	
0020	0360000000-E 12" RC PIPE CULVERTS, CLASS III	488.000 LF	24.00000		11,712.00	
0021	0366000000-E 15" RC PIPE CULVERTS, CLASS III	3,368.000 LF	28.00000		94,304.00	

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0022	0372000000-E 18" RC PIPE CULVERTS, CLASS III	240.000 LF	34.00000		8,160.00	
0023	0378000000-E 24" RC PIPE CULVERTS, CLASS III	396.000 LF	48.68000		19,277.28	
0024	0384000000-E 30" RC PIPE CULVERTS, CLASS III	8.000 LF	86.00000		688.00	
0025	0390000000-E 36" RC PIPE CULVERTS, CLASS III	20.000 LF	66.00000		1,320.00	
0026	0396000000-E 42" RC PIPE CULVERTS, CLASS III	4.000 LF	185.00000		740.00	
0027	0426000000-E 72" RC PIPE CULVERTS, CLASS III	24.000 LF	180.00000		4,320.00	
0028	0448400000-E 24" RC PIPE CULVERTS, CLASS IV	120.000 LF	45.00000		5,400.00	
0029	0448500000-E 30" RC PIPE CULVERTS, CLASS IV	32.000 LF	72.00000		2,304.00	
0030	0546000000-E **" CAA PIPE CULVERTS, *****" THICK (4", 0.064")	56.000 LF	27.00000		1,512.00	
0031	0582000000-E 15" CS PIPE CULVERTS, 0.064" THICK	90.000 LF	33.00000		2,970.00	
0032	0588000000-E 18" CS PIPE CULVERTS, 0.064" THICK	520.000 LF	37.00000		19,240.00	
0033	0986000000-E GENERIC PIPE ITEM NCDOT APPROVED PIPE LINER	253.000 LF	1,275.00000		322,575.00	

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0034	0995000000-E PIPE REMOVAL	295.000 LF	22.75000		6,711.25	
0035	1011000000-N FINE GRADING	LUMP	LUMP		285,000.00	
0036	1044000000-E LIME TREATED SOIL (SLURRY METHOD)	29,870.000 SY	2.65000		79,155.50	
0037	1066000000-E LIME FOR LIME TREATED SOIL	300.000 TON	210.00000		63,000.00	
0038	1099500000-E SHALLOW UNDERCUT	1,500.000 CY	7.95000		11,925.00	
0039	1099700000-E CLASS IV SUBGRADE STABILIZA- TION	3,000.000 TON	16.15000		48,450.00	
0040	1110000000-E STABILIZER AGGREGATE	500.000 TON	16.00000		8,000.00	
0041	1115000000-E GEOTEXTILE FOR PAVEMENT STA- BILIZATION	4,000.000 SY	2.90000		11,600.00	
0042	1121000000-E AGGREGATE BASE COURSE	394.000 TON	15.90000		6,264.60	
0043	1176000000-E SOIL CEMENT BASE	29,870.000 SY	2.50000		74,675.00	
0044	1187000000-E PORTLAND CEMENT FOR SOIL CE- MENT BASE	822.000 TON	137.00000		112,614.00	
0045	1209000000-E ASPHALT CURING SEAL	8,970.000 GAL	2.60000		23,322.00	

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0046	1220000000-E INCIDENTAL STONE BASE	500.000 TON	23.00000		11,500.00	
0047	1330000000-E INCIDENTAL MILLING	800.000 SY	13.50000		10,800.00	
0048	1489000000-E ASPHALT CONC BASE COURSE, TYPE B25.0B	5,910.000 TON	52.10000		307,911.00	
0049	1491000000-E ASPHALT CONC BASE COURSE, TYPE B25.0C	12,190.000 TON	39.20000		477,848.00	
0050	1508000000-E ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0D	5,760.000 TON	39.10000		225,216.00	
0051	1524200000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5D	9,310.000 TON	39.10000		364,021.00	
0052	1525000000-E ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	2,480.000 TON	41.25000		102,300.00	
0053	1575000000-E ASPHALT BINDER FOR PLANT MIX	1,225.000 TON	610.00000		747,250.00	
0054	1577000000-E POLYMER MODIFIED ASPHALT BIN- DER FOR PLANT MIX	535.000 TON	785.00000		419,975.00	
0055	1693000000-E ASPHALT PLANT MIX, PAVEMENT REPAIR	300.000 TON	122.00000		36,600.00	
0056	1840000000-E MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	24,000.000 LF	0.19000		4,560.00	
0057	1858000000-E *****" PORT CEM CONC PAVEMENT,RAMPS (WITH DOWELS) (11-1/2")	41,250.000 SY	72.00000		2,970,000.00	

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0058	1891000000-E GENERIC PAVING ITEM NONWOVEN GEOTEXTILE INTERLAYER	11,000.000 SY	1.90000		20,900.00	
0059	1902000000-N SURFACE TESTING CONCRETE PAVE-MENT	LUMP	LUMP		20,500.00	
0060	1924000000-N FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	LUMP	LUMP		15,400.00	
0061	2000000000-N RIGHT OF WAY MARKERS	13.000 EA	350.00000		4,550.00	
0062	2022000000-E SUBDRAIN EXCAVATION	168.000 CY	14.00000		2,352.00	
0063	2033000000-E SUBDRAIN FINE AGGREGATE	168.000 CY	42.00000		7,056.00	
0064	2044000000-E 6" PERFORATED SUBDRAIN PIPE	1,000.000 LF	6.50000		6,500.00	
0065	2070000000-N SUBDRAIN PIPE OUTLET	2.000 EA	420.00000		840.00	
0066	2077000000-E 6" OUTLET PIPE	12.000 LF	6.50000		78.00	
0067	2099000000-E SHOULDER DRAIN	5,000.000 LF	7.25000		36,250.00	
0068	2110000000-E 4" SHOULDER DRAIN PIPE	5,000.000 LF	2.30000		11,500.00	
0069	2121000000-E 4" OUTLET PIPE FOR SHOULDER DRAINS	260.000 LF	15.35000		3,991.00	

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0070	2132000000-N CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	6.000 EA	270.00000		1,620.00	
0071	2143000000-E BLOTTING SAND	15.000 TON	70.00000		1,050.00	
0072	2209000000-E ENDWALLS	7.000 CY	1,110.00000		7,770.00	
0073	2253000000-E PIPE COLLARS	6.000 CY	655.00000		3,930.00	
0074	2264000000-E PIPE PLUGS	1.000 CY	655.00000		655.00	
0075	2286000000-N MASONRY DRAINAGE STRUCTURES	68.000 EA	960.00000		65,280.00	
0076	2297000000-E MASONRY DRAINAGE STRUCTURES	11.800 CY	1,110.00000		13,098.00	
0077	2308000000-E MASONRY DRAINAGE STRUCTURES	42.000 LF	192.00000		8,064.00	
0078	2364200000-N FRAME WITH TWO GRATES, STD 840.20	9.000 EA	495.00000		4,455.00	
0079	2365000000-N FRAME WITH TWO GRATES, STD 840.22	21.000 EA	745.00000		15,645.00	
0080	2366000000-N FRAME WITH TWO GRATES, STD 840.24	2.000 EA	755.00000		1,510.00	
0081	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	9.000 EA	520.00000		4,680.00	

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0082	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	5.000 EA	530.00000		2,650.00	
0083	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	9.000 EA	530.00000		4,770.00	
0084	2396000000-N FRAME WITH COVER, STD 840.54	3.000 EA	395.00000		1,185.00	
0085	2462000000-E **" SLUICE GATE (18")	2.000 EA	4,000.00000		8,000.00	
0086	2462000000-E **" SLUICE GATE (24")	1.000 EA	4,300.00000		4,300.00	
0087	2462000000-E **" SLUICE GATE (36")	1.000 EA	5,000.00000		5,000.00	
0088	2473000000-N GENERIC DRAINAGE ITEM OIL / WATER SEPARATOR	1.000 EA	88,000.00000		88,000.00	
0089	2535000000-E **"X **" CONCRETE CURB (9" X 18")	860.000 LF	20.25000		17,415.00	
0090	2542000000-E 1'-6" CONCRETE CURB & GUTTER	1,790.000 LF	18.20000		32,578.00	
0091	2549000000-E 2'-6" CONCRETE CURB & GUTTER	5,310.000 LF	20.25000		107,527.50	
0092	2591000000-E 4" CONCRETE SIDEWALK	230.000 SY	45.45000		10,453.50	
0093	2627000000-E 4" CONCRETE ISLAND COVER	250.000 SY	45.45000		11,362.50	

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0094	2724000000-E PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	80.000 LF	126.00000		10,080.00	
0095	2753000000-E GENERIC PAVING ITEM SPECIAL SHOULDER BERM GUTTER	1,963.000 LF	20.25000		39,750.75	
0096	2910000000-N CONVERT EXISTING TRAFFIC BEAR-ING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	1.000 EA	760.00000		760.00	
0097	3000000000-N IMPACT ATTENUATOR UNIT, TYPE 350	1.000 EA	13,130.00000		13,130.00	
0098	3030000000-E STEEL BM GUARDRAIL	8,550.000 LF	14.65000		125,257.50	
0099	3045000000-E STEEL BM GUARDRAIL, SHOP CURVED	750.000 LF	15.15000		11,362.50	
0100	3150000000-N ADDITIONAL GUARDRAIL POSTS	15.000 EA	25.25000		378.75	
0101	3165000000-N GUARDRAIL ANCHOR UNITS, TYPE ********** (350, TL-2)	2.000 EA	1,620.00000		3,240.00	
0102	3210000000-N GUARDRAIL ANCHOR UNITS, TYPE CAT-1	12.000 EA	430.00000		5,160.00	
0103	3270000000-N GUARDRAIL ANCHOR UNITS, TYPE 350	10.000 EA	1,720.00000		17,200.00	
0104	3285000000-N GUARDRAIL ANCHOR UNITS, TYPE M-350	2.000 EA	1,620.00000		3,240.00	

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0105	3317000000-N GUARDRAIL ANCHOR UNITS, TYPE B-77	4.000 EA	1,465.00000		5,860.00	
0106	3360000000-E REMOVE EXISTING GUARDRAIL	5,400.000 LF	0.95000		5,130.00	
0107	3503000000-E WOVEN WIRE FENCE, 47" FABRIC	10,270.000 LF	2.20000		22,594.00	
0108	3509000000-E 4" TIMBER FENCE POSTS, 7'-6" LONG	649.000 EA	15.15000		9,832.35	
0109	3515000000-E 5" TIMBER FENCE POSTS, 8'-0" LONG	155.000 EA	20.20000		3,131.00	
0110	3628000000-E RIP RAP, CLASS I	1,600.000 TON	49.50000		79,200.00	
0111	3656000000-E GEOTEXTILE FOR DRAINAGE	3,030.000 SY	1.90000		5,757.00	
0112	3659000000-N PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	2.000 EA	1,020.00000		2,040.00	
0113	4048000000-E REINFORCED CONCRETE SIGN FOUN-DATIONS	8.000 CY	810.00000		6,480.00	
0114	4054000000-E PLAIN CONCRETE SIGN FOUNDA-TIONS	2.000 CY	790.00000		1,580.00	
0115	4057000000-E OVERHEAD FOOTING	84.000 CY	760.00000		63,840.00	
0116	4060000000-E SUPPORTS, BREAKAWAY STEEL BEAM	7,812.000 LB	3.80000		29,685.60	

