

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

PROPOSAL

INCLUDES ADDENDUM No.1 DATED 09-08-16

DATE AND TIME OF BID OPENING: **SEPTEMBER 20, 2016 AT 2:00 PM**

CONTRACT ID C203792
WBS 34820.3.30

FEDERAL-AID NO. NHF-0708(53)
COUNTY GUILFORD
T.I.P. NO. U-2524D
MILES 1.873
ROUTE NO.
LOCATION GREENSBORO WESTERN LOOP - FROM US-220 (BATTLEGROUND AVENUE)
 TO SR-2303 (LAWNDALE DRIVE).
TYPE OF WORK GRADING, DRAINAGE, PAVING, ITS, SIGNALS & STRUCTURES.

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 ROADWAY & STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

**PROPOSAL FOR THE CONSTRUCTION OF
CONTRACT No. C203792 IN GUILFORD 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. C203792; 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 be 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. C203792 in Guilford County, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

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

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

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

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

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



State Contract Officer

DocuSigned by:
Randy A Garris
A7079FC32A09478...

9/8/2016

TABLE OF CONTENTS

**COVER SHEET
PROPOSAL SHEET**

PROJECT SPECIAL PROVISIONS

CONTRACT TIME AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES: G-2
INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES: G-4
INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES: G-4
INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES: G-4
PERMANENT VEGETATION ESTABLISHMENT:..... G-5
DELAY IN RIGHT OF ENTRY: G-6
MAJOR CONTRACT ITEMS: G-6
SPECIALTY ITEMS: G-6
FUEL PRICE ADJUSTMENT: G-6
PAYOUT SCHEDULE: G-7
SCHEDULE OF ESTIMATED COMPLETION PROGRESS:..... G-7
DISADVANTAGED BUSINESS ENTERPRISE: G-8
CERTIFICATION FOR FEDERAL-AID CONTRACTS: G-21
CONTRACTOR'S LICENSE REQUIREMENTS: G-22
U.S. DEPARTMENT OF TRANSPORTATION HOTLINE: G-22
CARGO PREFERENCE ACT: G-22
SUBSURFACE INFORMATION:..... G-23
LOCATING EXISTING UNDERGROUND UTILITIES:..... G-23
VALUE ENGINEERING PROPOSAL: G-23
RESOURCE CONSERVATION AND ENV. SUSTAINABLE PRACTICES:..... G-24
DOMESTIC STEEL: G-25
PORTABLE CONCRETE BARRIER - (Partial Payments for Materials):..... G-25
MAINTENANCE OF THE PROJECT: G-25
COOPERATION BETWEEN CONTRACTORS:..... G-26
BID DOCUMENTATION: G-27
TWELVE MONTH GUARANTEE: G-30
IRAN DIVESTMENT ACT: G-31
GIFTS FROM VENDORS AND CONTRACTORS: G-31
LIABILITY INSURANCE:..... G-32
EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION: G-32
PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:..... G-37
EMPLOYMENT:..... G-39
STATE HIGHWAY ADMINISTRATOR TITLE CHANGE:..... G-39
SUBLETTING OF CONTRACT: G-39

ROADWAY..... R-1

STANDARD SPECIAL PROVISIONS

AVAILABILITY FUNDS – TERMINATION OF CONTRACTS SSP-1
 NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY SSP-2
 ERRATA..... SSP-5
 PLANT AND PEST QUARANTINES SSP-7
 AWARD OF CONTRACT SSP-8
 MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS SSP-13
 REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONST. CONTRACTS SSP-16
 ON-THE-JOB TRAINING SSP-25
 NCDENR NAME CHANGE..... SSP-28
 MINIMUM WAGES SSP-29

UNIT PROJECT SPECIAL PROVISIONS

GEOTECHNICAL.....GT-0.1
 SIGNINGSN-1
 TRAFFIC CONTROLTC-1
 UTILITY CONSTRUCTION UC-1
 UTILITY BY OTHERSUBO-1
 EROSION CONTROLEC-1
 TRAFFIC SIGNALS TS-1
 ITS..... ITS-1
 STRUCTURE / CULVERTS..... ST-1

PERMITS P-1

PROPOSAL ITEM SHEET

ITEM SHEET(S) (TAN SHEETS)

PROJECT SPECIAL PROVISIONS**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 **October 31, 2016**, 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 **December 28, 2020**.

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*, 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 **October 31, 2016**.

The completion date for this intermediate contract time is **July 1, 2020**.

The liquidated damages for this intermediate contract time are **Four Thousand Dollars (\$ 4,000.00)** 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*. 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 **Cotswold Ave., Old Battleground Rd., Lake Brandt Rd., Lawndale Dr., Greensboro Western Loop – U-2524C, and Battleground Ave., including ramps – U-2524C** during the following time restrictions:

DAY AND TIME RESTRICTIONS**(Cotswold Ave. & Lawndale Dr)****Monday thru Sunday****7:00 a.m. to 7:00 p.m.****(Old Battleground Rd. & Lake Brandt Rd.)****Monday thru Friday****7:00 a.m. to 9:00 a.m.****3:00 p.m. to 7:00 p.m.****(Greensboro Western Loop & Battleground Ave., including ramps – U-2524C)****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 **Cotswold Ave., Old Battleground Rd., Lake Brandt Rd., Lawndale Dr., Greensboro Western Loop – U-2524C, and Battleground Ave., including ramps – U-2524C** 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 any **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.
2. For **New Year's Day**, between the hours of **7:00 a.m.** December 31st to **7:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **7:00 p.m.** the following Tuesday.
3. For **Easter**, between the hours of **7:00 a.m.** Thursday and **7:00 p.m.** Monday.
4. For **Memorial Day**, between the hours of **7:00 a.m.** Friday and **7:00 p.m.** Tuesday.
5. For **Independence Day**, between the hours of **7:00 a.m.** the day before Independence Day and **7:00 p.m.** the day after Independence Day.

If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **7:00 a.m.** the Thursday before Independence Day and **7:00 p.m.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **7:00 a.m.** Friday and **7:00 p.m.** Tuesday.
7. For **Thanksgiving Day**, between the hours of **7:00 a.m.** Tuesday and **7:00 p.m.** Monday.
8. For **Christmas**, between the hours of **7:00 a.m.** the Friday before the week of Christmas Day and **7:00 p.m.** the following Tuesday after the week of Christmas Day.
9. For **Furniture Market**, between the hours of **7:00 a.m. Saturday, October 15th to 7:00 pm Thursday, October 20th, 2016.** Between the hours of **7:00 a.m. Saturday, April 15th to 7:00 p.m. Thursday, April 20th, 2017.** Also, between the hours of **7:00 a.m. Saturday, October 14th to 7:00 p.m. Thursday, October 19th, 2017.** Between the hours of **7:00 a.m. Saturday, April 14th to 7:00 p.m. Wednesday, April 18th, 2018.** Also, between the hours of **7:00 a.m. Saturday, October 13th to 7:00 p.m. Wednesday, October 17th, 2018.** Between the hours of **7:00 a.m. Saturday, April 6th to 7:00 p.m. Wednesday, April 10th, 2019.** Also, between the hours of **7:00 a.m. Saturday, October 19th to 7:00 p.m. Wednesday, October 23rd, 2019.** Between the hours of **7:00 a.m. Saturday, April 18th to 7:00 p.m. Wednesday, April 22nd, 2020.** Also, between the hours of **7:00 a.m. Saturday, October 17th to 7:00 p.m. Wednesday, October 21st, 2020.**
10. For **Wyndam Golf Championship**, between the hours of **7:00 a.m. Monday, August 15th to 7:00 pm Sunday, August 21st, 2016.** Also, between the hours of **7:00 a.m. Monday, August 14th to 7:00 p.m. Sunday, August 20th, 2017.** Also, between the hours of **7:00 a.m. Monday to 7:00 p.m. Sunday for event held in August 2018, August 2019, and August 2020 (actual dates to be determined closer to event).**

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

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

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

The liquidated damages are **One Thousand Dollars (\$ 1,000.00)** per fifteen (15) minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:

(2-20-07)

108

SP1 G14 D

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 **Lawndale Drive** during the following time restrictions:

DAY AND TIME RESTRICTIONS**Monday thru Sunday****6:00 a.m. to 10:00 p.m.**

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for 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 Dollars (\$ 2,000.00)** per fifteen (15) minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:

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

108

SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase I, Steps #5 & #6**, as shown on Sheet **TMP- 3**, and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

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

The liquidated damages are **Five Thousand Dollars (\$ 5,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES:

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

108

SP1 G14 F

The Contractor shall complete the work required of **the following Independent Intermediate Contract Times**, as shown on Sheet **TMP-3A**, and shall place and maintain traffic on same.

Independent Intermediate Contract Times:**Area 3, Phase I, Step #3****Area 3, Phase II, Step #4****Area 3, Phase III, Steps #3 and #4**

The time of availability for **each independent** intermediate contract time is the **Friday at 9:00 p.m.** that the Contractor elects to begin the work.

The completion time for **each independent** intermediate contract time is the following **Monday at 6:00 a.m.** after the time of availability.

The work of each Independent Intermediate Contract Time shall be completed in consecutive weekends of the Contactor's choosing.

The liquidated damages for **each Independent Intermediate Contract Time** are **Five Hundred Dollars (\$ 500.00)** per hour.

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.

DELAY IN RIGHT OF ENTRY:

(7-1-95) (Rev. 7-15-14)

108

SP1 G22

The Contractor will not be allowed right of entry to the following parcel(s) prior to the listed date(s) unless otherwise permitted by the Engineer.

<u>Parcel No.</u>	<u>Property Owner</u>	<u>Date</u>
040A Z	Terrace Mews Associates	9-1-16
058	Liberty Square	10-15-16
109A	330 NW 71 ST St. LC	9-1-16

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
5 —	Unclassified Excavation
73 —	10-1/2" Port Cem Conc Pavement, Through Lanes(w/ Dowels)
372 —	Soil Nail Retaining Walls

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
120 thru 130	Guardrail
132 thru 140	Fencing
145 thru 170	Signing
186 thru 189, 194 thru 197	Long-Life Pavement Markings
202 thru 203	Permanent Pavement Markers
204 thru 230, 401 thru 402	Utility Construction
231 thru 269	Erosion Control
270 thru 345	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 \$ **1.5593** 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

PAYOUT SCHEDULE:

(1-19-10) (Rev. 1-17-12)

108

SP1 G57

Submit an Anticipated Monthly Payout Schedule prior to beginning construction. The Anticipated Monthly Payout Schedule will be used by the Department to monitor funding levels for this project. Include a monthly percentage breakdown (in terms of the total contract amount) of the work anticipated to be completed. The schedule should begin with the date the Contractor plans to begin construction and end with the anticipated completion date. Submit updates of the Anticipated Monthly Payout Schedule on March 15, June 15, September 15, and December 15 of each calendar year until project acceptance. Submit the original Anticipated Monthly Payout Schedule and all subsequent updates to the Resident Engineer with a copy to the State Construction Engineer at 1 South Wilmington Street, 1543 Mail Service Center, Raleigh, NC 27699-1543.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-17-16)

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:

	<u>Fiscal Year</u>	<u>Progress (% of Dollar Value)</u>
2017	(7/01/16 - 6/30/17)	26% of Total Amount Bid
2018	(7/01/17 - 6/30/18)	33% of Total Amount Bid
2019	(7/01/18 - 6/30/19)	25% of Total Amount Bid
2020	(7/01/19 - 6/30/20)	16% 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. 4-19-16)

102-15(J)

SP1 G61

Description

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

Definitions

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

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

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

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

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

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

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

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

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

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

Forms and Websites Referenced in this Provision

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

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

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

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

JC-1 Joint Check Notification Form - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks.
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf>

Letter of Intent - Form signed by the Contractor and the DBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed DBE for the amount listed at the time of bid.
<http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf>

Listing of DBE Subcontractors Form - Form for entering DBE subcontractors on a project that will meet this DBE goal. This form is for paper bids only.
[http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20\(Federal\).docx](http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20(Federal).docx)

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

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

DBE Goal

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

Disadvantaged Business Enterprises **13.0** %

- (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 Contractual Services 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. The prime contractor must give the DBE firm five (5) calendar days to respond to the prime contractor's notice of termination and advise the prime contractor and the Department of the reasons, if any, why the firm objects to the proposed termination of its subcontract and why the Department should not approve the action.

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.

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

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.

CARGO PREFERENCE ACT:

(2-16-16)

Privately owned United States-flag commercial vessels transporting cargoes are subject to the Cargo Preference Act (CPA) of 1954 requirements and regulations found in 46 CFR 381.7. Contractors are directed to clause (b) of 46 CFR 381.7 as follows:

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

“(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract."

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.

VALUE ENGINEERING PROPOSAL:

(05-19-15)

104

SP01 G116

Revise the *2012 Standard Specifications* as follows:

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

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

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

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

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

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

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

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

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

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

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

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

RESOURCE CONSERVATION AND ENV. SUSTAINABLE PRACTICES:

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

104-13

SP1 G118

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

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

Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills and any practice that minimizes the environmental impact on the project annually on the Project Construction Reuse and Recycling Reporting Form. The Project Construction

Reuse and Recycling Reporting Form and a location tool for local recycling facilities are available at:

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

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

DOMESTIC STEEL:

(4-16-13)

106

SP1 G120

Revise the *2012 Standard Specifications* as follows:

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

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

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.

COOPERATION BETWEEN CONTRACTORS:

(7-1-95)

105-7

SP1 G133

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

The Contractor's attention is directed to the fact that certain construction within and adjacent to the limits of this project is currently in progress under a previous contract (U-2524C, C203197).

The construction in progress is located at the western end of this project. Ramps, Collectors, mainline bridge and roadway construction is involved. U-2524C (C203197) currently has a completion date of March 14th, 2018

The Contractor on this contract (U-2524D, C203792) may not be able to access the project from the western end thru the existing project's limits (U-2524C, C203197) and may not be able to perform work within the limits of the existing project until after October 31st, 2017.

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

BID DOCUMENTATION:

(1-1-02) (Rev.8-18-15)

103

SP1 G142

General

The successful Bidder (Contractor) shall submit the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation used to prepare the bid for this contract to the Department within 10 days after receipt of notice of award of contract. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility selected by the Department.

The Department will not execute the contract until the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation has been received by the Department.

Terms

Bid Documentation - Bid Documentation shall mean all written information, working papers, computer printouts, electronic media, charts, and all other data compilations which contain or reflect information, data, and calculations used by the Bidder in the preparation of the bid. The term *bid documentation* includes, but is not limited to, contractor equipment rates, contractor overhead rates, labor rates, efficiency or productivity factors, arithmetical calculations, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by the Bidder in formulating and determining the bid. The term *bid documentation* also includes any manuals, which are standard to the industry used by the Bidder in determining the bid. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the publication and the publisher. *Bid Documentation* does not include bid documents provided by the Department for use by the Bidder in bidding on this project. The Bid Documentation can be in the form of electronic submittal (i.e. thumb drive) or paper. If the Bidder elects to submit the Bid Documentation in electronic format, the Department requires a backup submittal (i.e. a second thumb drive) in case one is corrupted.