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0117	4066000000-E SUPPORTS, SIMPLE STEEL BEAM	1,207.000 LB	3.05000		3,681.35	
0118	4072000000-E SUPPORTS, 3-LB STEEL U-CHANNEL	1,034.000 LF	7.60000		7,858.40	
0119	4078000000-E SUPPORTS, 2-LB STEEL U-CHANNEL	2.000 EA	21.25000		42.50	
0120	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (107+50 -L-)	LUMP	LUMP		29,300.00	
0121	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (119+44 -L-)	LUMP	LUMP		56,600.00	
0122	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (135+90 -L-)	LUMP	LUMP		29,300.00	
0123	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (182+30 -L-)	LUMP	LUMP		31,350.00	
0124	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (AT 74 WEST EXIT)	LUMP	LUMP		31,850.00	
0125	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (NORTH OF 74 EAST EXIT)	LUMP	LUMP		31,850.00	
0126	4096000000-N SIGN ERECTION, TYPE D	22.000 EA	45.45000		999.90	

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0127	4102000000-N SIGN ERECTION, TYPE E	21.000 EA	45.45000		954.45	
0128	4108000000-N SIGN ERECTION, TYPE F	2.000 EA	202.00000		404.00	
0129	4109000000-N SIGN ERECTION, TYPE *** (OVER-HEAD) (A)	2.000 EA	2,626.00000		5,252.00	
0130	4109000000-N SIGN ERECTION, TYPE *** (OVER-HEAD) (B)	2.000 EA	404.00000		808.00	
0131	4110000000-N SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	12.000 EA	354.00000		4,248.00	
0132	4110000000-N SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	7.000 EA	177.00000		1,239.00	
0133	4114000000-N SIGN ERECTION, MILEMARKERS	2.000 EA	177.00000		354.00	
0134	4116100000-N SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (B)	2.000 EA	355.00000		710.00	
0135	4138000000-N DISPOSAL OF SUPPORT, STEEL BEAM	2.000 EA	75.75000		151.50	
0136	4149000000-N DISPOSAL OF SIGN SYSTEM, OVER-HEAD	3.000 EA	1,820.00000		5,460.00	
0137	4152000000-N DISPOSAL OF SIGN SYSTEM, STEELBEAM	2.000 EA	50.50000		101.00	
0138	4155000000-N DISPOSAL OF SIGN SYSTEM, U- CHANNEL	4.000 EA	5.05000		20.20	

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0139	4158000000-N DISPOSAL OF SIGN SYSTEM, WOOD	2.000 EA	20.20000		40.40	
0140	4234000000-N DISPOSAL OF SIGN, A OR B (OVERHEAD)	4.000 EA	101.00000		404.00	
0141	4400000000-E WORK ZONE SIGNS (STATIONARY)	683.000 SF	4.15000		2,834.45	
0142	4405000000-E WORK ZONE SIGNS (PORTABLE)	636.000 SF	8.95000		5,692.20	
0143	4410000000-E WORK ZONE SIGNS (BARRICADE MOUNTED)	40.000 SF	4.40000		176.00	
0144	4415000000-N FLASHING ARROW BOARD	3.000 EA	2,225.00000		6,675.00	
0145	4420000000-N PORTABLE CHANGEABLE MESSAGE SIGN	2.000 EA	7,975.00000		15,950.00	
0146	4430000000-N DRUMS	400.000 EA	47.80000		19,120.00	
0147	4435000000-N CONES	215.000 EA	17.70000		3,805.50	
0148	4445000000-E BARRICADES (TYPE III)	32.000 LF	14.05000		449.60	
0149	4465000000-N TEMPORARY CRASH CUSHIONS	3.000 EA	5,000.00000		15,000.00	
0150	4480000000-N TMA	3.000 EA	23,740.00000		71,220.00	

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0151	4485000000-E PORTABLE CONCRETE BARRIER	10,000.000 LF	19.15000		191,500.00	
0152	4510000000-N LAW ENFORCEMENT	150.000 HR	41.00000		6,150.00	
0153	4650000000-N TEMPORARY RAISED PAVEMENT MARKERS	650.000 EA	8.85000		5,752.50	
0154	4685000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (4", 90 MILS)	660.000 LF	0.75000		495.00	
0155	4688000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (6", 90 MILS)	23,823.000 LF	0.75000		17,867.25	
0156	4690000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (6", 120 MILS)	6,991.000 LF	0.80000		5,592.80	
0157	4700000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (12", 90 MILS)	3,107.000 LF	2.00000		6,214.00	
0158	4702000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (12", 120 MILS)	1,081.000 LF	2.80000		3,026.80	
0159	4721000000-E THERMOPLASTIC PAVEMENT MARKINGCHARACTER (120 MILS)	4.000 EA	65.70000		262.80	
0160	4725000000-E THERMOPLASTIC PAVEMENT MARKINGSYMBOL (90 MILS)	9.000 EA	147.00000		1,323.00	
0161	4810000000-E PAINT PAVEMENT MARKING LINES (4")	8,533.000 LF	0.21000		1,791.93	

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0162	4815000000-E PAINT PAVEMENT MARKING LINES (6")	107,600.000 LF	0.26000		27,976.00	
0163	4820000000-E PAINT PAVEMENT MARKING LINES (8")	1,020.000 LF	0.55000		561.00	
0164	4825000000-E PAINT PAVEMENT MARKING LINES (12")	72.000 LF	1.40000		100.80	
0165	4845000000-N PAINT PAVEMENT MARKING SYMBOL	2.000 EA	85.90000		171.80	
0166	4855000000-E REMOVAL OF PAVEMENT MARKING LINES (6")	53,000.000 LF	0.60000		31,800.00	
0167	4905000000-N SNOWPLOWABLE PAVEMENT MARKERS	478.000 EA	29.05000		13,885.90	
0168	5010000000-E 100' HIGH MOUNT STANDARD	3.000 EA	18,700.00000		56,100.00	
0169	5020000000-N PORTABLE DRIVE UNIT	1.000 EA	3,030.00000		3,030.00	
0170	5070000000-N STANDARD FOUNDATION ********* (R1)	12.000 EA	865.00000		10,380.00	
0171	5070000000-N STANDARD FOUNDATION ********* (R2)	3.000 EA	885.00000		2,655.00	
0172	5155000000-E ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	165.000 LF	14.15000		2,334.75	
0173	5155000000-E ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")	245.000 LF	18.20000		4,459.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0174	5155000000-E ELECTRICAL DUCT, TYPE BD, SIZE ***** (6")	325.000 LF	20.20000		6,565.00	
0175	5185000000-E ** #2 W/G FEEDER CIRCUIT (4)	770.000 LF	8.05000		6,198.50	
0176	5190000000-E ********** * FEEDER CIRCUIT (4 - #1 W/G)	1,275.000 LF	10.60000		13,515.00	
0177	5190000000-E ********** * FEEDER CIRCUIT (4 - #2/0 W/G)	1,335.000 LF	12.90000		17,221.50	
0178	5220000000-E ** #2 W/G FEEDER CIRCUIT IN *****" CONDUIT (4, 2)	8,210.000 LF	10.00000		82,100.00	
0179	5225000000-E ** #1 W/G FEEDER CIRCUIT IN *****" CONDUIT (4, 2)	6,825.000 LF	10.85000		74,051.25	
0180	5230000000-E ********** * FEEDER CIRCUIT IN** CONDUIT (4 - #2/0 W/G, 3")	3,215.000 LF	16.15000		51,922.25	
0181	5240000000-N ELECTRICAL JUNCTION BOXES ********** (PC30)	13.000 EA	660.00000		8,580.00	
0182	5240000000-N ELECTRICAL JUNCTION BOXES ********** (PC36)	9.000 EA	800.00000		7,200.00	
0183	5260000000-N GENERIC LIGHTING ITEM RAMP B PIT ELECTRICAL WORK	LUMP	LUMP		7,575.00	
0184	5260000000-N GENERIC LIGHTING ITEM RAMP B STATIC SCALE PLATFORM	LUMP	LUMP		110,915.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0185	5260000000-N GENERIC LIGHTING ITEM RAMP B STATIC SCALE SYSTEM	LUMP	LUMP		40,915.00	
0186	5260000000-N GENERIC LIGHTING ITEM RAMP C PIT ELECTRICAL WORK	LUMP	LUMP		7,575.00	
0187	5260000000-N GENERIC LIGHTING ITEM RAMP C STATIC SCALE PLATFORM	LUMP	LUMP		110,915.00	
0188	5260000000-N GENERIC LIGHTING ITEM RAMP C STATIC SCALE SYSTEM	LUMP	LUMP		40,915.00	
0189	5262000000-E GENERIC LIGHTING ITEM HIGH MOUNT FOUNDATIONS	21.000 CY	910.00000		19,110.00	
0190	5270000000-N GENERIC LIGHTING ITEM 1 POLE, 120VAC EQUIPMENT DIS-CONNECT	8.000 EA	303.00000		2,424.00	
0191	5270000000-N GENERIC LIGHTING ITEM 15KVA POWER TRANSFORMER	1.000 EA	3,290.00000		3,290.00	
0192	5270000000-N GENERIC LIGHTING ITEM 2 POLE, 240VAC EQUIPMENT DIS-CONNECT	1.000 EA	570.00000		570.00	
0193	5270000000-N GENERIC LIGHTING ITEM HIGH MOUNT LUMINAIRE - LED	18.000 EA	2,185.00000		39,330.00	
0194	5270000000-N GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE WS, 120/208V	1.000 EA	10,050.00000		10,050.00	
0195	5270000000-N GENERIC LIGHTING ITEM LIGHT STANDARD, TYPE MLTS, 35'MH, 6'SA	15.000 EA	2,425.00000		36,375.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0196	5270000000-N GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMINAIRE-LED	15.000 EA	1,065.00000		15,975.00	
0197	5691700000-E 18" SANITARY GRAVITY SEWER	554.000 LF	80.00000		44,320.00	
0198	5775000000-E 4' DIA UTILITY MANHOLE	2.000 EA	6,850.00000		13,700.00	
0199	5811000000-E ABANDON 18" UTILITY PIPE	570.000 LF	25.25000		14,392.50	
0200	5816000000-N ABANDON UTILITY MANHOLE	3.000 EA	1,560.00000		4,680.00	
0201	5836400000-E 36" ENCASEMENT PIPE	390.000 LF	350.00000		136,500.00	
0202	5872400000-E TRENCHLESS INSTALLATION OF 36"IN SOIL	160.000 LF	206.00000		32,960.00	
0203	5872410000-E TRENCHLESS INSTALLATION OF 36"NOT IN SOIL	160.000 LF	1,250.00000		200,000.00	
0204	6000000000-E TEMPORARY SILT FENCE	1,200.000 LF	1.50000		1,800.00	
0205	6006000000-E STONE FOR EROSION CONTROL, CLASS A	770.000 TON	38.00000		29,260.00	
0206	6009000000-E STONE FOR EROSION CONTROL, CLASS B	4,400.000 TON	42.00000		184,800.00	

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0207	6012000000-E SEDIMENT CONTROL STONE	2,935.000 TON	31.00000		90,985.00	
0208	6015000000-E TEMPORARY MULCHING	58.000 ACR	630.00000		36,540.00	
0209	6018000000-E SEED FOR TEMPORARY SEEDING	3,500.000 LB	3.05000		10,675.00	
0210	6021000000-E FERTILIZER FOR TEMPORARY SEED-ING	18.500 TON	800.00000		14,800.00	
0211	6024000000-E TEMPORARY SLOPE DRAINS	3,500.000 LF	11.25000		39,375.00	
0212	6029000000-E SAFETY FENCE	1,500.000 LF	1.15000		1,725.00	
0213	6030000000-E SILT EXCAVATION	16,200.000 CY	7.15000		115,830.00	
0214	6036000000-E MATTING FOR EROSION CONTROL	52,000.000 SY	1.05000		54,600.00	
0215	6037000000-E COIR FIBER MAT	650.000 SY	5.30000		3,445.00	
0216	6042000000-E 1/4" HARDWARE CLOTH	3,500.000 LF	2.45000		8,575.00	
0217	6070000000-N SPECIAL STILLING BASINS	4.000 EA	2,500.00000		10,000.00	
0218	6071010000-E WATTLE	3,400.000 LF	4.10000		13,940.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0219	6071020000-E POLYACRYLAMIDE (PAM)	1,875.000 LB	8.60000		16,125.00	
0220	6071030000-E COIR FIBER BAFFLE	4,200.000 LF	3.50000		14,700.00	
0221	6071050000-E **" SKIMMER (1-1/2")	14.000 EA	1,350.00000		18,900.00	
0222	6071050000-E **" SKIMMER (2")	4.000 EA	1,485.00000		5,940.00	
0223	6084000000-E SEEDING & MULCHING	60.000 ACR	1,340.00000		80,400.00	
0224	6087000000-E MOWING	20.000 ACR	81.00000		1,620.00	
0225	6090000000-E SEED FOR REPAIR SEEDING	600.000 LB	4.70000		2,820.00	
0226	6093000000-E FERTILIZER FOR REPAIR SEEDING	2.000 TON	810.00000		1,620.00	
0227	6096000000-E SEED FOR SUPPLEMENTAL SEEDING	1,425.000 LB	3.95000		5,628.75	
0228	6108000000-E FERTILIZER TOPDRESSING	42.750 TON	810.00000		34,627.50	
0229	6111000000-E IMPERVIOUS DIKE	270.000 LF	61.00000		16,470.00	
0230	6114500000-N SPECIALIZED HAND MOWING	70.000 MHR	56.00000		3,920.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0231	6117000000-N RESPONSE FOR EROSION CONTROL	100.000 EA	85.00000		8,500.00	
0232	7060000000-E SIGNAL CABLE	260.000 LF	3.80000		988.00	
0233	7279000000-E TRACER WIRE	7,955.000 LF	0.86000		6,841.30	
0234	7301000000-E DIRECTIONAL DRILL (**********) (1, 2")	115.000 LF	19.20000		2,208.00	
0235	7301000000-E DIRECTIONAL DRILL (**********) (2, 2")	620.000 LF	38.40000		23,808.00	
0236	7301000000-E DIRECTIONAL DRILL (**********) (4, 2")	45.000 LF	72.75000		3,273.75	
0237	7312000000-N JUNCTION BOX (**********) (SPECIAL-SIZED)	8.000 EA	707.00000		5,656.00	
0238	7324000000-N JUNCTION BOX (STANDARD SIZE)	32.000 EA	380.00000		12,160.00	
0239	7360000000-N WOOD POLE	1.000 EA	707.00000		707.00	
0240	7420000000-E 2" RISER WITH WEATHERHEAD	6.000 EA	380.00000		2,280.00	
0241	7444000000-E INDUCTIVE LOOP SAWCUT	458.000 LF	13.05000		5,976.90	
0242	7516000000-E COMMUNICATIONS CABLE (**FIBER) (36)	8,200.000 LF	12.85000		105,370.00	

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Line No.	Item Description	Approx. Quantity and Units	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Ct
0243	7540000000-N SPLICE ENCLOSURE	8.000 EA	990.00000		7,920.00	
0244	7552000000-N INTERCONNECT CENTER	12.000 EA	1,010.00000		12,120.00	
0245	7566000000-N DELINEATOR MARKER	16.000 EA	160.00000		2,560.00	
0246	7613000000-N SOIL TEST	9.000 EA	707.00000		6,363.00	
0247	7614100000-E DRILLED PIER FOUNDATION	45.000 CY	1,010.00000		45,450.00	
0248	7901000000-N CABINET BASE EXTENDER	3.000 EA	835.00000		2,505.00	
0249	7980000000-N GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	26.000 EA	55.55000		1,444.30	
0250	7980000000-N GENERIC SIGNAL ITEM AVI ANTENNA	6.000 EA	2,500.00000		15,000.00	
0251	7980000000-N GENERIC SIGNAL ITEM AVI READER	6.000 EA	4,165.00000		24,990.00	
0252	7980000000-N GENERIC SIGNAL ITEM BASE MOUNTED EQUIPMENT CABINET	3.000 EA	2,500.00000		7,500.00	
0253	7980000000-N GENERIC SIGNAL ITEM CCTV CABINET	5.000 EA	3,535.00000		17,675.00	
0254	7980000000-N GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	5.000 EA	3,435.00000		17,175.00	

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0255	7980000000-N GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY (FIXED MOUNT)	3.000 EA	1,700.00000		5,100.00	
0256	7980000000-N GENERIC SIGNAL ITEM CCTV WOOD POLE	5.000 EA	707.00000		3,535.00	
0257	7980000000-N GENERIC SIGNAL ITEM COMPUTER WORKSTATION (INSTALL)	4.000 EA	3,335.00000		13,340.00	
0258	7980000000-N GENERIC SIGNAL ITEM DIGITAL HARDWARE VIDEO ENCODER	8.000 EA	2,565.00000		20,520.00	
0259	7980000000-N GENERIC SIGNAL ITEM DMS PEDESTAL TYPE STRUCTURE	1.000 EA	22,930.00000		22,930.00	
0260	7980000000-N GENERIC SIGNAL ITEM ENCLOSED COMMUNICATIONS RACK	3.000 EA	3,780.00000		11,340.00	
0261	7980000000-N GENERIC SIGNAL ITEM EQUIPMENT CABINET FOUNDATION	3.000 EA	835.00000		2,505.00	
0262	7980000000-N GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	13.000 EA	1,515.00000		19,695.00	
0263	7980000000-N GENERIC SIGNAL ITEM JUNCTION BOX (OVER-SIZED)	27.000 EA	707.00000		19,089.00	
0264	7980000000-N GENERIC SIGNAL ITEM LANE CONTROL SIGNAL	4.000 EA	5,000.00000		20,000.00	
0265	7980000000-N GENERIC SIGNAL ITEM MANAGED ETHERNET SWITCH	1.000 EA	49,350.00000		49,350.00	
0266	7980000000-N GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM	5.000 EA	8,145.00000		40,725.00	

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0267	7980000000-N GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM DESIGN	5.000 EA	3,030.00000		15,150.00	
0268	7980000000-N GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE	2.000 EA	21,530.00000		43,060.00	
0269	7980000000-N GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE DESIGN	2.000 EA	1,010.00000		2,020.00	
0270	7980000000-N GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (OVER-HEAD)	1.000 EA	950.00000		950.00	
0271	7980000000-N GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (UNDER-GROUND)	1.000 EA	885.00000		885.00	
0272	7980000000-N GENERIC SIGNAL ITEM OVER-HEIGHT VEHICLE DETECTION SYSTEM	2.000 EA	14,650.00000		29,300.00	
0273	7980000000-N GENERIC SIGNAL ITEM PATCH PANEL (ETHERNET)	12.000 EA	720.00000		8,640.00	
0274	7980000000-N GENERIC SIGNAL ITEM PIEZOELECTRIC AXLE SENSOR	6.000 EA	1,670.00000		10,020.00	
0275	7980000000-N GENERIC SIGNAL ITEM PIEZOELECTRIC QUARTZ SENSOR SET	6.000 EA	7,325.00000		43,950.00	
0276	7980000000-N GENERIC SIGNAL ITEM POLE MOUNTED EQUIPMENT CABINET	5.000 EA	1,515.00000		7,575.00	

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0277	7980000000-N GENERIC SIGNAL ITEM PRINTER (INSTALL)	1.000 EA	2,930.00000		2,930.00	
0278	7980000000-N GENERIC SIGNAL ITEM SERVER (INSTALL)	2.000 EA	2,525.00000		5,050.00	
0279	7980000000-N GENERIC SIGNAL ITEM SERVICE DISCONNECT	4.000 EA	335.00000		1,340.00	
0280	7980000000-N GENERIC SIGNAL ITEM SPLICE CENTER (36-FIBER)	1.000 EA	2,930.00000		2,930.00	
0281	7980000000-N GENERIC SIGNAL ITEM STEEL PEDESTAL POLE	3.000 EA	9,270.00000		27,810.00	
0282	7980000000-N GENERIC SIGNAL ITEM UPS	6.000 EA	835.00000		5,010.00	
0283	7980000000-N GENERIC SIGNAL ITEM VEHICLE SIGNAL HEAD (12". 2-SECTION, RED-GREEN)	6.000 EA	2,600.00000		15,600.00	
0284	7980000000-N GENERIC SIGNAL ITEM WALL-MOUNTED COMMUNICATIONS RACK	1.000 EA	3,780.00000		3,780.00	
0285	7985000000-N GENERIC SIGNAL ITEM ADVANCE LOCATION WIM ELECTRON-ICS	LUMP	LUMP		139,400.00	
0286	7985000000-N GENERIC SIGNAL ITEM ALPR SYSTEM	LUMP	LUMP		78,800.00	
0287	7985000000-N GENERIC SIGNAL ITEM CCTV SOFTWARE	LUMP	LUMP		7,080.00	

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0288	7985000000-N GENERIC SIGNAL ITEM CENTRAL CONTROL SOFTWARE	LUMP	LUMP		14,650.00	
0289	7985000000-N GENERIC SIGNAL ITEM COMPLIANCE LOCATION WIM ELEC-TRONICS	LUMP	LUMP		139,400.00	
0290	7985000000-N GENERIC SIGNAL ITEM DMS	LUMP	LUMP		91,600.00	
0291	7985000000-N GENERIC SIGNAL ITEM NETWORK MANAGEMENT SOFTWARE	LUMP	LUMP		10,355.00	
0292	7985000000-N GENERIC SIGNAL ITEM OPEN/CLOSED DMS PANEL	LUMP	LUMP		8,335.00	
0293	7985000000-N GENERIC SIGNAL ITEM SCALE HOUSE WIM ELECTRONICS	LUMP	LUMP		139,400.00	
0294	7985000000-N GENERIC SIGNAL ITEM SYSTEM WARRANTY	LUMP	LUMP		36,400.00	
0295	7985000000-N GENERIC SIGNAL ITEM TRAINING	LUMP	LUMP		8,335.00	
0296	7990000000-E GENERIC SIGNAL ITEM DROP CABLE (6 FIBER)	1,819.000 LF	10.10000		18,371.90	
0297	7990000000-E GENERIC SIGNAL ITEM ETHERNET CABLE	955.000 LF	0.15000		143.25	
0298	7990000000-E GENERIC SIGNAL ITEM FOUR-WIRE COPPER FEEDER CON-DUCTORS	2,536.000 LF	12.55000		31,826.80	