Contractor's Representative - Officer of the Contractor's company; if not an officer, the Contractor shall supply a letter signed and notarized by an officer of the Contractor's company, granting permission for the representative to sign the escrow agreement on behalf of the Contractor.

Escrow Agent - Officer of the select banking institution or other bonded document storage facility authorized to receive and release bid documentation.

Escrow Agreement Information

A draft copy of the Escrow Agreement will be mailed to the Bidder after the notice of award for informational purposes. The Bidder and Department will sign the actual Escrow Agreement at the time the bid documentation is delivered to the Escrow Agent.

Failure to Provide Bid Documentation

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

Submittal of Bid Documentation

- (A) Appointment – Email specs@ncdot.gov or call 919.707.6900 to schedule an appointment.
- (B) Delivery - A representative of the Bidder shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within 10 days after the notice of award is received.
- (C) Packaging – The container shall be no larger than 15.5 inches in length by 12 inches wide by 11 inches high and shall be water resistant. The container shall be clearly marked on the face and the back of the container with the following information: Bid Documentation, Bidder's Name, Bidder's Address, Date of Escrow Submittal, Contract Number, TIP Number if applicable, and County.

Affidavit

Bid documentation will be considered a certified copy if the Bidder includes an affidavit stating that the enclosed documentation is an EXACT copy of the original documentation used by the Bidder to determine the bid for this project. The affidavit shall also list each bid document with sufficient specificity so a comparison may be made between the list and the bid documentation to ensure that all of the bid documentation listed in the affidavit has been enclosed for escrow. The affidavit shall attest that the affiant has personally examined the bid documentation, that the affidavit lists all of the documents used by the Bidder to determine the bid for this project, and that all bid documentation has been included. The affidavit shall be signed by a chief officer of the company, have the person's name and title typed below the signature, and the signature shall be notarized at the bottom of the affidavit.

Verification

Upon delivery of the bid documentation, the Department's Contract Officer and the Bidder's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Bidder's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Bidder's representative, immediately place the complete bid documentation and affidavit in the

container and seal it. Both parties will deliver the sealed container to the Escrow Agent for placement in a safety deposit box, vault, or other secure accommodation.

Confidentiality of Bid Documentation

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

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

Duration and Use

The bid documentation and affidavit shall remain in escrow until 60 calendar days from the time the Contractor receives the final estimate; or until such time as the Contractor:

- (A) Gives written notice of intent to file a claim,
- (B) Files a written claim,
- (C) Files a written and verified claim,
- (D) Initiates litigation against the Department related to the contract; or
- (E) Authorizes in writing its release.

Upon the giving of written notice of intent to file a claim, filing a written claim, filing a written and verified claim, or the initiation of litigation by the Contractor against the Department, or receipt of a letter from the Contractor authorizing release, the Department may obtain the release and custody of the bid documentation.

The Bidder certifies and agrees that the sealed container placed in escrow contains all of the bid documentation used to determine the bid and that no other bid documentation shall be relevant or material in litigation over claims brought by the Contractor arising out of this contract.

Release of Bid Documentation to the Contractor

If the bid documentation remains in escrow 60 calendar days after the time the Contractor receives the final estimate and the Contractor has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the Department related to the contract, the Department will instruct the Escrow Agent to release the sealed container to the Contractor.

The Contractor will be notified by certified letter from the Escrow Agent that the bid documentation will be released to the Contractor. The Contractor or his representative shall retrieve the bid documentation from the Escrow Agent within 30 days of the receipt of the certified letter. If the Contractor does not receive the documents within 30 days of the receipt of the certified letter, the Department will contact the Contractor to determine final dispersion of the bid documentation.

Payment

The cost of the escrow will be borne by the Department. There will be no separate payment for all costs of compilation of the data, container, or verification of the bid documentation. Payment at the various contract unit or lump sum prices in the contract will be full compensation for all such costs.

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.

IRAN DIVESTMENT ACT:

(5-17-16)

SP01 G151

As a result of the Iran Divestment Act of 2015 (Act), Article 6E, N.C. General Statute § 147-86.55, the State Treasurer published the Final Divestment List (List) which includes the Final Divestment List-Iran, and the Parent and Subsidiary Guidance-Iran. These lists identify companies and persons engaged in investment activities in Iran and will be updated every 180 days. The List can be found at <https://www.nctreasurer.com/inside-the-department/OpenGovernment/Pages/Iran-Divestment-Act-Resources.aspx>

By submitting the Offer, the Contractor certifies that, as of the date of this bid, it is not on the then-current List created by the State Treasurer. The Contractor must notify the Department immediately if, at any time before the award of the contract, it is added to the List.

As an ongoing obligation, the Contractor must notify the Department immediately if, at any time during the contract term, it is added to the List. Consistent with § 147-86.59, the Contractor shall not contract with any person to perform a part of the work if, at the time the subcontract is signed, that person is on the then-current List.

During the term of the Contract, should the Department receive information that a person is in violation of the Act as stated above, the Department will offer the person an opportunity to respond and the Department will take action as appropriate and provided for by law, rule, or contract.

GIFTS FROM VENDORS AND CONTRACTORS:

(12-15-09)

107-1

SP1 G152

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

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

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

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

LIABILITY INSURANCE:

(5-20-14)

SP1 G160

Revise the *2012 Standard Specifications* as follows:

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

Prior to beginning services, all contractors shall provide proof of coverage issued by a workers' compensation insurance carrier, or a certificate of compliance issued by the Department of Insurance for self-insured subcontractors, irrespective of whether having regularly in service fewer than three employees.

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 Certified Designer on the erosion and sediment control/stormwater component of all reclamation plans and if applicable, the certification number of the Level III 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 *Cease 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”.

SUBLETTING OF CONTRACT:

(11-18-2014)

108-6

SP1 G186

Revise the *2012 Standard Specifications* as follows:

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

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

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

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

PROJECT SPECIAL PROVISIONS**ROADWAY****CLEARING AND GRUBBING - METHOD III:**

(4-6-06) (Rev.8-18-15)

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*. Conventional clearing methods may be used except where permit drawings or conditions have been included in the proposal which require certain areas to be cleared by hand methods.

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.

TEMPORARY DETOURS:

(7-1-95) (Rev. 11-19-13)

1101

SP2 R30B

Construct temporary detours required on this project in accordance with the typical sections in the plans or as directed.

After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage and stockpile the aggregate base course removed from the detours at locations within the right of way, as directed by the Engineer, for removal by State Forces. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor.

Aggregate base course and earth material that is removed will be measured and will be paid at the contract unit price per cubic yard for *Unclassified Excavation*. Pavement that is removed will be measured and will be paid at the contract unit price per square yard for *Removal of Existing Pavement*. Pipe culverts removed from the detours remain the property of the Contractor. Pipe culverts that are removed will be measured and will be paid at the contract unit price per linear foot for *Pipe Removal*. Payment for the construction of the detours will be made at the contract unit prices for the various items involved.

Such prices and payments will be full compensation for constructing the detours and for the work of removing, salvaging, and stockpiling aggregate base course; removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

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*.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS:

(4-16-02) (Rev. 5-19-15)

235

SP02 R70

Description

This specification allows the Contractor an option, with the approval of the Engineer, to use coal combustion products (CCPs) in embankments as a substitute for conventional borrow material. The amount of CCPs allowed to be used for this project will be less than 80,000 tons total and less than 8,000 tons per acre.

Materials

Supply coal combustion products from the Department list of potential suppliers maintained by the Value Management Unit. Site specific approval of CCP material will be required prior to beginning construction.

The following CCPs are unacceptable:

- (A) Frozen material,
- (B) Ash from boilers fired with both coal and petroleum coke, and
- (C) Material with a maximum dry unit weight of less than 65 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C.

Collect and transport CCPs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the CCPs as needed and transport in covered trucks to prevent dusting.

Preconstruction Requirements

When CCPs are to be used as a substitute for earth borrow material, request written approval from the Engineer at least ninety (90) days in advance of the intent to use CCPs and include the following details using the NCDOT Form #CCP-2015-V1 in accordance with NCGS § 130A-309.215(b)(1):

- (A) Description, purpose and location of project.
- (B) Estimated start and completion dates of project.
- (C) Estimated volume of CCPs to be used on project with specific locations and construction details of the placement.
- (D) Toxicity Characteristic Leaching Procedure analysis from a representative sample of each different CCP source to be used in the project for, at minimum, all of the following constituents: arsenic, barium, cadmium, lead, chromium, mercury, selenium, and silver.
- (E) The names, address, and contact information for the generator of the CCPs.
- (F) Physical location of the project at which the CCPs were generated.

Submit the form to the Engineer and the State Value Management Engineer at valuemanagementunit@ncdot.gov for review. The Engineer and the State Value Management Engineer will coordinate the requirements of NCGS § 130A-309.215(a)(1) and notify the

Contractor that all the necessary requirements have been met before the placement of structural fill using coal combustion products is allowed.

Construction Methods

In accordance with the detail in the plans, place CCPs in the core of the embankment section with at least 4 feet of earth cover to the outside limits of the embankments or subgrade and at least 5 feet above the seasonal high ground-water table. CCPs used in embankments shall not be placed as follows:

- (A) Within 50 feet of any property boundary.
- (B) Within 300 horizontal feet of a private dwelling or well.
- (C) Within 50 horizontal feet of the top of the bank of a perennial stream or other surface water body.
- (D) Within a 100-year floodplain except as authorized under NCGS § 143-215.54A(b). A site located in a floodplain shall not restrict the flow of the 100-year floodplain or result in washout of solid waste so as to pose a hazard to human life, wildlife or land and water resources.
- (E) Within 50 horizontal feet of a wetland, unless, after consideration of the chemical and physical impact on the wetland, the United States Army Corps of Engineers issues a permit or waiver for the fill.

Construct embankments by placing CCPs in level uniform lifts with no more than a lift of 10 inches and compacted to at least a density of 95 percent as determined by test methods in AASHTO T-99, Determination of Maximum Dry Density and Optimum Moisture Content, Method A or C depending upon particle size of the product. Provide a moisture content at the time of compaction of within 4 percent of optimum but not greater than one percent above optimum as determined by AASHTO T-99, Method A or C.

Divert surface waters resulting from precipitation from the CCPs placement area during filling and construction activities. Construct embankments such that rainfall will not run directly off of the CCPs. Provide dust control to minimize airborne emissions. Construct fill in a manner that prevents water from accumulating and ponding and do not pump nor discharge waters from CCP's filling and construction areas.

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *2012 Standard Specifications*.

ROCK AND BROKEN PAVEMENT FILLS:

(2-16-16)

235

SP2 R85

Revise the *2012 Standard Specifications* as follows:

Page 2-22, Article 235-2 MATERIALS, add the following after line 19:

Item	Section
Geotextile for Rock and Broken Pavement Fills, Type 2	1056

Provide Type 2 geotextile for filtration geotextiles. Use rip rap and No. 57 stone from either a quarry or onsite material to fill voids in rock and broken pavement fills. Provide small and large size rip rap with stone sizes that meet Class A and B in accordance with Table 1042-1 and No. 57 stone with a gradation that meets Table 1005-1 or use similar size onsite material approved by the Engineer.

Page 2-23, Subarticle 235-3(B) Embankment Formation, lines 18-19, delete the third sentence in the seventh paragraph.

Page 2-23, Subarticle 235-3(B) Embankment Formation, lines 21-23, replace the eighth paragraph with the following:

Before placing embankment fill material or filtration geotextiles over rock and broken pavement, fill voids in the top of rock and broken pavement fill with rip rap and No. 57 stone. Place and compact larger rip rap first followed by smaller rip rap. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install filtration geotextiles on top of rock, broken pavement, rip rap and No. 57 stone in accordance with Article 270-3 before placing remaining embankment fill material.

Remove any rocks, debris or pavement pieces from the roadbed larger than 2" within 12" of the subgrade or finished grade, whichever is lower.

Page 2-24, Article 235-5 MEASUREMENT AND PAYMENT, line 13, add the following to the end of the first paragraph:

Payment for rip rap, No. 57 stone and geotextiles to construct embankments with rock and broken pavement fills will be considered incidental to the work in Sections 225, 226, 230 and 240.

BLASTING:

(2-16-16)

220

SP2 R88B

Revise the *2012 Standard Specifications* as follows:

Page 2-8, Article 220-1 DESCRIPTION, line 22, delete “cushion, ”.

Page 2-8, Article 220-1 DESCRIPTION, line 23, add the following after the third sentence:

Unless required otherwise in the contract, design blasts for the vibration and air overpressure limits in this section.

Page 2-9, Subarticle 220-3(A) Vibration and Air Overpressure Limits, line 18, add the following to the end of Subarticle 220-3(A):

Unless required otherwise in the contract or directed, design production and trench blasts in accordance with the following:

- (1) Production Blasting
 - (a) For rock cut slopes steeper than 1.5:1 (H:V) without pre-splitting, do not use production blast holes more than 4" in diameter within 10 ft of finished slope faces or neat lines
 - (b) Do not drill production holes below bottom of adjacent pre-split blast holes
 - (c) Use delay blasting to detonate production blast holes towards a free face
- (2) Trench Blasting
 - (a) Do not use trench blast holes more than 3" in diameter
 - (b) Do not use ANFO or other bulk loaded products
 - (c) Use cartridge explosives or other explosive types designed for trench blasting
 - (d) Use charges with a diameter of 1/2" to 3/4" less than the trench blast hole diameter

PIPE INSTALLATION:

(11-20-12) (Rev. 8-18-15)

300

SP3 R01

Revise the *2012 Standard Specifications* as follows:

Page 3-1, Article 300-2, Materials, line 15, in the materials table, replace “Flowable Fill” and “Geotextiles” with the following:

Item	Section
Flowable Fill, Excavatable	1000-6
Grout, Type 2	1003
Geotextiles, Type 4	1056

Page 3-1, Article 300-2, Materials, lines 23-24, replace sentence with the following:

Provide foundation conditioning geotextile and geotextile to wrap pipe joints in accordance with Section 1056 for Type 4 geotextile.

Page 3-3, Subarticle 300-6(A), Rigid Pipe, line 2, in the first paragraph, replace “an approved non-shrink grout.” with “grout.” and line 4, in the second paragraph, replace “filtration geotextile” with “geotextile”.

Page 3-3, Article 300-7, Backfilling, lines 37-38, in the first and second sentences of the fifth paragraph, replace “Excavatable flowable fill” with “Flowable fill”.

CORRUGATED STEEL STRUCTURAL PLATE PIPE AND PIPE ARCH:

(7-21-15)

SPI 3-07

Description

Furnish and install corrugated steel structural plate pipe and pipe arch of the size and gauge called for on the plans at locations indicated in the contract. The work includes the construction of joints and connections to other pipes, endwalls, and other drainage structures.

Materials

The plate and fasteners for corrugated steel structural plate pipe and pipe arch shall meet the requirements of AASHTO M167.

When elongated pipe is called for by the contract, shop form the pipe to provide for a 5 percent elongation.

Unless otherwise required by the contract, place bolt holes along those edges of the plates that form longitudinal seams in the finished structure in 2 rows spaced 2” apart. Space the bolt holes a maximum of 6” apart.

Space bolt holes along those edges of the plates that form circumferential seams in the finished structure a maximum of 12” apart.

The maximum distance from the center of any bolt hole to the edge of the plate shall not be less than 1 3/4 times the diameter of the bolt. The diameter of bolt holes in longitudinal seams, excepting those at plate corners, shall not exceed the bolt diameter by more than 1/8”. The diameter of holes in circumferential seams, including those at plate corners, shall not exceed the bolt diameter by more than 1/2” and the average of the diameter on the major and minor axes shall not exceed the bolt diameter by more than 1/4”.

Cut plates for forming skewed or sloped ends to give the required angle of skew or slope. Burned edges shall be free from oxide and burrs and present a workmanlike finish. Repair damaged spelter coating around cut or burned edges as required by AASHTO M36.

Furnish an erection drawing for each installation. Mark each plate as necessary to insure proper placement in the structure.

Suppliers that provide metal pipe culverts, fittings, and all other accessories covered by this section shall meet the requirements of the Department's Brand Certification program for metal pipe culverts, and be listed on the Department's pre-approved list for suppliers of metal pipe culvert.

Provide for review, design and detail drawings for all structural plate elbows, wyes, and tees. All designs and details shall meet the requirements of AASHTO Section 12 and be sealed by a North Carolina Licensed Professional Engineer. Provide seven copies of the plans and one copy of the design calculations to the Engineer for review and acceptance prior to beginning fabrication. Include the cost of any required reinforcement (stiffeners, miscellaneous fabricated steel, heavier gauge plates, etc.) in the unit bid prices for the items involved.

Provide elbows, wyes, and tees of at least the same gauge as the connecting pipe culvert.

Acceptance

Acceptance of corrugated steel structural plate pipe and pipe arches, and its accessories will be based on, but not limited to, visual inspections, classification requirements, check samples taken from material delivered to the project, and conformance to the annual Brand Registration. Culvert pipe materials not meeting the above requirements will be rejected unless written approval is obtained from the State Materials Engineer.

Construction Methods

(A) Excavation, Foundation Preparation, and Backfilling

Install the pipe and pipe arch in accordance with Section 300 of the *2012 Standard Specifications* except place a minimum of 6 inch thickness of foundation conditioning material in accordance with the details shown in the plans.

(B) Erection

Erect in accordance with the manufacturer's assembly diagrams and instruction sheets. All erection procedures and methods shall meet industry standards. Handle structural plate with reasonable care. Do not drag or skid plate. The plate or the assembled pipe or pipe arch will be rejected, if the spelter coating is broken beyond repair prior to acceptance.

Assemble the entire pipe culvert completely before placing any backfill. Maintain correct position of pipe during assembly, correct for spiraling.

Install all bolts in accordance with the procedures specified by the manufacturer before backfill is placed. Tighten all nuts to a minimum of 100 foot-pounds and a maximum of 200 foot-pounds of torque. Check nut tightness with a properly calibrated torque wrench before, during, and after placing backfill.

Camber the invert grade by an amount sufficient to prevent the development of sag or back slope in the flow line after the backfill is placed. The Contractor shall determine the amount of camber required and submit to the Engineer for approval.

(C) Workmanship

Provide quality workmanship when installing the pipe and pipe arch. Evidence of poor or inadequate workmanship includes but is not limited to the following:

- (1) Uneven laps.
- (2) Improper shaping.
- (3) Variation from a straight center line.
- (4) Ragged edges.
- (5) Loose, unevenly lined or spaced bolts.
- (6) Illegible identification stamp on any plate.
- (7) Bruised, scaled or broken spelter coating.
- (8) Dents or bends in the metal itself.

Poor or inadequate workmanship may constitute sufficient cause for rejection of the completed or partially completed work, or of any materials proposed for use in the work.

(D) Elbows, Wyes, and Tees

Shop fabricate all structural plate elbows, wyes, and tees with the angle between the branch and main line of the lateral as noted on the plans. Provide joint connections in accordance with the manufacturer's instructions.

Measurement and Payment

Corrugated Steel Structural Plate Pipe or Pipe Arch will be measured and paid for as the actual number of linear feet of pipe or pipe arch, measured along the flow line of the pipe or pipe arch, not including elbows, wyes, and tees, to the nearest foot, that has been completed and accepted.

Payment will be made under:

Pay Item	Pay Unit
___ "C.S. Structural Plate Pipe, ___ Gauge	Linear Foot
___ "C.S. Structural Plate Pipe, ___ Gauge, Elongated	Linear Foot
___ "x ___" C.S. Structural Plate Pipe Arch, ___ Gauge	Linear Foot
___ "C.S. Structural Plate Pipe Elbow, Elongated, ___ Gauge (___" x ___" Corrugation)	Each
___ "C.S. Structural Plate Pipe Elbow, Elongated, ___ Gauge with ___ Bolts, ___" x ___" Corrugation	Each
___ "C.S. Structural Plate Pipe Wye, Elongated, ___ Gauge, (___" x ___" Corrugation)	Each

___"C.S. Structural Plate Pipe Wye, Elongated, ___Gauge with ___ Bolts, "___ x ___" Corrugation	Each
___"C.S. Structural Plate Pipe Tee, Elongated, ___Gauge, ___" x ___" Corrugation	Each
___"C.S. Structural Plate Pipe Tee, Elongated, ___Gauge with ___ Bolts, "___ x ___" Corrugation	Each

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12)

300, 340, 1000, 1530, 1540, 1550

SP3 R30

Description

This work consists of all work necessary to place flowable fill in accordance with these provisions, the plans, and as directed.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item

Flowable Fill

Section

1000-6

Construction Methods

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions dictate. The Contractor shall provide a method to plug the ends of the existing pipe in order to contain the flowable fill.

Measurement and Payment

At locations where flowable fill is called for on the plans and a pay item for flowable fill is included in the contract, *Flowable Fill* will be measured in cubic yards and paid as the actual number of cubic yards that have been satisfactorily placed and accepted. Such price and payment will be full compensation for all work covered by this provision including, but not limited to, the mix design, furnishing, hauling, placing and containing the flowable fill.

Payment will be made under:

Pay Item

Flowable Fill

Pay Unit

Cubic Yard

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-17-12)

422

SP4 R02

Description

Bridge approach fills include bridge approach fills for sub regional tier bridges and reinforced

bridge approach fills. Construct bridge approach fills in accordance with the contract and Standard Drawing No. 422.10 or 422.11 of the *2012 Roadway Standard Drawings*. Define “geosynthetics” as geotextiles or geomembranes.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Geotextiles	1056
Portland Cement Concrete	1000
Select Material	1016
Subsurface Drainage Materials	1044
Wire Staples	1060-8(D)

For bridge approach fills for sub regional tier bridges, provide Type 1 geotextile for filtration geotextiles. For reinforced bridge approach fills, provide Type 5 geotextile for geotextile reinforcement and Type 1 geotextile and No. 78M stone for drains. Use Class B concrete for concrete pads.

Use Class III or V select material for reinforced bridge approach fills and only Class V select material (standard size No. 78M stone) for bridge approach fills for sub regional tier bridges. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For drains and PVC pipes behind end bents, use pipes with perforations that meet AASHTO M 278.

Use PVC, HDPE or linear low density polyethylene (LLDPE) geomembranes for reinforced bridge approach fills. For PVC geomembranes, provide grade PVC30 geomembranes that meet ASTM D7176. For HDPE and LLDPE geomembranes, use geomembranes with a nominal thickness of at least 30 mils that meet Geosynthetic Research Institute Standard Specifications GM13 or GM17, respectively. Handle and store geomembranes in accordance with Article 1056-2 of the *2012 Standard Specifications*. Provide material certifications for geomembranes in accordance with Article 1056-3 of the *2012 Standard Specifications*.

Construction Methods

Excavate as necessary for bridge approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geomembranes or filtration geotextiles until excavation dimensions and foundation material are approved. Attach geomembranes and filtration geotextiles to end bent cap back and wing walls with adhesives, tapes or other approved methods. Glue or weld geomembrane seams to prevent leakage.

For reinforced bridge approach fills, place geotextile reinforcement within 3" of locations shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and in slight tension free of kinks, folds, wrinkles or creases. Install geotextile reinforcement with the orientation, dimensions and number of layers shown in Standard Drawing No. 422.10 of the *2012 Roadway*

Standard Drawings. Place first layer of geotextile reinforcement directly on geomembranes with no void or material in between. Install geotextile reinforcement with the machine direction (MD) parallel to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextile reinforcement in the MD so seams are perpendicular to the roadway centerline. Wrap geotextile reinforcement at end bent cap back and wing walls as shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and directed by the Engineer. Extend geotextile reinforcement at least 4 ft back behind end bent cap back and wing walls into select material.

Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geosynthetics.

For reinforced bridge approach fills, construct one foot square drains consisting of 4" diameter continuous perforated PVC pipes surrounded by No. 78M stone wrapped in Type 1 geotextiles. Install drains in accordance with Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings*. For bridge approach fills for sub regional tier bridges, install 4" diameter continuous perforated PVC drain pipes in accordance with Standard Drawing No. 422.11 of the *2012 Roadway Standard Drawings*.

Use solvent cement to connect PVC pipes so joints do not leak. Connect perforated pipes to outlet pipes just behind wing walls. Provide drain pipes and drains with positive drainage towards outlets. Place pipe sleeves in or under wing walls for outlet pipes so positive drainage is maintained. Use sleeves that can withstand wing wall loads.

Place select material in 8" to 10" thick lifts. Use only hand operated compaction equipment to compact select material for bridge approach fills. Compact Class III select material in accordance with Subarticle 235-3(C) of the *2012 Standard Specifications*. Compact No. 78M stone with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, drain pipes or drains when placing and compacting select material. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics, drain pipes or drains until they are covered with at least 8" of select material. Replace any damaged geosynthetics, drain pipes or drains to the satisfaction of the Engineer.

Cover open ends of outlet pipes with rodent screens as shown in Standard Drawing No. 815.03 of the *2012 Roadway Standard Drawings*. Connect ends of outlet pipes to concrete pads or existing drainage structures as directed by the Engineer. Construct concrete pads with an Ordinary surface finish that meets Subarticle 825-6(B) of the *2012 Standard Specifications*.

Measurement and Payment

Reinforced Bridge Approach Fill, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Reinforced Bridge Approach Fill, Station ____* will be full compensation for labor, tools, equipment and reinforced bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting select material, connecting

outlet pipes to existing drainage structures and supplying select materials, geosynthetics, drains, pipe sleeves and outlet components and any incidentals necessary to construct all reinforced bridge approach fills at each bridge.

Bridge Approach Fill - Sub Regional Tier, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Bridge Approach Fill - Sub Regional Tier, Station ____* will be full compensation for labor, tools, equipment and bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting No. 78M stone, connecting outlet pipes to existing drainage structures and supplying No. 78M stone, filtration geotextiles, drain pipes, pipe sleeves and outlet components and any incidentals necessary to construct all bridge approach fills at each sub regional tier bridge.

Payment will be made under:

Pay Item	Pay Unit
Reinforced Bridge Approach Fill, Station ____	Lump Sum
Bridge Approach Fill - Sub Regional Tier, Station ____	Lump Sum

PREPARATION OF SUBGRADE AND BASE:

(1-16-96)

610

SP5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2012 Standard Specifications* except use an automatically controlled fine grading machine using string lines, laser controls or other approved methods to produce final subgrade and base surfaces meeting the lines, grades and cross sections required by the plans or established by the Engineer.

No direct payment will be made for the work required by this provision as it will be considered incidental to other work being paid for by the various items in the contract.

ASPHALT PAVEMENTS - SUPERPAVE:

(6-19-12) (Rev. 8-16-16)

605, 609, 610, 650

SP6 R01

Revise the *2012 Standard Specifications* as follows:

Page 6-3, Article 605-7, APPLICATION RATES AND TEMPERATURES, replace this article, including Table 605-1, 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 6-6, Subarticle 607-5(A), Milled Asphalt Pavement, line 25, add the following to the end of the paragraph:

Areas to be paid under these items include mainline, turn lanes, shoulders, and other areas milled in conjunction with the mainline and any additional equipment necessary to remove pavement in the area of manholes, water valves, curb, gutter and other obstructions.

Page 6-6, Subarticle 607-5(C), Incidental Milling, lines 42-48, replace the paragraph with the following:

Incidental Milling to be paid will be the actual number of square yards of surface milled where the Contractor is required to mill butt joints, irregular areas and intersections milled as a separate operation from mainline milling and re-mill areas that are not due to the Contractor's negligence whose length is less than 100 feet. Measurement will be made as provided in Subarticle 607-5(A) for each cut the Contractor is directed to perform. Where the Contractor elects to make multiple cuts to achieve the final depth, no additional measurement will be made. Compensation will be made at the contract unit price per square yard for *Incidental Milling*.

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 6-20, Subarticle 610-3(C), Job Mix Formula (JMF), lines 47-48, replace the last sentence of the third paragraph with the following:

The JMF mix temperature shall be within the ranges shown in Table 610-1 unless otherwise approved.

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

TABLE 610-1	
MIXING TEMPERATURE AT THE ASPHALT PLANT	
Binder Grade	JMF Mix Temperature
PG 58-28; PG 64-22	250 - 290°F
PG 70-22	275- 305°F
PG 76-22	300- 325°F

Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF), lines 1-2, in the first sentence of the first paragraph, delete “and compaction”. Lines 4-7, delete the second paragraph and replace with the following:

When RAS is used, the JMF mix temperature shall be established at 275°F or higher.

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:

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 ^A
S9.5C, S12.5C	45°F ^A
S9.5D, S12.5D	50°F

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

Page 6-23, Subarticle 610-5(A), General, lines 33-34, replace the last sentence of the third paragraph with the following:

Produce the mixture at the asphalt plant within ± 25 °F of the JMF mix temperature. The temperature of the mixture, when discharged from the mixer, shall not exceed 350°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”. Line 28, in the last paragraph, replace “+15 °F to -25 °F of the specified JMF temperature.” with “ ± 25 °F of the specified JMF mix temperature.”

Page 6-26, Article 610-8, SPREADING AND FINISHING, line 34, add the following new paragraph:

As referenced in Section 9.6.3 of the *HMA/QMS Manual*, use the automatic screed controls on the paver to control the longitudinal profile. Where approved by the Engineer, the Contractor has the option to use either a fixed or mobile string line.

Page 6-29, Article 610-13, FINAL SURFACE TESTING AND ACCEPTANCE, line 39, add the following after the first sentence in the first paragraph:

Smoothness acceptance testing using the inertial profiler is not required on ramps, loops and turn lanes.