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0299	7990000000-E GENERIC SIGNAL ITEM LEAD-IN CABLE	228.000 LF	3.05000		695.40	
0300	7990000000-E GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (1, 2")	559.000 LF	7.10000		3,968.90	
0301	7990000000-E GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (2, 2")	5,649.000 LF	8.59000		48,524.91	
0302	7990000000-E GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (3, 2")	1,917.000 LF	10.10000		19,361.70	
0303	7990000000-E GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (4, 2")	85.000 LF	18.20000		1,547.00	
0304	7992000000-E GENERIC SIGNAL ITEM DMS OVERHEAD FOOTINGS	8.000 CY	1,010.00000		8,080.00	
0305	8881000000-E GENERIC STRUCTURE ITEM CLASS AA CONCRETE (WEIGH BRIDGE - STATIC SCALE)	509.000 CY	795.00000		404,655.00	
0306	8889000000-E GENERIC STRUCTURE ITEM EPOXY COATED REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	35,037.000 LB	0.85000		29,781.45	
0307	8889000000-E GENERIC STRUCTURE ITEM REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	37,175.000 LB	1.15000		42,751.25	
0308	8892000000-E GENERIC STRUCTURE ITEM GROOVING CONCRETE SLABS	6,422.000 SF	2.55000		16,376.10	
	Section 0001 Total				19,403,082.92	

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Section 0002	CULVERT ITEMS					
	Alt Group					
0309	8126000000-N CULVERT EXCAVATION, STA ****** (153+40.68 -L-)	LUMP	LUMP		2,550.00	
0310	8133000000-E FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	170.000 TON	35.35000		6,009.50	
0311	8196000000-E CLASS A CONCRETE (CULVERT)	224.600 CY	503.00000		112,973.80	
0312	8245000000-E REINFORCING STEEL (CULVERT)	29,302.000 LB	1.05000		30,767.10	
0313	8889000000-E GENERIC STRUCTURE ITEM POLYURETHANE GROUT INJECTION	12,500.000 LB	14.15000		176,875.00	
	Section 0002 Total				329,175.40	
	Bid Total				19,732,258.32	

NON-COLLUSION AND DEBARMENT CERTIFICATION

The bidder certifies that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with this bid, and that the bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor. In addition, submitting this electronic bid constitutes the bidder's certification of Status under penalty of perjury under the laws of the United States and in accordance with the Debarment Certification on file with the Department.

By submitting this bid, the bidder certifies to the best of his knowledge and belief that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the prospective bidder is unable to certify to any of the statements in this certification, the bidder shall submit an explanation in the blanks provided herein. The explanation will not necessarily result in denial of participation in a contract.

Explanation:
NOT ANSWERED
NOT ANSWERED
NOT ANSWERED
NOT ANSWERED

If the prequalified bidder's status changes, he shall immediately submit a new fully executed non-collusion affidavit and debarment certification with an explanation of the change to the Contract Office prior to submitting the bid.

Failure to furnish a certification or an explanation will be grounds for rejection of a bid

AWARD LIMITS ON MULTIPLE PROJECTS

By answering YES to this statement, the bidder acknowleges that they are using the award limits on multiple projects. No

A bidder who desires to bid on more than one project on which bids are to be opened on the same date, and who also desires to avoid receiving an award of more projects than he is equipped to handle, may bid on any number of projects but may limit the total amount of work awarded to him on selected projects by completing the AWARD LIMITS ON MULTIPLE PROJECTS.

The Award Limits on Multiple Projects must be filled in on each project bid for which the Bidder desires protection.

It is the desire of the Bidder to be awarded contracts, the value of which

will not exceed a total of NOT ANSWERED for those

projects indicated herein, for which bids will be opened on (MM/DD/YY)

The Award Limits shall apply to the following projects:

Contract Number	County
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	
NOT ANSWERED	

It is agreed that if I am (we are) the low Bidder(s) on indicated projects, the total value of which is more than the above stipulated award limits, the Board of Transportation will award me (us) projects from among those indicated that have a total value not to exceed the award limit and will result in the lowest total bids to the Department of Transportation.

PROPOSAL: C203357
LETTING: L140318 CALL: 018
VENDOR: 3747 SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO

LINE NO.	ITEM NO.	ITEM DESC.	UNIT TYPE	SUBCONTRACTOR QUANTITY	SUBCONTRACTOR UNIT PRICE	EXTENDED AMOUNT
DBE SUBCONTRACTOR: 3553 DRIGGERS ELECTRIC & CONTROL CO						
Will Use Quote: Yes						
0113	4048000000-E	REINF CONC F	CY	8.000	800.00000	6400.00
0114	4054000000-E	PLN CONC FOU	CY	2.000	780.00000	1560.00
0115	4057000000-E	OVERHEAD FOO	CY	84.000	750.00000	63000.00
0116	4060000000-E	SUPPORT, BRE	LB	7812.000	3.75000	29295.00
0117	4066000000-E	SUPPORTS, SI	LB	1207.000	3.00000	3621.00
0118	4072000000-E	SUPPORT, 3-L	LF	1034.000	7.50000	7755.00
0119	4078000000-E	SUPPORT, 2-L	EA	2.000	21.00000	42.00
0120	4082100000-N	SUPPORT, OVR	LS	1.000	29000.00000	29000.00
0121	4082100000-N	SUPPORT, OVR	LS	1.000	56000.00000	56000.00
0122	4082100000-N	SUPPORT, OVR	LS	1.000	29000.00000	29000.00
0123	4082100000-N	SUPPORT, OVR	LS	1.000	31000.00000	31000.00
0124	4082100000-N	SUPPORT, OVR	LS	1.000	31500.00000	31500.00
0125	4082100000-N	SUPPORT, OVR	LS	1.000	31500.00000	31500.00
0126	4096000000-N	SIGN ERECTIO	EA	22.000	45.00000	990.00
0127	4102000000-N	SIGN ERECTIO	EA	21.000	45.00000	945.00
0128	4108000000-N	SIGN ERECTIO	EA	2.000	200.00000	400.00
0129	4109000000-N	SIGN ERECTIO	EA	2.000	2600.00000	5200.00
0130	4109000000-N	SIGN ERECTIO	EA	2.000	400.00000	800.00
0131	4110000000-N	SIGN ERECTIO	EA	12.000	350.00000	4200.00
0132	4110000000-N	SIGN ERECTIO	EA	7.000	175.00000	1225.00
0133	4114000000-N	SIGN ERECTIO	EA	2.000	175.00000	350.00
0134	4116100000-N	SIGN ERECT,	EA	2.000	350.00000	700.00
0135	4138000000-N	DISPOSE SUPP	EA	2.000	75.00000	150.00
0136	4149000000-N	DISPOSE SIGN	EA	3.000	1800.00000	5400.00
0137	4152000000-N	DISPOSE SIGN	EA	2.000	50.00000	100.00
0138	4155000000-N	DISPOSE SIGN	EA	4.000	5.00000	20.00
0139	4158000000-N	DISPOSE SIGN	EA	2.000	20.00000	40.00
0140	4234000000-N	DISPOSE SIGN	EA	4.000	100.00000	400.00
0168	5010000000-E	100' HIGH MO	EA	3.000	18500.00000	55500.00
0169	5020000000-N	PORTABLE DRI	EA	1.000	3000.00000	3000.00
0170	5070000000-N	STD FOUNDAT	EA	12.000	850.00000	10200.00
0171	5070000000-N	STD FOUNDAT	EA	3.000	875.00000	2625.00
0172	5155000000-E	ELECT DUCT B	LF	165.000	14.00000	2310.00
0173	5155000000-E	ELECT DUCT B	LF	245.000	18.00000	4410.00
0174	5155000000-E	ELECT DUCT B	LF	325.000	20.00000	6500.00
0175	5185000000-E	**-#2 W/G FE	LF	770.000	7.95000	6121.50
0176	5190000000-E	**********	LF	1275.000	10.50000	13387.50
0177	5190000000-E	**********	LF	1335.000	12.75000	17021.25
0178	5220000000-E	**-#2 W/G FE	LF	8210.000	9.90000	81279.00
0179	5225000000-E	**-#1 W/G FE	LF	6825.000	10.75000	73368.75
0180	5230000000-E	**********	LF	3215.000	16.00000	51440.00
0181	5240000000-N	ELEC JB ****	EA	13.000	650.00000	8450.00
0182	5240000000-N	ELEC JB ****	EA	9.000	790.00000	7110.00
0186	5260000000-N	GENERIC LIGH	LS	1.000	7500.00000	7500.00

PROPOSAL: C203357
LETTING: L140318 CALL: 018
VENDOR: 3747 SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO

LINE NO.	ITEM NO.	ITEM DESC.	UNIT TYPE	SUBCONTRACTOR QUANTITY	SUBCONTRACTOR UNIT PRICE	EXTENDED AMOUNT
0189	5262000000-E	GENERIC LIGH	CY	21.000	900.00000	18900.00
0190	5270000000-N	GENERIC LIGH	EA	8.000	300.00000	2400.00
0191	5270000000-N	GENERIC LIGH	EA	1.000	3255.00000	3255.00
0192	5270000000-N	GENERIC LIGH	EA	1.000	565.00000	565.00
0193	5270000000-N	GENERIC LIGH	EA	18.000	2163.00000	38934.00
0194	5270000000-N	GENERIC LIGH	EA	1.000	9950.00000	9950.00
0195	5270000000-N	GENERIC LIGH	EA	15.000	2400.00000	36000.00
0196	5270000000-N	GENERIC LIGH	EA	15.000	1055.00000	15825.00
0232	7060000000-E	SIGNAL CABLE	LF	260.000	3.75000	975.00
0233	7279000000-E	TRACER WIRE	LF	7955.000	0.85000	6761.75
0237	7312000000-N	JUNCTION BOX	EA	8.000	700.00000	5600.00
0238	7324000000-N	JUNCTION BOX	EA	32.000	375.00000	12000.00
0239	7360000000-N	WOOD POLE	EA	1.000	700.00000	700.00
0240	7420000000-E	2" RISER WIT	EA	6.000	375.00000	2250.00
0242	7516000000-E	COMMUNICATIO	LF	8200.000	12.70000	104140.00
0245	7566000000-N	DELINEATOR M	EA	16.000	155.00000	2480.00
0246	7613000000-N	SOIL TEST	EA	9.000	700.00000	6300.00
0247	7614100000-E	DRILLED PIER	CY	45.000	1000.00000	45000.00
0248	7901000000-N	CABINET BASE	EA	3.000	825.00000	2475.00
0249	7980000000-N	GENERIC SIGN	EA	26.000	55.00000	1430.00
0252	7980000000-N	GENERIC SIGN	EA	3.000	2475.00000	7425.00
0253	7980000000-N	GENERIC SIGN	EA	5.000	3500.00000	17500.00
0254	7980000000-N	GENERIC SIGN	EA	5.000	3400.00000	17000.00
0255	7980000000-N	GENERIC SIGN	EA	3.000	1680.00000	5040.00
0256	7980000000-N	GENERIC SIGN	EA	5.000	700.00000	3500.00
0259	7980000000-N	GENERIC SIGN	EA	1.000	22700.00000	22700.00
0260	7980000000-N	GENERIC SIGN	EA	3.000	3740.00000	11220.00
0261	7980000000-N	GENERIC SIGN	EA	3.000	825.00000	2475.00
0263	7980000000-N	GENERIC SIGN	EA	27.000	700.00000	18900.00
0266	7980000000-N	GENERIC SIGN	EA	5.000	8062.00000	40310.00
0267	7980000000-N	GENERIC SIGN	EA	5.000	3000.00000	15000.00
0268	7980000000-N	GENERIC SIGN	EA	2.000	21315.00000	42630.00
0269	7980000000-N	GENERIC SIGN	EA	2.000	1000.00000	2000.00
0270	7980000000-N	GENERIC SIGN	EA	1.000	940.00000	940.00
0271	7980000000-N	GENERIC SIGN	EA	1.000	875.00000	875.00
0276	7980000000-N	GENERIC SIGN	EA	5.000	1500.00000	7500.00
0279	7980000000-N	GENERIC SIGN	EA	4.000	330.00000	1320.00
0281	7980000000-N	GENERIC SIGN	EA	3.000	9174.00000	27522.00
0283	7980000000-N	GENERIC SIGN	EA	6.000	2570.00000	15420.00
0284	7980000000-N	GENERIC SIGN	EA	1.000	3740.00000	3740.00
0290	7985000000-N	GENERIC SIGN	LS	1.000	90668.00000	90668.00
0292	7985000000-N	GENERIC SIGN	LS	1.000	8250.00000	8250.00
0296	7990000000-E	GENERIC SIGN	LF	1819.000	10.00000	18190.00
0297	7990000000-E	GENERIC SIGN	LF	955.000	0.15000	143.25
0298	7990000000-E	GENERIC SIGN	LF	2536.000	12.40000	31446.40
0299	7990000000-E	GENERIC SIGN	LF	228.000	3.00000	684.00
0300	7990000000-E	GENERIC SIGN	LF	559.000	7.00000	3913.00

PROPOSAL: C203357
LETTING: L140318 CALL: 018
VENDOR: 3747 SLOAN CONSTRUCTION A DIV OF REEVES CONSTRUCTION CO

LINE NO.	ITEM NO.	ITEM DESC.	UNIT TYPE	SUBCONTRACTOR QUANTITY	SUBCONTRACTOR UNIT PRICE	EXTENDED AMOUNT
0301	7990000000-E	GENERIC SIGN	LF	5649.000	8.50000	48016.50
0302	7990000000-E	GENERIC SIGN	LF	1917.000	10.00000	19170.00
0303	7990000000-E	GENERIC SIGN	LF	85.000	18.00000	1530.00
0304	7992000000-E	GENERIC SIGN	CY	8.000	1000.00000	8000.00
0001	0000100000-N	MOBILIZATION	LS	1.000	76561.48000	76561.48

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 1,576,346.38 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 1,576,3

DBE SUBCONTRACTOR: 3080 CURTIN TRUCKING & DRAINAGE, INC.
Will Use Quote: Yes

0094	2724000000-E	PC REINF BAR	LF	80.000	125.00000	10000.00
0149	4465000000-N	TEMPORARY CR	EA	3.000	4950.00000	14850.00
0151	4485000000-E	PORT CONC BA	LF	10000.000	18.95000	189500.00
0067	2099000000-E	SHOULDER DRA	LF	5000.000	7.10000	35500.00
0068	2110000000-E	4" SHOULDER	LF	5000.000	2.25000	11250.00
0069	2121000000-E	4" OUTLET PI	LF	260.000	15.00000	3900.00
0070	2132000000-N	CONC PAD SHL	EA	6.000	265.00000	1590.00

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 266,590.00 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 266,590

DBE SUBCONTRACTOR: 12802 NICKELSTON INDUSTRIES, INC.
Will Use Quote: Yes

0097	3000000000-N	IMPACT ATTEM	EA	1.000	13000.00000	13000.00
0098	3030000000-E	STL BM GUARD	LF	8550.000	14.50000	123975.00
0099	3045000000-E	SBGR SHOP CU	LF	750.000	15.00000	11250.00
0100	3150000000-N	ADDIT GUARDR	EA	15.000	25.00000	375.00
0101	3165000000-N	GR ANCHOR TY	EA	2.000	1600.00000	3200.00
0102	3210000000-N	GR ANCHOR TY	EA	12.000	425.00000	5100.00
0103	3270000000-N	GR ANCHOR TY	EA	10.000	1700.00000	17000.00
0104	3285000000-N	GR ANCHOR TY	EA	2.000	1600.00000	3200.00
0105	3317000000-N	GR ANCHOR TY	EA	4.000	1450.00000	5800.00
0106	3360000000-E	REMOVE EXIST	LF	5400.000	0.90000	4860.00

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 187,760.00 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 187,760

DBE SUBCONTRACTOR: 3765 STAY ALERT SAFETY SERVICES INC
Will Use Quote: Yes

0141	4400000000-E	WORK ZONE SI	SF	683.000	4.15000	2834.45
0142	4405000000-E	WORK ZONE SI	SF	636.000	8.85000	5628.60
0143	4410000000-E	WORK ZONE SI	SF	40.000	4.35000	174.00
0144	4415000000-N	FLASHING ARR	EA	3.000	2200.00000	6600.00

LINE NO.	ITEM NO.	ITEM DESC.	UNIT TYPE	SUBCONTRACTOR QUANTITY	SUBCONTRACTOR UNIT PRICE	EXTENDED AMOUNT
0145	4420000000-N	PORTABLE CHA	EA	2.000	7895.00000	15790.00
0148	4445000000-E	BARRICADES (	LF	32.000	13.90000	444.80
0150	4480000000-N	TMA	EA	3.000	23500.00000	70500.00

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 101,971.80 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 101,971

DBE SUBCONTRACTOR: 5659 SOUTHERN CONCRETE & CONSTRUCTION INC
Will Use Quote: Yes

0089	2535000000-E	***X*** CONC	LF	860.000	20.00000	17200.00
0090	2542000000-E	1'-6" CONC C	LF	1790.000	18.00000	32220.00
0091	2549000000-E	2'-6" CONC C	LF	5310.000	20.00000	106200.00
0092	2591000000-E	4" CONCRETE	SY	230.000	45.00000	10350.00
0093	2627000000-E	4" CONC ISLA	SY	250.000	45.00000	11250.00
0095	2753000000-E	GENERIC PAVI	LF	1963.000	20.00000	39260.00
0001	0000100000-N	MOBILIZATION	LS	1.000	5000.00000	5000.00

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 221,480.00 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 221,480

DBE SUBCONTRACTOR: 4247 SEAL BROTHERS CONTRACTING LLC
Will Use Quote: Yes

0107	3503000000-E	WOVEN WIRE F	LF	10270.000	2.18000	22388.60
0108	3509000000-E	4" TIMBER PO	EA	649.000	15.00000	9735.00
0109	3515000000-E	5" TIMBER PO	EA	155.000	20.00000	3100.00

DBE COMMITMENT TOTAL FOR SUBCONTRACTOR: 35,223.60 Committed
DBE COMMITMENT TOTAL FOR VENDOR (SubContractor) 35,223.

TOTAL DBE COMMITMENT FOR VENDOR: Entered: 12.11% or 2309371.83
Required: 12.00% or 2367871.00
<GOAL MET>

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum LS	921,000.00	921,000.00
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum LS	325,000.00	325,000.00
0003	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM INSPECTIONS BUILDING: COMPLETE GENERAL CONSTRUCTION & ALL SYSTEMS AS INDICATED	Lump Sum LS	600,000.00	600,000.00
0004	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM SCALE BUILDING & SCALE BOOTH: COMPLETE GEN. CONST. & ALL SYSTEMS AS INDICATED	Lump Sum LS	900,000.00	900,000.00
0005	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum LS	395,000.00	395,000.00
0006	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	3 ACR	5,000.00	15,000.00
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	210,900 CY	4.40	927,960.00
0008	0036000000-E	225	UNDERCUT EXCAVATION	3,500 CY	5.60	19,600.00
0009	0106000000-E	230	BORROW EXCAVATION	225,000 CY	8.00	1,800,000.00
0010	0134000000-E	240	DRAINAGE DITCH EXCAVATION	1,840 CY	5.56	10,230.40
0011	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	15,330 SY	3.00	45,990.00
0012	0192000000-N	260	PROOF ROLLING	15 HR	310.00	4,650.00
0013	0195000000-E	265	SELECT GRANULAR MATERIAL	3,500 CY	25.00	87,500.00
0014	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	8,900 SY	2.35	20,915.00
0015	0223000000-E	275	ROCK PLATING	8,500 SY	60.00	510,000.00
0016	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	628 TON	35.00	21,980.00
0017	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	2,080 SY	3.00	6,240.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0018	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (12", V)	116 LF	35.00	4,060.00
0019	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (36", V)	272 LF	75.00	20,400.00
0020	0360000000-E	310	12" RC PIPE CULVERTS, CLASS III	488 LF	24.00	11,712.00
0021	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	3,368 LF	28.00	94,304.00
0022	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	240 LF	34.00	8,160.00
0023	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	396 LF	48.68	19,277.28
0024	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	8 LF	86.00	688.00
0025	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	20 LF	66.00	1,320.00
0026	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	4 LF	185.00	740.00
0027	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	24 LF	180.00	4,320.00
0028	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	120 LF	45.00	5,400.00
0029	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	32 LF	72.00	2,304.00
0030	0546000000-E	310	**" CAA PIPE CULVERTS, *****" THICK (4", 0.064")	56 LF	27.00	1,512.00
0031	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	90 LF	33.00	2,970.00
0032	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	520 LF	37.00	19,240.00
0033	0986000000-E	SP	GENERIC PIPE ITEM NCDOT APPROVED PIPE LINER	253 LF	1,275.00	322,575.00