Page 6-30, Subarticle 610-13(A), Option 1 – Inertial Profiler, lines 15-16, replace the fourth sentence of the fourth paragraph with the following:

The interval at which relative profile elevations are reported shall be 2”.

Page 6-30, Subarticle 610-13(A), Option 1 – Inertial Profiler, lines 25-28, replace the ninth paragraph with the following:

Operate the profiler at any speed as per the manufacturer’s recommendations to collect valid data.

Page 6-30, Subarticle 610-13(A), Option 1 – Inertial Profiler, lines 30-31, delete the third sentence of the tenth paragraph.

Page 6-31, Subarticle 610-13(A), Option 1 – Inertial Profiler, lines 11-13, replace the first sentence of the third paragraph with the following:

After testing, transfer the profile data from the profiler portable computer’s hard drive to a write once storage media (Flash drive, USB, DVD-R or CD-R) or electronic media approved by the Engineer.

Page 6-31, Subarticle 610-13(A), Option 1 – Inertial Profiler, lines 17-18, replace the first sentence of the fourth paragraph with the following:

Submit a report with the documentation and electronic data of the evaluation for each section to the Engineer within 10 days after completion of the smoothness testing. The report shall be in the tabular format for each 0.10 segment or a portion thereof with a summary of the MRI values and the localized roughness areas including corresponding project station numbers or acceptable reference points. Calculate the pay adjustments for all segments in accordance with the formulas in Sections (1) and (2) shown below. The Engineer shall review and approval all pay adjustments unless corrective action is required.

Page 6-31, Subarticle 610-13(A)(1), Acceptance for New Construction, lines 36-37, replace the third paragraph with the following:

The price adjustment will apply to each 0.10-mile section or prorated for a portion thereof, based on the Mean Roughness Index (MRI), the average IRI values from both wheel paths.

Page 6-32, Subarticle 610-13(A)(2), Localized Roughness, lines 12-16, replace the first paragraph with the following:

Areas of localized roughness shall be identified through the “Smoothness Assurance Module (SAM)” provided in the ProVAL software. Use the SAM report to optimize repair strategies by analyzing the measurements from profiles collected using inertial profilers. The ride quality threshold for localized roughness shall be 165 in/mile for any sections that are 15 ft. to 100 ft. in length at the continuous short interval of 25 ft. Submit a continuous roughness report to identify each section with project station numbers or reference points outside the threshold and identify all localized roughness, with the signature of the Operator included with the submitted IRI trace and electronic files.

Page 6-32, Subarticle 610-13(A)(2), Localized Roughness, line 21, add the following new paragraph:

If the Engineer does not require corrective action, the pay adjustment for each area of localized roughness shall be based on the following formula:

$$PA = (165 - LR\#) 5$$

Where:

PA = Pay Adjustment (dollars)
 LR# = The Localized Roughness number determined from SAM report for the ride quality threshold

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

TABLE 650-1 OGAFC GRADATION CRITERIA			
<i>Sieve Size (mm)</i>	<i>Type FC-1</i>	<i>Type FC-1 Modified</i>	<i>Type FC-2 Modified</i>
19.0	-	-	100
12.5	100	100	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

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 \$ **349.29** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **July 1, 2016**.

OPEN GRADED ASPHALT FRICTION COURSE, PERMEABLE ASPHALT DRAINAGE COURSE, AND ULTRA-THIN BONDED WEARING COURSE:

(4-17-12)(Rev. 12-15-15)

609, 610

SP6 R62

When producing and constructing open graded asphalt friction course, permeable asphalt drainage course, and ultra-thin bonded wearing course revise the *2012 Standard Specifications* as follows:

Page 6-10, Subarticle 609-6(B) Required Sampling and Testing Frequencies, delete the third paragraph and replace with the following:

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

<u>Accumulative Production Increment</u>	<u>Number of Samples per Increment</u>
500 tons	1

Page 6-10, Subarticle 609-6(C) Control Charts, delete the fourth paragraph and replace with the following:

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *HMA/QMS Manual*:

- (a) Aggregate Gradation Test Results:
1. 12.5 mm (Types P57 & FC-2 Mod. Only)
 2. 9.5 mm (Excluding Type P57)
 3. 4.75 mm
 4. 2.36 mm
 5. 0.075 mm Sieves
- (b) Binder Content, %, P_b

Page 6-11, Subarticle 609-6(D) Control Limits, Table 609-1 CONTROL LIMITS, replace with the following:

Mix Control Criteria	Target Source	Moving Average Limit	Individual Limit
12.5 mm Sieve (Types P57 & FC-2 Mod)	JMF	± 4.0	± 8.0
9.5 mm Sieve (Excluding Type P57)	JMF	± 4.0	± 8.0
4.75 mm Sieve	JMF	± 4.0	± 8.0
2.36 mm Sieve	JMF	± 4.0	± 8.0
0.075 mm Sieve	JMF	± 1.5	± 2.5
Binder Content	JMF	± 0.3	± 0.7
TSR (Ultra-thin Only)	Min. Spec. Limit	-	- 15%

Page 6-12, Subarticle 609-6(F) Allowable Retesting for Mix Deficiencies, Table 609-2 RETEST LIMITS FOR MIX DEFICIENCIES, replace with the following:

Property	Limit
% Binder Content	by more than $\pm 1.0\%$
12.5 mm Sieve (Types P 57 & FC-2 Mod)	by more than $\pm 9.0\%$
9.5 mm Sieve (Excluding Type P 57)	by more than $\pm 9.0\%$
4.75 mm sieve	by more than $\pm 9.0\%$
2.36 mm sieve	by more than $\pm 9.0\%$
0.075 mm sieve	by more than $\pm 3.0\%$
TSR (Ultra-thin only)	by more than -15% from Specification limit

Page 6-17, Subarticle 609-9(C) Limits of Precision, Table 609-3 LIMITS OF PRECISION FOR TEST RESULTS, replace with the following:

TABLE 609-3 LIMITS OF PRECISION FOR TEST RESULTS	
Mix Property	Limits of Precision
12.5 mm Sieve (Types P 57 & FC-2 Mod. Only)	± 6.0%
9.5 mm Sieve (Excluding Type P 57)	± 5.0%
4.75 mm Sieve	± 5.0%
2.36 mm Sieve	± 5.0%
0.075 mm Sieve	± 2.0%
Asphalt Binder Content	± 0.5%
TSR (Ultra-thin HMA Only)	± 15.0%

Page 6-19, Article 610-3, COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA), lines 23-24, replace the second sentence in the fifth paragraph with the following:

RAS material may constitute up to 6% by weight of total mixture for any mix with the exception of OGAFC which may constitute up to 5% by weight.

Page 6-19, Article 610-3, COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA), line 32, add the following after the fifth sentence of the fifth paragraph:

For OGAFC, the maximum percent of binder contributed from RAS or a combination of RAS and RAP is 18%.

PORTLAND CEMENT CONCRETE PAVEMENT:

(02-05-15)

700, 710

SPI 7-17

Revise the *2012 Standard Specifications* as follows:

Page 7-1, Article 700-1, DESCRIPTION, lines 16-17, replace fifth paragraph with:

Submit for approval a Process Control Plan addressing all operations necessary in the production and placement of concrete pavement a minimum of 30 calendar days prior to placing concrete pavement.

Page 7-2, Subarticle 700-5(A)(1), lines 29-31, replace first paragraph with:

A descending air temperature at the location of the concrete paving operation and away from artificial heat reaches 35°F. Paving may resume when the weather forecast is projected to reach a high of 40°F on that day's operation and the morning ambient temperature is above 32°F.

Page 7-2, Subarticle 700-5(A), General, lines 38 and 40, replace “3500 psi” with “3000 psi.”

Page 7-4, Subarticle 700-8(B), Cold Weather, lines 38-42, replace the first paragraph with the following:

When the air temperature is projected to drop below 35°F for more than four hours, insulate the Portland cement concrete pavement to prohibit the concrete surface temperature from dropping below 35°F during the curing period.

Page 7-5, Subarticle 700-9(A), General, line 9, first sentence of the first paragraph, replace “methods herein” with “curing methods herein”.

Page 7-5, Subarticle 700-9(A), General, lines 12-15, delete the third paragraph and replace with the following:

Curing is required until the concrete compressive strength has exceeded 3,000 psi using the maturity method in accordance with Article 700-13.

Page 7-6, Subarticle 700-11(A), General, lines 20-29, delete the first and last sentence of the second paragraph. Add the following as the last sentence of the second paragraph on lines 25-26. Move third paragraph (lines 27-29) to between the first and second paragraph before line 20.

To estimate the time of sawing, it is recommended to use the latest version of FHWA’s High Performance Paving software entitled HIPERPAV.

Page 7-8, Subarticle 700-11(G), Verification of Dowel Bar Alignment, line 7, in the second sentence of the second paragraph on the page replace “vertical tilt,” with “vertical tilt, and total misalignment”. Line 25, in the fourth sentence of the seventh paragraph on the page replace “greater misalignment” with “total misalignment”. Lines 26-27, delete the last sentence of the seventh paragraph on the page. Line 29, in the first sentence of the sixth paragraph on the page replace “score of 10” with “score of 12”.

Page 7-8, Subarticle 700-11(G), TABLE 700-1, TOLERANCE FOR DOWEL BAR ALIGNMENT^A, replace with the following:

TABLE 700-1 TOLERANCE FOR DOWEL BAR ALIGNMENT^A	
Misalignment Category, inches	Weight
$0 \leq d \leq 0.6$	0
$0.6 < d \leq 0.8$	2
$0.8 < d \leq 1.00$	4
$1.00 < d \leq 1.50$	5
$1.50 \leq d$	10

A. Where **d** is the individual dowel bar misalignment.

Page 7-9, Subarticle 700-12, (B) Age of Pavement, line 6, delete “14 calendar days old.” and replace with “7 calendar days old and concrete is dry based on sealant manufacturer’s recommendations.”

Page 7-9, Article 700-13, USE OF NEW PAVEMENT OR SHOULDER, line 31, in the first sentence of the first paragraph replace “3,500 psi, unless otherwise permitted.” with “3,000 psi.” Line 36, add the following as the third sentence of the second paragraph:

Install loggers in slabs after every 2 lots approximately 4 inches from the concrete surface.

Page 7-10, Article 700-13, USE OF NEW PAVEMENT OR SHOULDER, lines 6-11, replace the second paragraph on the page with the following:

Validate the strength-maturity relationship and the correlation between cylinders and beams during the first day’s production by casting cylinders and beams and performing strength tests. Use the TTF developed during the mix design process to verify the production strength-maturity relationship. Validate the strength-maturity relationship and the correlation between cylinders and beams by casting cylinders and beams and performing strength tests least every 30 calendar days, or when the TTF varies by more than 10% from the latest approved maturity curve or there is a material change from the approved concrete mix design. If the verification sample’s compressive strength when tested at TTF is less than 3,000 psi, immediately suspend early opening of traffic on pavement that has not obtained TTF until a new strength-maturity relationship is developed.

Page 7-13, Article 710-6, FINISHING, lines 5-10, replace the second paragraph on the page with the following:

Produce the final surface finish on all mainline pavement, auxiliary lanes, and ramps by mechanical equipment for longitudinally tined grooves while the concrete is plastic. The tining shall be done with a mechanical device such as a wire comb. The comb shall have a single row of tines. Each shall have a nominal width of 5/64 inch to 1/8 inch. The nominal spacing of the tines shall be $3/4 \pm 1/8$ inch center-to-center. The nominal depth of tined groove in the plastic concrete shall be $1/8 \pm 1/32$ inch.

Longitudinal tining shall be accomplished by equipment with automated horizontal and vertical controls to ensure straight, uniform depth tined grooves. The texture geometry shall be the same as imparted throughout the length of the tining comb. A 2-inch to 3-inch wide strip of pavement surface shall be protected from tining for the length of and centered about longitudinal joints.

The tining operation shall be done so that the desired surface texture will be achieved while minimizing displacement of the larger aggregate particles and before the surface permanently sets. Where abutting pavement is to be placed, the tining shall extend as close to the edge as possible without damaging the edge. If abutting pavement is not to be placed, the 6-inch area nearest the edge or one foot from the face of the curb shall not be tined. Hand-operated tining equipment that produces an equivalent texture may be used only on small or irregularly shaped areas. Tines shall be thoroughly cleaned at the end of each day’s use and damaged or worn tines replaced.

When surface corrections for pavement smoothness are made in the hardened concrete, no additional texturing is required.

Page 7-13, Article 710-7, FINAL SURFACE TESTING, lines 41-42, replace the third and fourth sentences of the fourth paragraph with the following:

The profile data shall be filtered with a cutoff wavelength of 250 ft. The interval at which relative profile elevations are reported shall be a maximum of 1".

Page 7-14, Article 710-7, FINAL SURFACE TESTING, line 38, in the first sentence of the ninth paragraph on the page, replace "(DVD-R or CD-R)" with "(USB flash drive, external hard drive, or DVD)".

Page 7-15, Subarticle 710-7(B), Localized Roughness, line 33, in the third sentence of the first paragraph, replace "125 in/mile" with "150 in/mile".

Page 7-17, Subarticle 710-10(A), General, lines 18-21, replace the fourth paragraph with the following:

Payment for all work of surface testing will be incidental to the contract unit price for *Portland Cement Concrete Pavement, Through Lanes, (with dowels) for Surface Testing Concrete Pavement*.

Page 7-19, Subarticle 710-10(E), Compensation, lines 1-5, delete the second paragraph (the paragraph at the top of the page).

Page 7-19, Subarticle 710-10(F), Pay Items, line 7, delete *Surface Testing Concrete Pavement (Lump Sum)* from the Pay Item table.

MILLED RUMBLE STRIPS (Concrete Shoulder):

(1-24-14)

SPI07-14

Description

Mill rumble strips on Portland cement concrete shoulders in accordance with *Roadway Standard Drawing* No. 720.01, the plans, and as directed by the Engineer.

Equipment

Provide equipment consisting of a rotary type cutting head with an outside diameter of no more than 24" and no less than 16" long. Provide a cutting head that has the cutting tips arranged in such a pattern as to provide a relatively smooth cut as well as a cutting head that is on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder and/or any irregularities in the shoulder surface. Provide a cutting tool equipped with guides to establish consistent alignment and uniformity of each cut in relation to the roadway.

Construction Methods

Demonstrate the ability to achieve desired surface inside each depression without tearing or snagging the Portland cement concrete prior to beginning the work.

Provide rumble strips that have finished dimensions and pattern in accordance with *Roadway Standard Drawing* No. 720.01.

Material resulting from the operation shall become the property of the Contractor. Remove and dispose of material in accordance with Section 802 of the *Standard Specifications*.

Remove all equipment to a location where it does not present a traffic hazard and clean pavement before reopening work area to traffic.

Measurement and Payment

Milled Rumble Strips (Concrete Shoulder) will be measured and paid as the actual number of linear feet of shoulder, measured longitudinally along the surface of each shoulder, where rumble strips have been constructed and accepted.