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0034	0995000000-E	340	PIPE REMOVAL	295 LF	22.75	6,711.25
0035	1011000000-N	500	FINE GRADING	Lump Sum LS	285,000.00	285,000.00
0036	1044000000-E	501	LIME TREATED SOIL (SLURRY METHOD)	29,870 SY	2.65	79,155.50
0037	1066000000-E	501	LIME FOR LIME TREATED SOIL	300 TON	210.00	63,000.00
0038	1099500000-E	505	SHALLOW UNDERCUT	1,500 CY	7.95	11,925.00
0039	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	3,000 TON	16.15	48,450.00
0040	1110000000-E	510	STABILIZER AGGREGATE	500 TON	16.00	8,000.00
0041	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	4,000 SY	2.90	11,600.00
0042	1121000000-E	520	AGGREGATE BASE COURSE	394 TON	15.90	6,264.60
0043	1176000000-E	542	SOIL CEMENT BASE	29,870 SY	2.50	74,675.00
0044	1187000000-E	542	PORTLAND CEMENT FOR SOIL CEMENT BASE	822 TON	137.00	112,614.00
0045	1209000000-E	543	ASPHALT CURING SEAL	8,970 GAL	2.60	23,322.00
0046	1220000000-E	545	INCIDENTAL STONE BASE	500 TON	23.00	11,500.00
0047	1330000000-E	607	INCIDENTAL MILLING	800 SY	13.50	10,800.00
0048	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	5,910 TON	52.10	307,911.00
0049	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	12,190 TON	39.20	477,848.00
0050	1508000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0D	5,760 TON	39.10	225,216.00
0051	1524200000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5D	9,310 TON	39.10	364,021.00
0052	1525000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	2,480 TON	41.25	102,300.00

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0053	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	1,225 TON	610.00	747,250.00
0054	1577000000-E	620	POLYMER MODIFIED ASPHALT BIN-DER FOR PLANT MIX	535 TON	785.00	419,975.00
0055	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	300 TON	122.00	36,600.00
0056	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	24,000 LF	0.19	4,560.00
0057	1858000000-E	710	******" PORT CEM CONC PAVEMENT, RAMPS (WITH DOWELS) (11-1/2")	41,250 SY	72.00	2,970,000.00
0058	1891000000-E	SP	GENERIC PAVING ITEM NONWOVEN GEOTEXTILE INTERLAYER	11,000 SY	1.90	20,900.00
0059	1902000000-N	710	SURFACE TESTING CONCRETE PAVE-MENT	Lump Sum LS	20,500.00	20,500.00
0060	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum LS	15,400.00	15,400.00
0061	2000000000-N	806	RIGHT OF WAY MARKERS	13 EA	350.00	4,550.00
0062	2022000000-E	815	SUBDRAIN EXCAVATION	168 CY	14.00	2,352.00
0063	2033000000-E	815	SUBDRAIN FINE AGGREGATE	168 CY	42.00	7,056.00
0064	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	1,000 LF	6.50	6,500.00
0065	2070000000-N	815	SUBDRAIN PIPE OUTLET	2 EA	420.00	840.00
0066	2077000000-E	815	6" OUTLET PIPE	12 LF	6.50	78.00
0067	2099000000-E	816	SHOULDER DRAIN	5,000 LF	7.25	36,250.00
0068	2110000000-E	816	4" SHOULDER DRAIN PIPE	5,000 LF	2.30	11,500.00
0069	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	260 LF	15.35	3,991.00
0070	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	6 EA	270.00	1,620.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0071	2143000000-E	818	BLOTTING SAND	15 TON	70.00	1,050.00
0072	2209000000-E	838	ENDWALLS	7 CY	1,110.00	7,770.00
0073	2253000000-E	840	PIPE COLLARS	6 CY	655.00	3,930.00
0074	2264000000-E	840	PIPE PLUGS	1 CY	655.00	655.00
0075	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	68 EA	960.00	65,280.00
0076	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	11.8 CY	1,110.00	13,098.00
0077	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	42 LF	192.00	8,064.00
0078	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	9 EA	495.00	4,455.00
0079	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	21 EA	745.00	15,645.00
0080	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	2 EA	755.00	1,510.00
0081	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	9 EA	520.00	4,680.00
0082	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	5 EA	530.00	2,650.00
0083	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	9 EA	530.00	4,770.00
0084	2396000000-N	840	FRAME WITH COVER, STD 840.54	3 EA	395.00	1,185.00
0085	2462000000-E	SP	**" SLUICE GATE (18")	2 EA	4,000.00	8,000.00
0086	2462000000-E	SP	**" SLUICE GATE (24")	1 EA	4,300.00	4,300.00
0087	2462000000-E	SP	**" SLUICE GATE (36")	1 EA	5,000.00	5,000.00
0088	2473000000-N	SP	GENERIC DRAINAGE ITEM OIL / WATER SEPARATOR	1 EA	88,000.00	88,000.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0089	2535000000-E	846	**"X **" CONCRETE CURB (9" X 18")	860 LF	20.25	17,415.00
0090	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	1,790 LF	18.20	32,578.00
0091	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	5,310 LF	20.25	107,527.50
0092	2591000000-E	848	4" CONCRETE SIDEWALK	230 SY	45.45	10,453.50
0093	2627000000-E	852	4" CONCRETE ISLAND COVER	250 SY	45.45	11,362.50
0094	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	80 LF	126.00	10,080.00
0095	2753000000-E	846	GENERIC PAVING ITEM SPECIAL SHOULDER BERM GUTTER	1,963 LF	20.25	39,750.75
0096	2910000000-N	SP	CONVERT EXISTING TRAFFIC BEARING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	1 EA	760.00	760.00
0097	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	1 EA	13,130.00	13,130.00
0098	3030000000-E	862	STEEL BM GUARDRAIL	8,550 LF	14.65	125,257.50
0099	3045000000-E	862	STEEL BM GUARDRAIL, SHOP CURVED	750 LF	15.15	11,362.50
0100	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	15 EA	25.25	378.75
0101	3165000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (350, TL-2)	2 EA	1,620.00	3,240.00
0102	3210000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE CAT-1	12 EA	430.00	5,160.00
0103	3270000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE 350	10 EA	1,720.00	17,200.00
0104	3285000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE M-350	2 EA	1,620.00	3,240.00
0105	3317000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE B-77	4 EA	1,465.00	5,860.00
0106	3360000000-E	863	REMOVE EXISTING GUARDRAIL	5,400 LF	0.95	5,130.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0107	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	10,270 LF	2.20	22,594.00
0108	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	649 EA	15.15	9,832.35
0109	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	155 EA	20.20	3,131.00
0110	3628000000-E	876	RIP RAP, CLASS I	1,600 TON	49.50	79,200.00
0111	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	3,030 SY	1.90	5,757.00
0112	3659000000-N	SP	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	2 EA	1,020.00	2,040.00
0113	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	8 CY	810.00	6,480.00
0114	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	2 CY	790.00	1,580.00
0115	4057000000-E	SP	OVERHEAD FOOTING	84 CY	760.00	63,840.00
0116	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	7,812 LB	3.80	29,685.60
0117	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	1,207 LB	3.05	3,681.35
0118	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	1,034 LF	7.60	7,858.40
0119	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	2 EA	21.25	42.50
0120	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (107+50 -L-)	Lump Sum LS	29,300.00	29,300.00
0121	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (119+44 -L-)	Lump Sum LS	56,600.00	56,600.00
0122	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (135+90 -L-)	Lump Sum LS	29,300.00	29,300.00
0123	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (182+30 -L-)	Lump Sum LS	31,350.00	31,350.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0124	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (AT 74 WEST EXIT)	Lump Sum LS	31,850.00	31,850.00
0125	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (NORTH OF 74 EAST EXIT)	Lump Sum LS	31,850.00	31,850.00
0126	4096000000-N	904	SIGN ERECTION, TYPE D	22 EA	45.45	999.90
0127	4102000000-N	904	SIGN ERECTION, TYPE E	21 EA	45.45	954.45
0128	4108000000-N	904	SIGN ERECTION, TYPE F	2 EA	202.00	404.00
0129	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	2 EA	2,626.00	5,252.00
0130	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	2 EA	404.00	808.00
0131	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	12 EA	354.00	4,248.00
0132	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	7 EA	177.00	1,239.00
0133	4114000000-N	904	SIGN ERECTION, MILEMARKERS	2 EA	177.00	354.00
0134	4116100000-N	904	SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (B)	2 EA	355.00	710.00
0135	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	2 EA	75.75	151.50
0136	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	3 EA	1,820.00	5,460.00
0137	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	2 EA	50.50	101.00
0138	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	4 EA	5.05	20.20
0139	4158000000-N	907	DISPOSAL OF SIGN SYSTEM, WOOD	2 EA	20.20	40.40

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0140	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	4 EA	101.00	404.00
0141	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	683 SF	4.15	2,834.45
0142	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	636 SF	8.95	5,692.20
0143	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	40 SF	4.40	176.00
0144	4415000000-N	1115	FLASHING ARROW BOARD	3 EA	2,225.00	6,675.00
0145	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	2 EA	7,975.00	15,950.00
0146	4430000000-N	1130	DRUMS	400 EA	47.80	19,120.00
0147	4435000000-N	1135	CONES	215 EA	17.70	3,805.50
0148	4445000000-E	1145	BARRICADES (TYPE III)	32 LF	14.05	449.60
0149	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	3 EA	5,000.00	15,000.00
0150	4480000000-N	1165	TMA	3 EA	23,740.00	71,220.00
0151	4485000000-E	1170	PORTABLE CONCRETE BARRIER	10,000 LF	19.15	191,500.00
0152	4510000000-N	SP	LAW ENFORCEMENT	150 HR	41.00	6,150.00
0153	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	650 EA	8.85	5,752.50
0154	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	660 LF	0.75	495.00
0155	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	23,823 LF	0.75	17,867.25
0156	4690000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 120 MILS)	6,991 LF	0.80	5,592.80
0157	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	3,107 LF	2.00	6,214.00
0158	4702000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 120 MILS)	1,081 LF	2.80	3,026.80

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0159	4721000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (120 MILS)	4 EA	65.70	262.80
0160	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	9 EA	147.00	1,323.00
0161	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	8,533 LF	0.21	1,791.93
0162	4815000000-E	1205	PAINT PAVEMENT MARKING LINES (6")	107,600 LF	0.26	27,976.00
0163	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	1,020 LF	0.55	561.00
0164	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	72 LF	1.40	100.80
0165	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	2 EA	85.90	171.80
0166	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	53,000 LF	0.60	31,800.00
0167	4905000000-N	1253	SNOWPLOWABLE PAVEMENT MARKERS	478 EA	29.05	13,885.90
0168	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA	18,700.00	56,100.00
0169	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA	3,030.00	3,030.00
0170	5070000000-N	1405	STANDARD FOUNDATION ********* (R1)	12 EA	865.00	10,380.00
0171	5070000000-N	1405	STANDARD FOUNDATION ********* (R2)	3 EA	885.00	2,655.00
0172	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	165 LF	14.15	2,334.75
0173	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")	245 LF	18.20	4,459.00
0174	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (6")	325 LF	20.20	6,565.00
0175	5185000000-E	1410	** #2 W/G FEEDER CIRCUIT (4)	770 LF	8.05	6,198.50