Payment will be made under:

Pay Item	Pay Unit
Milled Rumble Strips (Concrete Shoulder)	Linear Foot

TEMPORARY SIDEWALK:**Description**

Construct temporary sidewalk in accordance with the plans, Section 848 of the *Standard Specifications* and as directed by the Engineer.

Materials

Refer to Article 848-2 of the *Standard Specifications*.

Construction Methods

Construct the temporary sidewalk in accordance with Section 848 of the *Standard Specifications*. When temporary sidewalk is no longer needed, remove and properly dispose of.

Measurement and Payment

Temporary Sidewalk will be measured and paid in square yards, measured along the surface of the completed and accepted work. Such price includes, but is not limited to, excavating and

backfilling, sawing the existing sidewalk, furnishing and placing concrete, constructing and sealing joints and removing and properly disposing of temporary sidewalk.

Payment will be made under:

Pay Item	Pay Unit
Temporary Sidewalk	Square Yard

MEDIAN HAZARD PROTECTION:

Description

Construct Median Hazard Protection at the concrete barrier transition sections as shown in the detail in the plans, in accordance with the detail in the plans and as directed by the Engineer.

Measurement and Payment

Median Hazard Protection will be measured and paid for per each that are completed and accepted. Such price and payment will be full compensation for all labor, materials (including, but not limited to concrete barrier, earth material, #57 stone, concrete cover, galvanized bar and grout) and all incidentals necessary construct the Median Hazard Protection.

Payment will be made under:

Pay Item	Pay Unit
Median Hazard Protection	Each

STEEL BOLLARDS:

SPI

Furnish and install steel bollards in accordance with the detail in the plans, at locations shown in the plans and as directed by the Engineer.

Install bollards plum and true to line in Class "B" concrete footing conforming with all applicable portions of Sections 825 and 1000 of the *Standard Specifications*.

Steel Bollards will be measured and paid as the actual number installed and accepted. Such payment will be full compensation for all materials, labor, and equipment necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Steel Bollards	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

_____ " Sluice Gate

Pay Unit

Each

GUARDRAIL ANCHOR UNITS, TYPE M-350:

(4-20-04) (Rev. 7-21-15)

862

SP08 R060

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

Furnish guardrail anchor units listed on the NCDOT Approved Products List at <https://apps.dot.state.nc.us/vendor/approvedproducts/> or approved equal.

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

Guardrail Anchor Units, Type M-350

Pay Unit

Each

GUARDRAIL ANCHOR UNITS, TYPE 350 (TL-3):

(4-20-04) (Rev. 7-21-15)

862

SP08 R065

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

Furnish guardrail anchor units listed on the NCDOT [Approved Products List](https://apps.dot.state.nc.us/vendor/approvedproducts/) at <https://apps.dot.state.nc.us/vendor/approvedproducts/> or approved equal.

Prior to installation the Contractor shall submit to the Engineer:

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

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

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item

Guardrail Anchor Units, Type 350

Pay Unit

Each

IMPACT ATTENUATOR UNITS, TYPE 350:

(4-20-04) (Rev. 7-21-15)

SP08 R075

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

Furnish impact attenuator units listed on the Approved Products List at <https://apps.dot.state.nc.us/vendor/approvedproducts/> or approved equal. 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 NON-GATING Impact Attenuator Units.

If the median width is greater than 40 feet, the Contractor may use GATING or NON-GATING Impact Attenuator Units.

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

TEMPORARY 48" CHAIN LINK FENCE WITH POSTS:**Description**

Construct temporary 48" chain link fence in accordance with the plans, the *2012 Standard Specifications*, Roadway Standard Drawing No. 866.01, and as directed by the Engineer.

Materials

Refer to Article 866-2 of the *Standard Specifications*.

Construction Methods

Construct the temporary 48" chain link fence in accordance with the applicable requirements of Section 866 of the *2012 Standard Specifications*, Roadway Standard Drawing No. 866.01, and as directed by the Engineer. After the fence has served its purpose and is no longer needed, as determined by the Engineer, it will become the property of the Contractor and shall be removed.

Measurement and Payment

Temporary 48" Chain Link Fence With Posts will be measured and paid for as the actual number of linear feet of fence constructed and accepted, measured in place from center of end post to center of end post. All posts used for the chain link fence are included in the price of the fence and will not be paid for separately. Such price and payment will be full compensation for all materials, labor, fence maintenance, removal, and incidentals, necessary to satisfactorily complete the work.

Work includes, but is not limited to, clearing and grading; and furnishing and installing fence fabric, barbed wire, tie wires, tie rods, stretcher bars, top rails, tension wire, posts and post braces, concrete, fittings and any other materials, and removal of the fence.

Payment will be made under:

Pay Item

Temporary 48" Chain Link Fence With Posts

Pay Unit

Linear Foot

DETECTABLE WARNINGS FOR PROPOSED CURB RAMPS:

(6-15-10) (Rev. 8-16-11)

848

SP8 R126

Description

Construct detectable warnings consisting of integrated raised truncated domes on proposed concrete curb ramps in accordance with the *2012 Standard Specifications*, plan details, the requirements of the *28 CFR Part 36 ADA Standards for Accessible Design* and this provision.

Materials

Detectable warning for proposed curb ramps shall consist of integrated raised truncated domes. The description, size and spacing shall conform to Section 848 of the *2012 Standard Specifications*.

Use material for detectable warning systems as shown herein. Material and coating specifications must be stated in the Manufacturers Type 3 Certification and all Detectable Warning systems must be on the NCDOT Approved Products List.

Install detectable warnings created from one of the following materials: precast concrete blocks or bricks, clay paving brick, gray or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile. Only one material type for detectable warning will be permitted per project, unless otherwise approved by the Engineer.

- (A) Detectable Warnings shall consist of a base with integrated raised truncated domes, and when constructed of precast concrete they shall conform to the material requirements of Article 848-2 of the *2012 Standard Specifications*.
- (B) Detectable Warnings shall consist of a base with integrated raised truncated domes, and may be comprised of other materials including, but not limited, to clay paving brick, gray iron or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile, which are cast into the concrete of the curb ramps. The material shall have an integral color throughout the thickness of the material. The detectable warning shall include fasteners or anchors for attachment in the concrete and shall be furnished as a system from the manufacturer.

Prior to installation, the Contractor shall submit to the Engineer assembling instructions from the manufacturer for each type of system used in accordance with Article 105-2 of the *2012 Standard Specifications*. The system shall be furnished as a kit containing all consumable materials and consumable tools, required for the application. They shall be capable of being affixed to or anchored in the concrete curb ramp, including green concrete (concrete that has set but not appreciably hardened). The system shall be solvent free and contain no volatile organic compounds (VOC). The static coefficient of friction shall be 0.8 or greater when measured on top of the truncated domes and when measured between the domes in accordance with ASTM C1028 (dry and wet). The system shall be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to degradation by motor fuels, lubricants and antifreeze.

- (C) When steel or gray iron or ductile iron casting products are provided, only products that meet the requirements of Subarticle 106-1(B) of the *2012 Standard Specifications* may be used. Submit to the Engineer a Type 6 Certification, catalog cuts and installation procedures at least 30 days prior to installation for all.

Construction Methods

- (A) Prior to placing detectable warnings in proposed concrete curb ramps, adjust the existing subgrade to the proper grade and in accordance with Article 848-3 of the *2012 Standard Specifications*.
- (B) Install all detectable warning in proposed concrete curb ramps in accordance with the manufacturer's recommendations.

Measurement and Payment

Detectable Warnings installed for construction of proposed curb ramps will not be paid for separately. Such payment will be included in the price bid for *Concrete Curb Ramps*.

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

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

9, 14, 17

SP9 R05

Description

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

Materials

Refer to the *2012 Standard Specifications*.

Item	Section
Conduit	1091-3
Grout, Type 2	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
$\leq 1 \frac{1}{2}$	1/3 turn (2 flats)
$> 1 \frac{1}{2}$	1/6 turn (1 flat)

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

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

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. 3-15-16) 1000, 1002, 1005, 1016, 1018, 1024, 1050, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092 SP10 R01

Revise the *2012 Standard Specifications* as follows:

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

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

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

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

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

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

an increase only), cement (applies to a decrease only), or pozzolan (applies to an increase or decrease greater than 5%).

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

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

Item	Section
Type IL Blended Cement	1024-1

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

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

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

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

TABLE 1000-1 REQUIREMENTS FOR CONCRETE											
Class of Concrete	Min. Comp. Strength at 28 days	Maximum Water-Cement Ratio				Consistency Max. Slump		Cement Content			
		Air-Entrained Concrete		Non Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
<i>Units</i>	<i>psi</i>					<i>inch</i>	<i>inch</i>	<i>lb/cy</i>	<i>lb/cy</i>	<i>lb/cy</i>	<i>lb/cy</i>
AA	4,500	0.381	0.426	-	-	3.5	-	639	715	-	-
AA Slip Form	4,500	0.381	0.426	-	-	1.5	-	639	715	-	-
Drilled Pier	4,500	-	-	0.450	0.450	-	5-7 dry 7-9 wet	-	-	640	800
A	3,000	0.488	0.532	0.550	0.594	3.5	4	564	-	602	-
B	2,500	0.488	0.567	0.559	0.630	1.5 machine-placed 2.5 hand-placed	4	508	-	545	-
Sand Light-weight	4,500	-	0.420	-	-	4	-	715	-	-	-
Latex Modified	3,000 7 day	0.400	0.400	-	-	6	-	658	-	-	-
Flowable Fill excavatable	150 max. at 56 days	as needed	as needed	as needed	as needed	-	Flowable	-	-	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	-	Flowable	-	-	100	as needed
Pavement	4,500 design, field 650 flexural, design only	0.559	0.559	-	-	1.5 slip form 3.0 hand place	-	526	-	-	-
Precast	See Table 1077-1	as needed	as needed	-	-	6	as needed	as needed	as needed	as needed	as needed
Prestress	per contract	See Table 1078-1	See Table 1078-1	-	-	8	-	564	as needed	-	-

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

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

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

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

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

(H) Handling and Storing Test Panels

Notify the Area Materials Engineer when preconstruction or production test panels are made within 24 hours of shooting the panels. Field cure and protect test panels from damage in accordance with ASTM C1140 until the Department transports panels to the Materials and Tests Regional Laboratory for coring.

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

TABLE 1005-1 AGGREGATE GRADATION - COARSE AGGREGATE													
Percentage of Total by Weight Passing													
Std. Size #	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#40	#200	Remarks
4	100	90-100	20-55	0-15	-	0-5	-	-	-	-	-	A	Asphalt Plant Mix
467M	100	95-100	-	35-70	-	0-30	0-5	-	-	-	-	A	Asphalt Plant Mix
5	-	100	90-100	20-55	0-10	0-5	-	-	-	-	-	A	AST, Sediment Control Stone
57	-	100	95-100	-	25-60	-	0-10	0-5	-	-	-	A	AST, Str. Concrete, Shoulder Drain, Sediment Control Stone
57M	-	100	95-100	-	25-45	-	0-10	0-5	-	-	-	A	AST, Concrete Pavement
6M	-	-	100	90-100	20-55	0-20	0-8	-	-	-	-	A	AST
67	-	-	100	90-100	-	20-55	0-10	0-5	-	-	-	A	AST, Str. Concrete, Asphalt Plant Mix
78M	-	-	-	100	98-100	75-100	20-45	0-15	-	-	-	A	Asphalt Plant Mix, Str. Conc. Weep Hole Drains
14M	-	-	-	-	-	100	35-70	5-20	-	0-8	-	A	Asphalt Plant Mix, AST, Weep Hole Drains,
9	-	-	-	-	-	100	85-100	10-40	-	0-10	-	A	AST
ABC	-	100	75-97	-	55-80	-	35-55	-	25-45	-	14-30	4-12B	Aggregate Base Course, Aggregate Stabilization
ABC (M)	-	100	75-100	-	45-79	-	20-40	-	0-25	-	-	0-12B	Maintenance Stabilization
Lightweight	-	-	-	-	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 10-39, Article 1016-3, CLASSIFICATIONS , lines 27-32, replace with the following:

Select material is clean, unweathered durable, blasted rock material obtained from an approved source. While no specific gradation is required, the below criteria will be used to evaluate the materials for visual acceptance by the Engineer:

- (A) At least 50% of the rock has a diameter of from 1.5 ft to 3 ft,
- (B) 30% of the rock ranges in size from 2” to 1.5 ft in diameter, and
- (C) Not more than 20% of the rock is less than 2” in diameter. No rippable rock will be permitted.

Page 10-40, Tables 1018-1 and 1018-2, PIEDMONT, WESTERN AND COASTAL AREA CRITERIA FOR ACCEPTANCE OF BORROW MATERIAL, under second column in both tables, replace second row with the following:

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

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

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

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

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

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

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

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

All fencing material and accessories shall meet Section 106.

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

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

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

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

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

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

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

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

1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS

(A) General

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

(B) Classification

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

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

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

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

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

(C) Requirements

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

(D) Prequalification

Refer to Subarticle 1081-1(E).

(E) Acceptance

Refer to Subarticle 1081-1(F).

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

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

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

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

The epoxy shall meet Article 1081-4.

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

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

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

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

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

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

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

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

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

HIGH STRENGTH CONCRETE FOR DRIVEWAYS:

(11-21-00) (Rev. 1-17-12)

848

SP10 R02

Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-5 of the *2012 Standard Specifications*.

Measurement and payment will be in accordance with Section 848 of the *2012 Standard Specifications*.

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.

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.

GROUT PRODUCTION AND DELIVERY:

(3-17-15)

1003

SP10 R20

Revise the *2012 Standard Specifications* as follows:

Replace Section 1003 with the following:

SECTION 1003 GROUT PRODUCTION AND DELIVERY

1003-1 DESCRIPTION

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

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

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

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

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

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

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

1003-2 MATERIALS

Refer to Division 10.

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

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

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

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

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

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

1003-3 COMPOSITION AND DESIGN

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

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

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

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

Perform laboratory tests in accordance with the following test procedures:

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

- A.** Applicable to grout with aggregate.
- B.** Applicable to Neat Cement Grout.
- C.** American National Standards Institute/American Petroleum Institute Recommended Practice.
- D.** Procedure A (Rapid Freezing and Thawing in Water) required.
- E.** Moist room storage required.

1003-4 GROUT REQUIREMENTS

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

**TABLE 1003-2
GROUT REQUIREMENTS**

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

A. Applicable to Type 1 through 4 grouts.

B. Applicable to Type 5 grout.

C. ASTM C1107.

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

1003-5 TEMPERATURE REQUIREMENTS

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

1003-6 ELAPSED TIME FOR PLACING GROUT

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

**TABLE 1003-3
ELAPSED TIME FOR PLACING GROUT
(with continuous agitation)**

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

1003-7 MIXING AND DELIVERY

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

GEOSYNTHETICS:

(2-16-16)

1056

SP10 R25

Revise the *2012 Standard Specifications* as follows:

Replace Section 1056 with the following:

**SECTION 1056
GEOSYNTHETICS****1056-1 DESCRIPTION**

Provide geosynthetics for subsurface drainage, separation, stabilization, reinforcement, erosion control, filtration and other applications in accordance with the contract. Use geotextiles, geocomposite drains and geocells that are on the NCDOT Approved Products List. Prefabricated geocomposite drains include sheet, strip and vertical drains (PVDs), i.e., "wick drains" consisting of a geotextile attached to and/or encapsulating a plastic drainage core. Geocells are comprised of ultrasonically welded polymer strips that when expanded form a 3D honeycomb grid that is typically filled with material to support vegetation.

If necessary or required, hold geotextiles and sheet drains in place with new wire staples, i.e., "sod staples" that meet Subarticle 1060-8(D) or new anchor pins. Use steel anchor pins with a diameter of at least 3/16" and a length of at least 18" and with a point at one end and a head at the other end that will retain a steel washer with an outside diameter of at least 1.5".

1056-2 HANDLING AND STORING

Load, transport, unload and store geosynthetics so geosynthetics are kept clean and free of damage. Label, ship and store geosynthetics in accordance with Section 7 of AASHTO M 288. Geosynthetics with defects, flaws, deterioration or damage will be rejected. Do not unwrap geosynthetics until just before installation. Do not leave geosynthetics exposed for more than 7 days before covering except for geosynthetics for temporary wall faces and erosion control.

1056-3 CERTIFICATIONS

Provide Type 1, Type 2 or Type 4 material certifications in accordance with Article 106-3 for geosynthetics. Define "minimum average roll value" (MARV) in accordance with ASTM D4439. Provide certifications with MARV for geosynthetic properties as required. Test geosynthetics using laboratories accredited by the Geosynthetic Accreditation Institute (GAI) to perform the required test methods. Sample geosynthetics in accordance with ASTM D4354.

1056-4 GEOTEXTILES

When required, sew geotextiles together in accordance with Article X1.1.4 of AASHTO M 288. Provide sewn seams with seam strengths meeting the required strengths for the geotextile type and class specified.

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

Use woven or nonwoven geotextiles with properties that meet Table 1056-1. Define “machine direction” (MD) and “cross-machine direction” (CD) in accordance with ASTM D4439.

TABLE 1056-1 GEOTEXTILE REQUIREMENTS						
Property	Requirement					Test Method
	Type 1	Type 2	Type 3^A	Type 4	Type 5^B	
<i>Typical Application</i>	<i>Shoulder Drains</i>	<i>Under Rip Rap</i>	<i>Silt Fence Fabric</i>	<i>Soil Stabilization</i>	<i>Temporary Walls</i>	
Elongation (MD & CD)	≥ 50%	≥ 50%	≤ 25%	< 50%	< 50%	ASTM D4632
Grab Strength (MD & CD)	Table 1 ^D , Class 3	Table 1 ^D , Class 1	100 lb ^C	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 ^C (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2 ^D , 15% to 50% <i>in Situ</i> Soil Passing 0.075 mm	Table 6 ^D , 15% to 50% <i>in Situ</i> Soil Passing 0.075mm	Table 7 ^D	Table 5 ^D	0.20 sec ^{-1.C}	ASTM D4491
Apparent Opening Size					0.60 mm ^E	ASTM D4751
UV Stability (Retained Strength)					70% ^C (after 500 hr of exposure)	ASTM D4355

- A.** Minimum roll width of 36" required.
B. Minimum roll width of 13 ft required.
C. MARV per Article 1056-3.
D. AASHTO M 288.
E. Maximum average roll value.

1056-5 GEOCOMPOSITE DRAINS

Provide geocomposite drain types in accordance with the contract and with properties that meet Table 1056-2.

TABLE 1056-2 GEOCOMPOSITE DRAIN REQUIREMENTS				
Property	Requirement			Test Method
	Sheet Drain	Strip Drain	Wick Drain	
Width	≥ 12" (unless required otherwise in the contract)	12" ±1/4"	4" ±1/4"	N/A
In-Plane Flow Rate ^A (with gradient of 1.0 and 24-hour seating period)	6 gpm/ft @ applied normal compressive stress of 10 psi	15 gpm/ft @ applied normal compressive stress of 7.26 psi	1.5 gpm ^B @ applied normal compressive stress of 40 psi	ASTM D4716

A. MARV per Article 1056-3.

B. Per 4" drain width.

For sheet and strip drains, use accessories (e.g., pipe outlets, connectors, fittings, etc.) recommended by the Drain Manufacturer. Provide sheet and strip drains with Type 1 geotextiles heat bonded or glued to HDPE, polypropylene or high impact polystyrene drainage cores that meet Table 1056-3.

TABLE 1056-3 DRAINAGE CORE REQUIREMENTS			
Property	Requirement (MARV)		Test Method
	Sheet Drain	Strip Drain	
Thickness	1/4"	1"	ASTM D1777 or D5199
Compressive Strength	40 psi	30 psi	ASTM D6364

For wick drains with a geotextile wrapped around a corrugated drainage core and seamed to itself, use drainage cores with an ultimate tensile strength of at least 225 lb per 4" width in accordance with ASTM D4595 and geotextiles with properties that meet Table 1056-4.

TABLE 1056-4 WICK DRAIN GEOTEXTILE REQUIREMENTS		
Property	Requirement	Test Method
Elongation	$\geq 50\%$	ASTM D4632
Grab Strength	Table 1 ^A , Class 3	ASTM D4632
Tear Strength		ASTM D4533
Puncture Strength		ASTM D6241
Permittivity	$0.7 \text{ sec}^{-1.B}$	ASTM D4491
Apparent Opening Size (AOS)	Table 2 ^A ,	ASTM D4751
UV Stability (Retained Strength)	$> 50\%$ <i>in Situ</i> Soil Passing 0.075 mm	ASTM D4355

A. AASHTO M 288.

B. MARV per Article 1056-3.

For wick drains with a geotextile fused to both faces of a corrugated drainage core along the peaks of the corrugations, use wick drains with an ultimate tensile strength of at least 1,650 lb/ft in accordance with ASTM D4595 and geotextiles with a permittivity, AOS and UV stability that meet Table 1056-4.

1056-6 GEOCELLS

Geocells will be identified by product labels attached to the geocell wrapping. Unwrap geocells just before use in the presence of the Engineer. Previously opened geocell products will be rejected.

Manufacture geocells from virgin polyethylene resin with no more than 10% rework, also called “regrind”, materials. Use geocells made from textured and perforated HDPE strips with an open area of 10% to 20% and properties that meet Table 1056-5.

TABLE 1056-5 GEOCELL REQUIREMENTS		
Property	Minimum Requirement	Test Method
Cell Depth	4"	N/A
Sheet Thickness	50 mil -5%, +10%	ASTM D5199
Density	58.4 lb/cf	ASTM D1505
Carbon Black Content	1.5%	ASTM D1603 or D4218
ESCR ^A	5000 hr	ASTM D1693
Coefficient of Direct Sliding (with material that meets AASHTO M 145 for soil classification A-2)	0.85	ASTM D5321
Short-Term Seam (Peel) Strength (for 4" seam)	320 lb	USACE ^C Technical Report GL-86-19, Appendix A
Long-Term Seam (Hang) Strength ^B (for 4" seam)	160 lb	

A. Environmental Stress Crack Resistance.

B. Minimum test period of 168 hr with a temperature change from 74°F to 130°F in 1-hour cycles.

C. US Army Corps of Engineers.

Provide geocell accessories (e.g., stakes, pins, clips, staples, rings, tendons, anchors, deadmen, etc.) recommended by the Geocell Manufacturer.

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.

GROUT REFERENCES FOR POSITIVE PROTECTION:

(5-19-15)

1170

SP11 R20

Revise the *2012 Standard Specifications* as follows:

Page 11-14, Article 1170-2, Materials, line 30, in the materials table, replace "Freeze-Thaw Durable Grout, Nonshrink" with "Grout, Type 3".

Page 11-14, Article 1170-2, Materials, lines 31-32, delete the first paragraph after the materials table.

GROUT REFERENCES FOR UTILITY MANHOLES:

(8-18-15)

1525

SP15 R40

Revise the *2012 Standard Specifications* as follows:

Page 15-13, Article 1525-2, Materials, line 9, in the materials table, add the following:

Item	Section
Grout, Type 2	1003

Page 15-13, Article 1525-2, Materials, lines 20-21, replace the third paragraph after the materials table with the following:

Use Type 2 grout with properties that meet Table 1003-2 in the *Grout Production and Delivery* provision except provide grout with a plastic consistency in accordance with ASTM C1107.

Page 15-14, Subarticle 1525-3(B), Installation of Precast Units, line 22, in the second sentence of the first paragraph, replace “non-shrink grout.” with “grout.”

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.

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:

<u>Restricted Noxious Weed</u>	<u>Limitations per Lb. Of Seed</u>	<u>Restricted Noxious Weed</u>	<u>Limitations per Lb. of Seed</u>
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)	Bermudagrass
Kobe Lespedeza	Browntop Millet
Korean Lespedeza	German Millet – Strain R
Weeping Lovegrass	Clover – Red/White/Crimson
Carpetgrass	

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. 04-21-15)

Z-4

Revise the 2012 *Standard Specifications* as follows:

Division 2

Page 2-7, line 31, Article 215-2 Construction Methods, replace “Article 107-26” with “Article 107-25”.

Page 2-17, Article 226-3, Measurement and Payment, line 2, delete “pipe culverts,”.

Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows:
Line 1, replace “(4) Buffer Zone” with “(c) Buffer Zone”; **Line 12**, replace “(5) Evaluation for Potential Wetlands and Endangered Species” with “(d) Evaluation for Potential Wetlands and Endangered Species”; and **Line 33**, replace “(6) Approval” with “(4) Approval”.

Division 3

Page 3-1, after line 15, Article 300-2 Materials, replace “1032-9(F)” with “1032-6(F)”.

Division 4

Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping, replace “sheet pile” with “reinforcement”.

Division 6

Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments, replace “30” with “45”.

Page 6-10, line 42, Subarticle 609-6(C)(2), replace “Subarticle 609-6(E)” with “Subarticle 609-6(D)”.

Page 6-11, Table 609-1 Control Limits, replace “Max. Spec. Limit” for the Target Source of $P_{0.075}/P_{be}$ Ratio with “1.0”.

Page 6-40, Article 650-2 Materials, replace “Subarticle 1012-1(F)” with “Subarticle 1012-1(E)”

Division 7

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

Division 8

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

Division 10

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

Division 12

Page 12-7, Table 1205-3, add “FOR THERMOPLASTIC” to the end of the title.

Page 12-8, Subarticle 1205-5(B), line 13, replace “Table 1205-2” with “Table 1205-4”.

Page 12-8, Table 1205-4 and 1205-5, replace “THERMOPLASTIC” in the title of these tables with “POLYUREA”.

Page 12-9, Subarticle 1205-6(B), line 21, replace “Table 1205-4” with “Table 1205-6”.

Page 12-11, Subarticle 1205-8(C), line 25, replace “Table 1205-5” with “Table 1205-7”.

Division 15

Page 15-4, Subarticle 1505-3(F) Backfilling, line 26, replace “Subarticle 235-4(C)” with “Subarticle 235-3(C)”.

Page 15-6, Subarticle 1510-3(B), after line 21, replace the allowable leakage formula with the following: $W=LD\sqrt{P} \div 148,000$

Page 15-6, Subarticle 1510-3(B), line 32, delete “may be performed concurrently or” and replace with “shall be performed”.

Page 15-17, Subarticle 1540-3(E), line 27, delete “Type 1”.

Division 17

Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation, replace “1633.01” with “1631.01”.

STANDARD SPECIAL PROVISION**PLANT AND PEST QUARANTINES****(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)**

(3-18-03) (Rev. 10-15-13)

Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-733-6932, or <http://www.ncagr.gov/plantind/> to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed or other noxious weeds.

STANDARD SPECIAL PROVISION**AWARD OF CONTRACT**

(6-28-77)(Rev 2/16/2016)

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”.

TITLE VI AND NONDISCRIMINATION**I. Title VI Assurance**

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(1) Compliance with Regulations: The contractor shall comply with the Regulation relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

(2) Nondiscrimination: The Contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

(3) Solicitations for Subcontractors, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

(4) Information and Reports: The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the North Carolina Department of Transportation (NCDOT) or the Federal Highway Administration (FHWA) to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information the contractor shall so certify to the NCDOT, or the FHWA as appropriate, and shall set forth what efforts it has made to obtain the information.

(5) Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the NCDOT shall impose such contract sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:

- (a) Withholding of payments to the contractor under the contract until the contractor complies, and/or
- (b) Cancellation, termination or suspension of the contract, in whole or in part.

(6) Incorporation of Provisions: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

The contractor shall take such action with respect to any subcontractor procurement as the NCDOT or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance: provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the NCDOT to enter into such litigation to protect the interests of the NCDOT, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

II. Title VI Nondiscrimination Program

Title VI of the 1964 Civil Rights Act, 42 U.S.C. 2000d, provides that: "No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." The broader application of nondiscrimination law is found in other statutes, executive orders, and regulations (see Section III, Pertinent Nondiscrimination Authorities), which provide additional protections based on age, sex, disability and religion. In addition, the 1987 Civil Rights Restoration Act extends nondiscrimination coverage to all programs and activities of federal-aid recipients and contractors, including those that are not federally-funded.

Nondiscrimination Assurance

The North Carolina Department of Transportation (NCDOT) hereby gives assurance that no person shall on the ground of race, color, national origin, sex, age, and disability, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity conducted by the recipient, as provided by Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, and any other related Civil Rights authorities, whether those programs and activities are federally funded or not.