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0176	5190000000-E	1410	********** FEEDER CIRCUIT (4 - #1 W/G)	1,275 LF	10.60	13,515.00
0177	5190000000-E	1410	********** FEEDER CIRCUIT (4 - #2/0 W/G)	1,335 LF	12.90	17,221.50
0178	5220000000-E	1410	** #2 W/G FEEDER CIRCUIT IN ******" CONDUIT (4, 2)	8,210 LF	10.00	82,100.00
0179	5225000000-E	1410	** #1 W/G FEEDER CIRCUIT IN ******" CONDUIT (4, 2)	6,825 LF	10.85	74,051.25
0180	5230000000-E	1410	********** FEEDER CIRCUIT IN ** CONDUIT (4 - #2/0 W/G, 3")	3,215 LF	16.15	51,922.25
0181	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC30)	13 EA	660.00	8,580.00
0182	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC36)	9 EA	800.00	7,200.00
0183	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B PIT ELECTRICAL WORK	Lump Sum LS	7,575.00	7,575.00
0184	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B STATIC SCALE PLATFORM	Lump Sum LS	110,915.00	110,915.00
0185	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP B STATIC SCALE SYSTEM	Lump Sum LS	40,915.00	40,915.00
0186	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C PIT ELECTRICAL WORK	Lump Sum LS	7,575.00	7,575.00
0187	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C STATIC SCALE PLATFORM	Lump Sum LS	110,915.00	110,915.00
0188	5260000000-N	SP	GENERIC LIGHTING ITEM RAMP C STATIC SCALE SYSTEM	Lump Sum LS	40,915.00	40,915.00
0189	5262000000-E	SP	GENERIC LIGHTING ITEM HIGH MOUNT FOUNDATIONS	21 CY	910.00	19,110.00
0190	5270000000-N	SP	GENERIC LIGHTING ITEM 1 POLE, 120VAC EQUIPMENT DIS-CONNECT	8 EA	303.00	2,424.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0191	5270000000-N	SP	GENERIC LIGHTING ITEM 15KVA POWER TRANSFORMER	1 EA	3,290.00	3,290.00
0192	5270000000-N	SP	GENERIC LIGHTING ITEM 2 POLE, 240VAC EQUIPMENT DIS-CONNECT	1 EA	570.00	570.00
0193	5270000000-N	SP	GENERIC LIGHTING ITEM HIGH MOUNT LUMINAIRE - LED	18 EA	2,185.00	39,330.00
0194	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE WS, 120/208V	1 EA	10,050.00	10,050.00
0195	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT STANDARD, TYPE MLTS, 35' MH, 6'SA	15 EA	2,425.00	36,375.00
0196	5270000000-N	SP	GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMI-NAIRE-LED	15 EA	1,065.00	15,975.00
0197	5691700000-E	1520	18" SANITARY GRAVITY SEWER	554 LF	80.00	44,320.00
0198	5775000000-E	1525	4' DIA UTILITY MANHOLE	2 EA	6,850.00	13,700.00
0199	5811000000-E	1530	ABANDON 18" UTILITY PIPE	570 LF	25.25	14,392.50
0200	5816000000-N	1530	ABANDON UTILITY MANHOLE	3 EA	1,560.00	4,680.00
0201	5836400000-E	1540	36" ENCASEMENT PIPE	390 LF	350.00	136,500.00
0202	5872400000-E	1550	TRENCHLESS INSTALLATION OF 36" IN SOIL	160 LF	206.00	32,960.00
0203	5872410000-E	1550	TRENCHLESS INSTALLATION OF 36" NOT IN SOIL	160 LF	1,250.00	200,000.00
0204	6000000000-E	1605	TEMPORARY SILT FENCE	1,200 LF	1.50	1,800.00
0205	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	770 TON	38.00	29,260.00
0206	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	4,400 TON	42.00	184,800.00
0207	6012000000-E	1610	SEDIMENT CONTROL STONE	2,935 TON	31.00	90,985.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0208	6015000000-E	1615	TEMPORARY MULCHING	58 ACR	630.00	36,540.00
0209	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	3,500 LB	3.05	10,675.00
0210	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	18.5 TON	800.00	14,800.00
0211	6024000000-E	1622	TEMPORARY SLOPE DRAINS	3,500 LF	11.25	39,375.00
0212	6029000000-E	SP	SAFETY FENCE	1,500 LF	1.15	1,725.00
0213	6030000000-E	1630	SILT EXCAVATION	16,200 CY	7.15	115,830.00
0214	6036000000-E	1631	MATTING FOR EROSION CONTROL	52,000 SY	1.05	54,600.00
0215	6037000000-E	SP	COIR FIBER MAT	650 SY	5.30	3,445.00
0216	6042000000-E	1632	1/4" HARDWARE CLOTH	3,500 LF	2.45	8,575.00
0217	6070000000-N	1639	SPECIAL STILLING BASINS	4 EA	2,500.00	10,000.00
0218	6071010000-E	SP	WATTLE	3,400 LF	4.10	13,940.00
0219	6071020000-E	SP	POLYACRYLAMIDE (PAM)	1,875 LB	8.60	16,125.00
0220	6071030000-E	1640	COIR FIBER BAFFLE	4,200 LF	3.50	14,700.00
0221	6071050000-E	SP	**" SKIMMER (1-1/2")	14 EA	1,350.00	18,900.00
0222	6071050000-E	SP	**" SKIMMER (2")	4 EA	1,485.00	5,940.00
0223	6084000000-E	1660	SEEDING & MULCHING	60 ACR	1,340.00	80,400.00
0224	6087000000-E	1660	MOWING	20 ACR	81.00	1,620.00
0225	6090000000-E	1661	SEED FOR REPAIR SEEDING	600 LB	4.70	2,820.00
0226	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	2 TON	810.00	1,620.00
0227	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	1,425 LB	3.95	5,628.75

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0228	6108000000-E	1665	FERTILIZER TOPDRESSING	42.75 TON	810.00	34,627.50
0229	6111000000-E	SP	IMPERVIOUS DIKE	270 LF	61.00	16,470.00
0230	6114500000-N	1667	SPECIALIZED HAND MOWING	70 MHR	56.00	3,920.00
0231	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	100 EA	85.00	8,500.00
0232	7060000000-E	1705	SIGNAL CABLE	260 LF	3.80	988.00
0233	7279000000-E	1715	TRACER WIRE	7,955 LF	0.86	6,841.30
0234	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	115 LF	19.20	2,208.00
0235	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	620 LF	38.40	23,808.00
0236	7301000000-E	1715	DIRECTIONAL DRILL (**********) (4, 2")	45 LF	72.75	3,273.75
0237	7312000000-N	1716	JUNCTION BOX (**********) (SPECIAL-SIZED)	8 EA	707.00	5,656.00
0238	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	32 EA	380.00	12,160.00
0239	7360000000-N	1720	WOOD POLE	1 EA	707.00	707.00
0240	7420000000-E	1722	2" RISER WITH WEATHERHEAD	6 EA	380.00	2,280.00
0241	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	458 LF	13.05	5,976.90
0242	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (36)	8,200 LF	12.85	105,370.00
0243	7540000000-N	1731	SPLICE ENCLOSURE	8 EA	990.00	7,920.00
0244	7552000000-N	1731	INTERCONNECT CENTER	12 EA	1,010.00	12,120.00
0245	7566000000-N	1733	DELINEATOR MARKER	16 EA	160.00	2,560.00
0246	7613000000-N	SP	SOIL TEST	9 EA	707.00	6,363.00
0247	7614100000-E	SP	DRILLED PIER FOUNDATION	45 CY	1,010.00	45,450.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0248	7901000000-N	1753	CABINET BASE EXTENDER	3 EA	835.00	2,505.00
0249	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	26 EA	55.55	1,444.30
0250	7980000000-N	SP	GENERIC SIGNAL ITEM AVI ANTENNA	6 EA	2,500.00	15,000.00
0251	7980000000-N	SP	GENERIC SIGNAL ITEM AVI READER	6 EA	4,165.00	24,990.00
0252	7980000000-N	SP	GENERIC SIGNAL ITEM BASE MOUNTED EQUIPMENT CABINET	3 EA	2,500.00	7,500.00
0253	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CABINET	5 EA	3,535.00	17,675.00
0254	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	5 EA	3,435.00	17,175.00
0255	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY (FIXED MOUNT)	3 EA	1,700.00	5,100.00
0256	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	5 EA	707.00	3,535.00
0257	7980000000-N	SP	GENERIC SIGNAL ITEM COMPUTER WORKSTATION (INSTALL)	4 EA	3,335.00	13,340.00
0258	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL HARDWARE VIDEO ENCODER	8 EA	2,565.00	20,520.00
0259	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL TYPE STRUCTURE	1 EA	22,930.00	22,930.00
0260	7980000000-N	SP	GENERIC SIGNAL ITEM ENCLOSED COMMUNICATIONS RACK	3 EA	3,780.00	11,340.00
0261	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET FOUNDATION	3 EA	835.00	2,505.00
0262	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	13 EA	1,515.00	19,695.00
0263	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (OVER-SIZED)	27 EA	707.00	19,089.00

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0264	7980000000-N	SP	GENERIC SIGNAL ITEM LANE CONTROL SIGNAL	4 EA	5,000.00	20,000.00
0265	7980000000-N	SP	GENERIC SIGNAL ITEM MANAGED ETHERNET SWITCH	1 EA	49,350.00	49,350.00
0266	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM	5 EA	8,145.00	40,725.00
0267	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH HINGED MAST ARM DESIGN	5 EA	3,030.00	15,150.00
0268	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE	2 EA	21,530.00	43,060.00
0269	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE WITH MONOTUBE GANTRY STRUCTURE DESIGN	2 EA	1,010.00	2,020.00
0270	7980000000-N	SP	GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (OVER-HEAD)	1 EA	950.00	950.00
0271	7980000000-N	SP	GENERIC SIGNAL ITEM NEW ELECTRICAL SERVICE (UNDER-GROUND)	1 EA	885.00	885.00
0272	7980000000-N	SP	GENERIC SIGNAL ITEM OVER-HEIGHT VEHICLE DETECTION SYSTEM	2 EA	14,650.00	29,300.00
0273	7980000000-N	SP	GENERIC SIGNAL ITEM PATCH PANEL (ETHERNET)	12 EA	720.00	8,640.00
0274	7980000000-N	SP	GENERIC SIGNAL ITEM PIEZOELECTRIC AXLE SENSOR	6 EA	1,670.00	10,020.00
0275	7980000000-N	SP	GENERIC SIGNAL ITEM PIEZOELECTRIC QUARTZ SENSOR SET	6 EA	7,325.00	43,950.00
0276	7980000000-N	SP	GENERIC SIGNAL ITEM POLE MOUNTED EQUIPMENT CABINET	5 EA	1,515.00	7,575.00
0277	7980000000-N	SP	GENERIC SIGNAL ITEM PRINTER (INSTALL)	1 EA	2,930.00	2,930.00
0278	7980000000-N	SP	GENERIC SIGNAL ITEM SERVER (INSTALL)	2 EA	2,525.00	5,050.00