Obligation

During the performance of this contract, the Contractor and its subcontractors are responsible for complying with NCDOT's Title VI Program. The Contractor must ensure that NCDOT's Notice of Nondiscrimination is posted in conspicuous locations accessible to all employees and subcontractors on the jobsite, along with the Contractor's own Equal Employment Opportunity (EEO) Policy Statement. The Contractor shall physically incorporate this "**TITLE VI AND NONDISCRIMINATION**" language, in its entirety, into all its subcontracts on federally-assisted and state-funded NCDOT-owned projects, and ensure its inclusion by subcontractors into all subsequent lower tier subcontracts. The Contractor and its subcontractors shall also physically incorporate the **FHWA-1273**, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only. The Contractor is also

responsible for making its subcontractors aware of NCDOT's Discrimination Complaints Process, as follows:

FILING OF COMPLAINTS

1. **Applicability** – These complaint procedures apply to the beneficiaries of the NCDOT's programs, activities, and services, including, but not limited to, members of the public, contractors, subcontractors, consultants, and other sub-recipients of federal and state funds.
2. **Eligibility** – Any person or class of persons who believes he/she has been subjected to discrimination or retaliation prohibited by any of the Civil Rights authorities, based upon race, color, sex, age, national origin, or disability, may file a written complaint with NCDOT's Civil Rights office. The law prohibits intimidation or retaliation of any sort. The complaint may be filed by the affected individual or a representative, and must be in writing.
3. **Time Limits and Filing Options** – A complaint must be filed no later than 180 calendar days after the following:
 - The date of the alleged act of discrimination; or
 - The date when the person(s) became aware of the alleged discrimination; or
 - Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

Title VI and other discrimination complaints may be submitted to the following entities:

- **North Carolina Department of Transportation**, Office of Equal Opportunity & Workforce Services (EOWS), External Civil Rights Section, 1511 Mail Service Center, Raleigh, NC 27699-1511; 919-508-1808 or toll free 800-522-0453
 - **US Department of Transportation**, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070
 - Federal Highway Administration**, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
 - Federal Highway Administration**, Office of Civil Rights, 1200 New Jersey Avenue, SE, 8th Floor, E81-314, Washington, DC 20590, 202-366-0693 / 366-0752
 - Federal Transit Administration**, Office of Civil Rights, ATTN: Title VI Program Coordinator, East Bldg. 5th Floor – TCR, 1200 New Jersey Avenue, SE, Washington, DC 20590
 - Federal Aviation Administration**, Office of Civil Rights, 800 Independence Avenue, SW, Washington, DC 20591, 202-267-3258
 - **US Department of Justice**, Special Litigation Section, Civil Rights Division, 950 Pennsylvania Avenue, NW, Washington, DC 20530, 202-514-6255 or toll free 877-218-5228
4. **Format for Complaints** – Complaints must be in **writing** and **signed** by the complainant(s) or a representative and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages including Braille.
 5. **Discrimination Complaint Form** – Contact NCDOT EOWS at the phone number above to receive a full copy of the Discrimination Complaint Form and procedures.

- 6. Complaint Basis** – Allegations must be based on issues involving race, color, national origin, sex, age, or disability. The term “basis” refers to the complainant’s membership in a protected group category. Contact this office to receive a Discrimination Complaint Form.

Protected Categories	Definition	Examples	Applicable Statutes and Regulations	
			FHWA	FTA
Race	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; Circular 4702.1B
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.		
National Origin	Place of birth. Citizenship is not a factor. Discrimination based on language or a person’s accent is also covered.	Mexican, Cuban, Japanese, Vietnamese, Chinese		
Sex	Gender	Women and Men	1973 Federal-Aid Highway Act	Title IX of the Education Amendments of 1972
Age	Persons of any age	21 year old person	Age Discrimination Act of 1975	
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, paraplegic, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990	

III. Pertinent Nondiscrimination Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 *et seq.*), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;

- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 *et seq.*).
- Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e *et seq.*, Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin);
- 49 CFR Part 26, regulation to ensure nondiscrimination in the award and administration of DOT-assisted contracts in the Department's highway, transit, and airport financial assistance programs, as regards the use of Disadvantaged Business Enterprises (DBEs);
- Form FHWA-1273, “Required Contract Provisions,” a collection of contract provisions and proposal notices that are generally applicable to *all Federal-aid construction projects* and must be made a part of, and physically incorporated into, *all federally-assisted contracts*, as well as appropriate subcontracts and purchase orders, particularly Sections II (Nondiscrimination) and III (Nonsegregated Facilities).

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.

* * * * *

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. 4-21-15)

Z-10

Description

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

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

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

Minorities and Women

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

Assigning Training Goals

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

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

STANDARD SPECIAL PROVISION

NAME CHANGE FOR NCDENR

(1-19-16)

Z-11

Description

Wherever in the 2012 Standard Specifications, Project Special Provisions, Standard Special Provisions, Permits or Plans that reference is made to “NCDENR” or “North Carolina Department of Environment and Natural Resources”, replace with “NCDEQ” or “North Carolina Department of Environmental Quality” respectively, as the case may be.

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC160101 01/08/2016 NC101

Z-101

Date: January 8, 2016

General Decision Number: NC160101 01/08/2016 NC101

Superseded General Decision Numbers: NC20150101

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

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

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

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.15 for calendar year 2016 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract for calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number
0

Publication Date
01/08/2016

SUNC2014-003 11/14/2014

	Rates	Fringes
BLASTER	18.64	
CARPENTER	13.68	.05
CEMENT MASON/CONCRETE FINISHER	13.93	
ELECTRICIAN		
Electrician	18.79	2.72
Telecommunications Technician	15.19	1.25
IRONWORKER	13.30	
LABORER		
Asphalt Raker and Spreader	12.78	
Asphalt Screed/Jackman	14.50	

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

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

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

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

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

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

END OF GENERAL DECISION

PROJECT SPECIAL PROVISIONS

GEOTECHNICAL

CONTINUOUS FLIGHT AUGER PILES FOR SOUND BARRIER WALLS (SPECIAL)	GT-1.1 - GT-1.5
PILES (LRFD) - (10/20/2015)	GT-2.1 - GT-2.2
MSE RETAINING WALLS (LRFD) - (3/17/2015)	GT-3.1 - GT-3.11
SEGMENTAL GRAVITY RETAINING WALLS (LRFD) - (3/17/2015)	GT-4.1 - GT-4.5
SOIL NAIL RETAINING WALLS (SPECIAL)	GT-5.1 - GT-5.14
GEOTEXTILE FOR PAVEMENT STABILIZATION - (1/21/2014)	GT-6.1 - GT-6.2
STEEL SHEET PILE RETAINING WALLS (SPECIAL)	GT-7.1 - GT-7.3

DocuSigned by:

Geotechnical Engineering Unit

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7/6/2016

CONTINUOUS FLIGHT AUGER PILES FOR SOUND BARRIER WALLS (SPECIAL)**1.0 GENERAL**

Continuous flight auger (CFA) piles are constructed by drilling a borehole with a continuous flight hollow stem auger and filling the borehole by pumping grout through the auger as it is withdrawn. After completing grout placement, reinforcement is inserted into the column of fluid grout. At the Contractor's option, construct CFA piles for sound barrier walls instead of pile excavation. Install CFA piles with the required depth in accordance with the contract and accepted submittals. Use a prequalified CFA Pile Subcontractor for CFA pile work. Define "pile" as a CFA pile and "reinforcement" as pile extending out of CFA pile.

2.0 INSTALLATION PLAN SUBMITTAL

Provide 4 copies and a PDF copy of the CFA pile installation plan submittal. Submit the installation plan at least 15 days before starting CFA pile construction. Do not begin pile construction until the CFA pile installation plan is accepted.

Provide detailed project specific information in the installation plan that includes the following:

1. List and sizes of proposed equipment including CFA drilling rigs, augers and other drilling tools and grouting equipment;
2. Step-by-step description of CFA pile installation and sequence of pile construction;
3. Methods for placing reinforcement with procedures for supporting and positioning the reinforcement;
4. Minimum grout volume factor;
5. Equipment and procedures for monitoring and recording grout volume;
6. Examples of construction records to be provided that meet Section 6.0 of this provision;
7. Procedures for containment and disposal of drilling spoils and waste grout;
8. Approved packaged grout or grout mix design that meets Section 1003 of the *Standard Specifications*; and
9. Other information shown in the plans or requested by the Engineer.

If alternate installation procedures are proposed or necessary, a revised CFA pile installation plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend CFA pile construction until a revised plan is accepted.

3.0 MATERIALS

Use Type 2 grout that meets Section 1003 of the *Standard Specifications*.

Use piles extending out of CFA piles that meet the *Sound Barrier Wall* provision.

4.0 PRECONSTRUCTION MEETING

Before starting CFA pile construction, hold a preconstruction meeting to discuss the installation and monitoring of the piles. Schedule this meeting after the CFA Pile Subcontractor mobilizes to the site. If this meeting occurs before all CFA pile submittals have been accepted, additional preconstruction meetings may be required before beginning construction of CFA piles without accepted submittals. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and CFA Pile Subcontractor Superintendent and Project Manager will attend preconstruction meetings.

5.0 CONSTRUCTION METHODS

Use equipment and methods accepted in the CFA pile installation plan or approved by the Engineer. Inform the Engineer of any deviations from the accepted plan.

Dispose of drilling spoils and waste grout as directed and in accordance with Section 802 of the *Standard Specifications*. Drilling spoils consist of all excavated material and fluids removed from boreholes.

A. Drilling

Use CFA piling rigs capable of drilling to the dimensions and depths shown in the plans or required otherwise by the Engineer. Install CFA piles with tip elevations no higher than shown in the plans or approved by the Engineer.

Use single helix hollow stem augers with uniform diameters and continuous flights from the top of the auger to the bottom tip of the cutting face. Provide augers with flights and teeth that cut the bottom of the borehole flat. Augers with outside diameters at least 97% of the pile design diameter are required. Augers capable of installing piles to a depth 20% greater than plan depth are also required.

Unless piles are installed with a hydraulic fixed mast installation platform and the stem to which the auger is fixed has an outside diameter 10" or greater, at least one guide connected to the leads of the CFA piling rig is required. Prevent the leads from rotating during drilling and grouting.

Seal the grout injection port to prevent entry during drilling. Keep the hollow stem of augers clean when drilling. Clearly mark augers or leads every foot along their length with markings visible to the unaided eye from the ground. Check for correct pile location and alignment before beginning drilling. Do not begin drilling until enough grout to complete the pile is on the project site.

Advance the auger into the ground at a continuous rate. Do not raise the auger until beginning grout placement. Control the auger rotation speed to prevent excess spoil from being transported to the ground surface and surrounding soil being drawn laterally into the borehole.

If muck, organics, soft soil or other unsuitable materials are encountered within 5 ft of the ground surface, contact the Engineer as these materials can cause problems with top of pile construction. If auger refusal is encountered before reaching plan depth, stop the auger rotation and inform the Engineer. Unless it is determined otherwise, define refusal as less than 1 ft of auger penetration per minute.

B. Grouting

Remove oil, rust inhibitors, residual drilling slurries and similar foreign materials from holding tanks/hoppers, stirring devices, pumps and lines and all other equipment in contact with grout before use.

Place a screen between the ready mix truck and the grout pump to remove large particles or cement balls using a mesh that has openings no larger than $\frac{3}{4}$ ".

Use a positive displacement piston type pump with a known volume per stroke that can develop peak pressures at the pump of at least 350 psi. Size the pump to maintain a smooth continuous delivery of grout while limiting pressure variations (particularly pressure drops) due to pump strokes. At the beginning of construction, provide the grout volume delivered by each pump stroke and verify this value is within 3% of the actual volume. Recalibrate the grout volume per pump stroke during construction as necessary or directed.

Measure grout temperature and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform flow field tests in the presence of the Engineer in accordance with ASTM C939 (Flow Cone).

Place grout in accordance with the contract and accepted submittals. Pump grout without difficulty to fill any soft or porous zones and with sufficient pressure to ensure a continuous monolithic pile with at least the plan cross section from the maximum borehole depth to the top of the grout column. Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing).

Begin placing grout within 5 minutes after the auger has reached plan depth. At the beginning of grout placement, lift the auger 6" to 12" and remove the sealing device by applying grout pressure or with a steel bar. Do not lift the auger beyond this range in order to minimize soil movement. After initiating grout flow, reinsert the auger to the original depth.

Pump grout continuously while extracting the auger at a smooth steady rate. Maintain a positive grout pressure at the auger injection point at all times. If rotation occurs while removing the auger, rotate the auger in the same direction as during drilling. If grout placement is suspended for any reason, inform the Engineer and redrill the CFA pile.

Monitor the depth of the auger injection point while counting pump strokes during grouting. Record the grout volume and factor versus depth of the auger injection point in increments of 5 ft or less. The grout volume factor is the grout volume placed

divided by the theoretical grout volume for each depth increment. A grout volume factor of at least 1.15 is required.

C. Top of Pile Finishing and Protection

After placing grout, remove all excess grout and spoil from and place a temporary form within the top of the grout column. Use a form 3 ft to 5 ft long with a diameter equal to or larger than the pile diameter. Place the form with equal lengths above and below the ground surface. Recheck the top of the grout and remove any foreign material. After the Engineer determines that grout reaches initial set, remove the form without disturbing the ground surface around the pile.

After inserting reinforcement, square the top of the CFA pile with the pile axis while grout is still fluid or by cutting off hardened grout. Construct the top of CFA pile to the elevation shown in the plans.

D. Reinforcement

Provide reinforcement for CFA piles consisting of piles shown in the plans and accepted submittals. Insert reinforcement as a unit while the grout is still fluid. Lower or gently push reinforcement into the grout. Do not vibrate or drive the reinforcement. Support the reinforcement at the ground surface until the grout strength reaches 2,500 psi. Contact the Engineer if reinforcement cannot be properly inserted to the required depth.

6.0 CONSTRUCTION RECORDS

Provide 2 copies of CFA pile construction records after completing each pile. Include the following in construction records:

1. Names of CFA Pile Subcontractor, Superintendent, Drill Rig Operator and Project Manager;
2. Project description, county, Department's contract, TIP and WBS element number;
3. Wall station and number and pile location and identifier;
4. The grout volume and factor versus depth of the auger injection point in increments of 5 ft or less;
5. CFA pile diameter, length and tip elevation, top of pile and ground surface elevations;
6. Auger diameter and theoretical volume of the borehole;
7. Grout temperature and flow records;
8. Size, length, top elevation and grade of reinforcement;
9. Date and time drilling begins and ends, grout is mixed and arrives on-site, pumping grout begins and ends and reinforcement is placed;
10. Weather conditions including air temperature at time of grout placement; and
11. All other pertinent details related to CFA pile construction.

After completing CFA piles for each sound barrier wall, provide a PDF copy of all corresponding construction records.

7.0 CFA PILE ACCEPTANCE

CFA pile acceptance is based in part on the following criteria.

1. Grout volume factor is greater than the minimum required for any 5 ft depth increment.
2. Grout is properly placed and does not have any evidence of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing).
3. CFA pile and reinforcement location, alignment and elevations are within tolerances for sound barrier walls for pile excavation and reinforcement is in accordance with the contract and accepted submittals.

If the Engineer determines a CFA pile is unacceptable, additional testing, remedial measures or replacement piles are required at no additional cost to the Department. Do not begin remediation work until remediation plans are approved.

8.0 MEASUREMENT AND PAYMENT

CFA piles for sound barrier walls will be paid at the contract unit price for *Sound Barrier Wall*. No separate payment will be made for CFA piles. The contract unit price for *Sound Barrier Wall* will be full compensation for all costs for submittals, monitoring and recording, labor, tools, equipment, reinforcement and grout complete and in place and all incidentals necessary to drill and construct CFA piles in accordance with this provision. No payment will be made for any costs associated with unacceptable CFA piles.



DocuSigned by:

Harold D. Pruitt

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1/14/2016

PILES**(10-20-15)**

Revise the *2012 Standard Specifications* as follows:

Page 4-70, Article 450-2, Materials, line 2, in the materials table, replace “Neat Cement Grout, Nonshrink” with “Neat Cement Grout, Type 1”.

Page 4-70, Article 450-2, Materials, line 8, in the last sentence of the second paragraph, replace “approved by the Materials and Tests Unit.” with “that are on the NCDOT Approved Products List.”