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0279	7980000000-N	SP	GENERIC SIGNAL ITEM SERVICE DISCONNECT	4 EA	335.00	1,340.00
0280	7980000000-N	SP	GENERIC SIGNAL ITEM SPLICE CENTER (36-FIBER)	1 EA	2,930.00	2,930.00
0281	7980000000-N	SP	GENERIC SIGNAL ITEM STEEL PEDESTAL POLE	3 EA	9,270.00	27,810.00
0282	7980000000-N	SP	GENERIC SIGNAL ITEM UPS	6 EA	835.00	5,010.00
0283	7980000000-N	SP	GENERIC SIGNAL ITEM VEHICLE SIGNAL HEAD (12" 2-SECTION, RED-GREEN)	6 EA	2,600.00	15,600.00
0284	7980000000-N	SP	GENERIC SIGNAL ITEM WALL-MOUNTED COMMUNICATIONS RACK	1 EA	3,780.00	3,780.00
0285	7985000000-N	SP	GENERIC SIGNAL ITEM ADVANCE LOCATION WIM ELECTRON-ICS	Lump Sum LS	139,400.00	139,400.00
0286	7985000000-N	SP	GENERIC SIGNAL ITEM ALPR SYSTEM	Lump Sum LS	78,800.00	78,800.00
0287	7985000000-N	SP	GENERIC SIGNAL ITEM CCTV SOFTWARE	Lump Sum LS	7,080.00	7,080.00
0288	7985000000-N	SP	GENERIC SIGNAL ITEM CENTRAL CONTROL SOFTWARE	Lump Sum LS	14,650.00	14,650.00
0289	7985000000-N	SP	GENERIC SIGNAL ITEM COMPLIANCE LOCATION WIM ELEC-TRONICS	Lump Sum LS	139,400.00	139,400.00
0290	7985000000-N	SP	GENERIC SIGNAL ITEM DMS	Lump Sum LS	91,600.00	91,600.00
0291	7985000000-N	SP	GENERIC SIGNAL ITEM NETWORK MANAGEMENT SOFTWARE	Lump Sum LS	10,355.00	10,355.00
0292	7985000000-N	SP	GENERIC SIGNAL ITEM OPEN/CLOSED DMS PANEL	Lump Sum LS	8,335.00	8,335.00
0293	7985000000-N	SP	GENERIC SIGNAL ITEM SCALE HOUSE WIM ELECTRONICS	Lump Sum LS	139,400.00	139,400.00
0294	7985000000-N	SP	GENERIC SIGNAL ITEM SYSTEM WARRANTY	Lump Sum LS	36,400.00	36,400.00

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0295	7985000000-N	SP	GENERIC SIGNAL ITEM TRAINING	Lump Sum LS	8,335.00	8,335.00
0296	7990000000-E	SP	GENERIC SIGNAL ITEM DROP CABLE (6 FIBER)	1,819 LF	10.10	18,371.90
0297	7990000000-E	SP	GENERIC SIGNAL ITEM ETHERNET CABLE	955 LF	0.15	143.25
0298	7990000000-E	SP	GENERIC SIGNAL ITEM FOUR-WIRE COPPER FEEDER CONDUCTORS	2,536 LF	12.55	31,826.80
0299	7990000000-E	SP	GENERIC SIGNAL ITEM LEAD-IN CABLE	228 LF	3.05	695.40
0300	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (1, 2")	559 LF	7.10	3,968.90
0301	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (2, 2")	5,649 LF	8.59	48,524.91
0302	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (3, 2")	1,917 LF	10.10	19,361.70
0303	7990000000-E	SP	GENERIC SIGNAL ITEM UNDERGROUND CONDUIT (4, 2")	85 LF	18.20	1,547.00
0304	7992000000-E	SP	GENERIC SIGNAL ITEM DMS OVERHEAD FOOTINGS	8 CY	1,010.00	8,080.00
0305	8881000000-E	SP	GENERIC STRUCTURE ITEM CLASS AA CONCRETE (WEIGH BRIDGE - STATIC SCALE)	509 CY	795.00	404,655.00
0306	8889000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATED REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	35,037 LB	0.85	29,781.45
0307	8889000000-E	SP	GENERIC STRUCTURE ITEM REINFORCING STEEL (WEIGH BRIDGE - STATIC SCALE)	37,175 LB	1.15	42,751.25
0308	8892000000-E	SP	GENERIC STRUCTURE ITEM GROOVING CONCRETE SLABS	6,422 SF	2.55	16,376.10

Contract Item Sheets For C203357

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0309	8126000000-N	414	CULVERT EXCAVATION, STA ****** (153+40.68 -L-)	Lump Sum LS	2,550.00	2,550.00
0310	8133000000-E	414	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	170 TON	35.35	6,009.50
0311	8196000000-E	420	CLASS A CONCRETE (CULVERT)	224.6 CY	503.00	112,973.80
0312	8245000000-E	425	REINFORCING STEEL (CULVERT)	29,302 LB	1.05	30,767.10
0313	8889000000-E	SP	GENERIC STRUCTURE ITEM POLYURETHANE GROUT INJECTION	12,500 LB	14.15	176,875.00
			TOTAL AMOUNT OF BID FOR ENTIRE PROJECT			$19,732,258.32

1005/Apr04/Q1242989.65/D1435883170000/E313

Contract No. C203357

County Gaston

Rev. 5-19-11

EXECUTION OF CONTRACT
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

CORPORATION

The Contractor being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with this Contract, that the Contractor has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Contractor intends to do the work with its own bonafide employees or subcontractors and did not bid for the benefit of another contractor.

By submitting this Execution of Contract, Non-Collusion Affidavit and Debarment Certification, the Contractor is certifying his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Sloan Construction - A division of Reeves Construction Company

Full name of Corporation

250 Plemmons Road - Duncan, SC 29334

Address as Prequalified

Attest _____ By _____

~~Secretary~~/Assistant Secretary — *Select appropriate title*

President/~~Vice President/Assistant Vice President~~ — *Select appropriate title*

Rob Loar

Print or type Signer's name

Robert Ponton

Print or type Signer's name

CORPORATE SEAL

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

9th day of April 2014.

Donna Lynn Williams

Signature of Notary Public

NOTARY SEAL

of Spartanburg County

State of South Carolina

My Commission Expires: 7.25.2021

Contract No. C203357

County Gaston

Rev. 5-19-11

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal,* and *voluntarily excluded,* as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR* 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

Contract No. C203357

County Gaston

Rev. 5-19-11

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

Contract No. **C203357**

County **Gaston**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

Contract Officer

4/16/14
Date

Execution of Contract and Bonds
Approved as to Form:

Attorney General

Signature Sheet (Bid - Acceptance by Department)

Bond No. 09074619 / 014062131

Contract No. C203357
County Gaston

Rev 5-17-11

CONTRACT PAYMENT BOND

Date of Payment Bond Execution	April 3, 2014
Name of Principal Contractor	Sloan Construction, a division of Reeves Construction Company
Name of Surety:	Fidelity and Deposit Company of Maryland / Liberty Mutual Insurance Company
Name of Contracting Body:	**North Carolina Department of Transportation**
	Raleigh, North Carolina
Amount of Bond:	($19,732,258.32) Nineteen Million Seven Hundred Thirty Two Thousand Two Hundred Fifty Eight Dollars and 32/100
Contract ID No.:	C203357 / WBS# 41188.3.FSI / IMS-085-1(106)3
County Name:	Gaston

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C203357

County Gaston

Rev 5-17-11

CONTRACT PAYMENT BOND

Affix Seal of Surety Company

Fidelity and Deposit Company of
Maryland / Liberty Mutual Insurance Company
Print or type Surety Company Name

By Rebecca E. Cano
Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

Joy Robertson
Print or type Signer's name

1441 Main Street

Columbia, SC 29201
Address of Attorney-in-Fact

Contract No. C203357 Rev 5-17-11

County Gaston

CONTRACT PAYMENT BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

Sloan Construction, a division of Reeves Construction Company

Full name of Corporation

250 Plemmons Road, Duncan, SC 29334

Address as prequalified

By _____

Signature of President, ~~Vice President, Assistant Vice President~~

Select appropriate title

Robert Ponton

Print or type Signer's name

Affix Corporate Seal

Attest _____

Signature of ~~Secretary~~, Assistant Secretary

Select appropriate title

Rob Loar

Print or type Signer's name

Bond No. 09074619 / 014062131

Contract No. C203357 Rev 5-17-11

County Gaston

CONTRACT PERFORMANCE BOND

Date of Performance Bond Execution:	April 3, 2014
Name of Principal Contractor:	Sloan Construction, a division of Reeves Construction Company
Name of Surety:	Fidelity and Deposit Company of Maryland / Liberty Mutual Insurance Company
Name of Contracting Body:	**North Carolina Department of Transportation**
	Raleigh, North Carolina
Amount of Bond:	($19,732,258.32) Nineteen Million Seven Hundred Thirty Two Thousand Two Hundred Fifty Eight Dollars and 32/100
Contract ID No.:	C203357 WBS# 41188.3.FSI / IMS-085-1(106)3
County Name:	Gaston

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C203357
County Gaston

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Affix Seal of Surety Company

Fidelity and Deposit Company of
Maryland / Liberty Mutual Insurance Company
~~Print or~~ type Surety Company Name

By Rebecca E. Cano
~~Print, stamp or~~ type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

Joy Robertson
Print or type Signer's name

1441 Main Street

Columbia, SC 29201
Address of Attorney-in-Fact

Contract No. C203357
County Gaston

Rev 5-17-11

CONTRACT PERFORMANCE BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

Sloan Construction, a division of Reeves Construction Company
Full name of Corporation

250 Plemmons Road, Duncan, SC 29334
Address as prequalified

By _____
Signature of President, ~~Vice President, Assistant Vice President~~
Select appropriate title

Robert Ponton
Print or type Signer's name

Affix Corporate Seal

Attest _____
Signature of ~~Secretary~~, Assistant Secretary
Select appropriate title

Rob Loar
Print or type Signer's name

Bond Number: 09074619 / 014062131

Obligee: Department of Transportation, State of North Carolina

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **Geoffrey Delisio, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Rebecca E. Cano**, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland, in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 17th day of May, A.D. 2012.

ATTEST:

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Gerald F. Haley
Assistant Secretary
Gerald F. Haley

Geoffrey Delisio
Vice President
Geoffrey Delisio

State of Maryland
County of Baltimore

On this 17th day of May, A.D. 2012, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Geoffrey Delisio, Vice President and Gerald F. Haley, Assistant Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn

Constance A. Dunn, Notary Public
My Commission Expires: July 14, 2015

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 3rd day of April, 2014.

Thomas O. McClellan, Vice President

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated. Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees. To confirm the validity of this Power of Attorney call 610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

American Fire and Casualty Company
The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That American Fire & Casualty Company and The Ohio Casualty Insurance Company are corporations duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Rebecca E. Cano of the city of Columbia, state of SC its true and lawful attorney-in-fact, with full power and authority hereby conferred to sign, execute and acknowledge the following surety bond:

Principal Name: Sloan Construction, a division of Reeves Construction Company

Obligee Name: Department of Transportation, State of North Carolina

Surety Bond Number: 09074619 / 014062131 **Bond Amount:** See Bond Form

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 18th day of November, 2013.

American Fire and Casualty Company
The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 18th day of November, 2013, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of American Fire and Casualty Company, Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Plymouth Twp., Montgomery County
My Commission Expires March 28, 2017
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of American Fire and Casualty Company, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Gregory W. Davenport, the undersigned, Assistant Secretary, of American Fire and Casualty Company, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 3rd day of April, 2014.

By: _____
Gregory W. Davenport, Assistant Secretary