Page 4-72, Subarticle 450-3(D)(3), Required Driving Resistance, lines 26-30, replace first paragraph with the following:

The Engineer will determine if the proposed pile driving methods and equipment are acceptable and provide the blows/ft and equivalent set for the required driving resistance noted in the plans, i.e., “pile driving criteria” except for structures with pile driving analyzer (PDA) testing. For structures with PDA testing, provide pile driving criteria for any bents and end bents with piles in accordance with Subarticle 450-3(F)(4).

Page 4-73, Subarticle 450-3(E)(1), Pile Excavation, lines 19-20, in the third sentence of the second paragraph, replace “use smooth or corrugated clean watertight steel casings” with “use smooth non-corrugated clean watertight steel casings”.

Page 4-73, Subarticle 450-3(F), Pile Driving Analyzer, lines 45-48, replace third paragraph with the following:

The Engineer will complete the review of the proposed pile driving methods and equipment within 7 days of receiving PDA reports and pile driving criteria. Do not place concrete for caps or footings on piles until PDA reports and pile driving criteria have been accepted.

Page 4-75, Subarticle 450-3(F), Pile Driving Analyzer, line 21, add the following to the end of Article 450-3:

(4) Pile Driving Criteria

Analyze pile driving with the GRL Wave Equation Analysis Program (GRLWEAP) manufactured by Pile Dynamics, Inc. Use the same PDA Consultant that provides PDA reports to perform GRLWEAP analyses and develop pile driving criteria. Provide driving criteria sealed by an engineer approved as a Project Engineer (key person) for the same PDA Consultant.

Analyze pile driving so driving stresses, energy transfer, ram stroke and blows/ft from PDA testing and resistances from CAPWAP analyses correlate to GRLWEAP models. Provide pile driving criteria for each combination of required driving resistance and pile length installed for all pile types and sizes. Submit 2 copies of pile driving criteria with

PDA reports. Include the following for driving criteria:

- (a) Project information in accordance with Subarticle 450-3(F)(3)(a)
- (b) Table showing blows/ft and equivalent set vs. either stroke for multiple strokes in increments of 6" or bounce chamber pressure for multiple pressures in increments of 1 psi
- (c) Maximum stroke or blows/ft or pile cushion requirements to prevent overstressing piles as needed
- (d) GRLWEAP software version information
- (e) PDF copy of all pile driving criteria and executable GRLWEAP input and output files

Page 4-76, Article 450-4, Measurement and Payment, lines 27-29, replace third sentence of the sixth paragraph with the following:

The contract unit price for *PDA Testing* will be full compensation for performing PDA testing the first time a pile is tested, performing CAPWAP analysis on data collected during initial drive, restrikes and redrives, providing PDA reports, performing GRLWEAP analysis and developing and providing pile driving criteria.



MECHANICALLY STABILIZED EARTH RETAINING WALLS**(3-17-15)****1.0 GENERAL**

Construct mechanically stabilized earth (MSE) retaining walls consisting of steel or geosynthetic reinforcement in the reinforced zone connected to vertical facing elements. Use precast concrete panels for vertical facing elements and coarse aggregate in the reinforced zone unless noted otherwise in the plans. Provide reinforced concrete coping as required. Design and construct MSE retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified MSE Wall Installer to construct MSE retaining walls.

Define “reinforcement” as steel or geosynthetic reinforcement and “geosynthetics” as geosynthetic grids (geogrids) or strips (geostrips). Define “aggregate” as coarse or fine aggregate. Define “panel” as a precast concrete panel and “coping” as precast or cast-in-place concrete coping.

Define “MSE wall” as a mechanically stabilized earth retaining wall and “MSE Wall Vendor” as the vendor supplying the chosen MSE wall system. Define “MSE panel wall” as an MSE wall with panels and “MSE segmental wall” as an MSE wall with segmental retaining wall (SRW) units. Define “abutment wall” as an MSE wall with bridge foundations in any portion of the reinforced zone or an MSE wall connected to an abutment wall. Even if bridge foundations only penetrate a small part of the reinforced zone, the entire MSE wall is considered an abutment wall.

Use an approved MSE wall system in accordance with the plans and any NCDOT restrictions or exceptions for the chosen system. Value engineering proposals for other MSE wall systems will not be considered. Do not use MSE wall systems with an “approved for provisional use” status for abutment walls or MSE walls subject to scour, walls with design heights greater than 35 ft or walls supporting or adjacent to railroads or interstate highways. The list of approved MSE wall systems with approval status is available from:

connect.ncdot.gov/resources/Geological/Pages/Products.aspx

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Aggregate	1014
Anchor Pins	1056-2
Curing Agents	1026
Epoxy, Type 3A	1081
Geotextiles, Type 2	1056
Grout, Type 3	1003
Joint Materials	1028
Portland Cement Concrete, Class A	1000
Precast Retaining Wall Coping	1077

Reinforcing Steel	1070
Retaining Wall Panels	1077
Segmental Retaining Wall Units	1040-4
Shoulder Drain Materials	816-2
Wire Staples	1060-8(D)

Provide Type 2 geotextile for filtration and separation geotextiles. Use Class A concrete for cast-in-place coping, leveling concrete and pads.

Use panels and SRW units from producers approved by the Department and licensed by the MSE Wall Vendor. Unless required otherwise in the contract, produce panels with a smooth flat final finish that meets Article 1077-11 of the *Standard Specifications*. Accurately locate and secure reinforcement connectors in panels and maintain required concrete cover. Produce panels within 1/4" of the panel dimensions shown in the accepted submittals.

Damaged panels or SRW units with excessive discoloration, chips or cracks as determined by the Engineer will be rejected. Do not damage reinforcement connection devices or mechanisms in handling or storing panels and SRW units.

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. Handle and store geosynthetics in accordance with Article 1056-2 of the *Standard Specifications*. Load, transport, unload and store MSE wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

A. Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate except do not use No. 57 or 57M stone in the reinforced zone of MSE walls with geosynthetic reinforcement or connectors. Use the following for fine aggregate:

1. Standard size No. 1S, 2S, 2MS or 4S that meets Table 1005-2 of the *Standard Specifications* or
2. Gradation that meets Class III, Type 3 select material in accordance with Article 1016-3 of the *Standard Specifications*.

Fine aggregate is exempt from mortar strength in Subarticle 1014-1(E) of the *Standard Specifications*. Use fine aggregate with a maximum organic content of 1.0%. Provide aggregate with electrochemical properties that meet the following requirements:

AGGREGATE ELECTROCHEMICAL REQUIREMENTS					
Aggregate Type	Reinforcement or Connector Material	pH	Resistivity	Chlorides	Sulfates
Coarse	Steel	Not Required			

Fine	Steel	5 – 10	$\geq 3,000 \Omega \cdot \text{cm}$	$\leq 100 \text{ ppm}$	$\leq 200 \text{ ppm}$
Coarse or Fine	Polyester Type (PET) Geogrid	5 – 8	N/A*	N/A*	N/A*
Coarse or Fine	Geostrip or Polyolefin Geogrid	4.5 – 9	N/A*	N/A*	N/A*

* Resistivity, chlorides and sulfates are not applicable to geosynthetics.

Use aggregate from a source that meets the *Mechanically Stabilized Earth Wall Aggregate Sampling and Testing Procedures*. Perform pH tests for coarse aggregate in accordance with Materials and Tests (M&T) Unit Chemical Procedure C-Elec. Perform organic content tests for fine aggregate in accordance with AASHTO T 267 instead of Subarticle 1014-1(D) of the *Standard Specifications*. Perform electrochemical tests for fine aggregate in accordance with the following test procedures:

Property	Test Method
pH	AASHTO T 289
Resistivity	AASHTO T 288
Chlorides	AASHTO T 291
Sulfates	AASHTO T 290

B. Reinforcement

Provide steel or geosynthetic reinforcement supplied by the MSE Wall Vendor or a manufacturer approved or licensed by the vendor. Use reinforcement approved for the chosen MSE wall system. The list of approved reinforcement for each MSE wall system is available from the website shown elsewhere in this provision.

1. Steel Reinforcement

Provide Type 1 material certifications in accordance with Article 106-3 of the *Standard Specifications* for steel reinforcement. Use welded wire grid reinforcement (“mesh”, “mats” and “ladders”) that meet Article 1070-3 of the *Standard Specifications* and metallic strip reinforcement (“straps”) that meet ASTM A572 or A1011. Galvanize steel reinforcement in accordance with Section 1076 of the *Standard Specifications*.

2. Geosynthetic Reinforcement

Define “machine direction” (MD) for geosynthetics in accordance with ASTM D4439. Provide Type 1 material certifications for geosynthetic strengths in the MD in accordance with Article 1056-3 of the *Standard Specifications*. Test geosynthetics in accordance with ASTM D6637.

C. Bearing Pads

For MSE panel walls, use bearing pads that meet Section 3.6.1.a of the *FHWA Design*

and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I (Publication No. FHWA-NHI-10-024). Provide bearing pads with thicknesses that meet the following:

BEARING PAD THICKNESS	
Facing Area per Panel (A)	Minimum Pad Thickness After Compression (based on 2 times panel weight above pads)
$A \leq 30$ sf	1/2"
$30 \text{ sf} < A \leq 75$ sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide miscellaneous components approved for the chosen MSE wall system. The list of approved miscellaneous components for each MSE wall system is available from the website shown elsewhere in this provision.

3.0 PRECONSTRUCTION REQUIREMENTS

A. MSE Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each MSE wall. Before beginning MSE wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of MSE wall locations as needed. For proposed slopes above or below MSE walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual MSE wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. MSE Wall Designs

For MSE wall designs, submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on the working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Wall Design Consultant to design MSE walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Wall Design Consultant.

Design MSE walls in accordance with the plans, *AASHTO LRFD Bridge Design Specifications* and any NCDOT restrictions for the chosen MSE wall system unless

otherwise required. Design MSE walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*. Use a uniform reinforcement length throughout the wall height of at least 0.7H with H as shown in the plans or 6 ft, whichever is longer, unless noted otherwise in the plans. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate drains, the reinforced zone or leveling pads outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads and design parameters approved for the chosen MSE wall system or default values in accordance with the AASHTO LRFD specifications. Design steel components including reinforcement and connectors for the design life noted in the plans and aggregate type in the reinforced zone. Use corrosion loss rates for galvanizing in accordance with the AASHTO LRFD specifications for nonaggressive backfill and carbon steel corrosion rates in accordance with the following:

CARBON STEEL CORROSION RATES	
Aggregate Type (in reinforced zone)	Corrosion Loss Rate (after zinc depletion)
Coarse	0.47 mil/year
Fine (except abutment walls)	0.58 mil/year
Fine (abutment walls)	0.70 mil/year

For geosynthetic reinforcement and connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 lb/sf in accordance with Figure C11.5.6-3(b) of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts or concrete barrier rail above MSE walls, analyze top 2 reinforcement layers for traffic impact loads in accordance with Section 7.2 of the FHWA MSE wall manual shown elsewhere in this provision except use the following for geosynthetic reinforcement rupture:

$$\phi T_{al} R_c \geq T_{max} + (T_I / RF_{CR})$$

Where,

- ϕ = resistance factor for tensile resistance in accordance with Section 7.2.1 of the FHWA MSE wall manual,
- T_{al} = long-term geosynthetic design strength approved for chosen MSE wall system,
- R_c = reinforcement coverage ratio = 1 for continuous geosynthetic reinforcement,
- T_{max} = factored static load in accordance with Section 7.2 of the FHWA MSE wall manual,
- T_I = factored impact load in accordance with Section 7.2 of the FHWA MSE wall manual and
- RF_{CR} = creep reduction factor approved for chosen MSE wall system.

If existing or future obstructions such as foundations, guardrail, fence or handrail posts, moment slabs, pavements, pipes, inlets or utilities will interfere with reinforcement,

maintain a clearance of at least 3" between obstructions and reinforcement unless otherwise approved. Locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations.

Use 6" thick cast-in-place unreinforced concrete leveling pads beneath panels and SRW units that are continuous at steps and extend at least 6" in front of and behind bottom row of panels or SRW units. Unless required otherwise in the plans, embed top of leveling pads in accordance with the following requirements:

EMBEDMENT REQUIREMENTS		
Front Slope¹ (H:V)	Minimum Embedment Depth² (whichever is greater)	
6:1 or flatter (except abutment walls)	H/20	1 ft for $H \leq 10$ ft 2 ft for $H > 10$ ft
6:1 or flatter (abutment walls)	H/10	2 ft
> 6:1 to < 3:1	H/10	2 ft
3:1 to 2:1	H/7	2 ft

1. Front slope is as shown in the plans.
2. Define "H" as the maximum design height plus embedment per wall with the design height and embedment as shown in the plans.

When noted in the plans, locate a continuous aggregate shoulder drain along the base of the reinforced zone behind the aggregate. Provide wall drainage systems consisting of drains and outlet components in accordance with Standard Drawing No. 816.02 of the *Roadway Standard Drawings*.

For MSE panel walls, cover joints at back of panels with filtration geotextiles at least 12" wide. If the approval of the chosen MSE wall system does not require a minimum number of bearing pads, provide the number of pads in accordance with the following:

NUMBER OF BEARING PADS		
Facing Area per Panel (A)	Maximum Wall Height Above Horizontal Panel Joint	Minimum Number of Pads per Horizontal Panel Joint
$A \leq 30$ sf	25 ft	2
	35 ft ¹	3
$30 \text{ sf} < A \leq 75$ sf	25 ft	3
	35 ft ¹	4

1. Additional bearing pads per horizontal panel joint may be required for wall heights above joints greater than 35 ft.

For MSE segmental walls, coarse aggregate is required in any SRW unit core spaces and between and behind SRW units for a horizontal distance of at least 18". Separation geotextiles are required between the aggregate and overlying fill or pavement sections except when concrete pavement, full depth asphalt or cement treated base is placed

directly on aggregate. When noted in the plans, separation geotextiles are also required at the back of the reinforced zone between the aggregate and backfill or natural ground. Unless required otherwise in the plans, use reinforced concrete coping at top of walls that meets the following requirements:

1. Coping dimensions as shown in the plans,
2. At the Contractor's option, coping that is precast or cast-in-place concrete for MSE panel walls unless cast-in-place coping is required as shown in the plans,
3. Cast-in-place concrete coping for MSE segmental walls and
4. At the Contractor's option and when shown in the plans, cast-in-place concrete coping that extends down back of panels or SRW units or connects to panels or SRW units with dowels.

For MSE segmental walls with dowels, attach dowels to top courses of SRW units in accordance with the following:

1. Set dowels in core spaces of SRW units filled with grout instead of coarse aggregate or
2. Embed adhesively anchored dowels in holes of solid SRW units with epoxy.

For MSE panel walls with coping, connect cast-in-place concrete coping or leveling concrete for precast concrete coping to top row of panels with dowels cast into panels. When concrete barrier rail is required above MSE walls, use concrete barrier rail with moment slab as shown in the plans.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with foundation pressures, typical sections with reinforcement and connection details, aggregate locations and types, geotextile locations and details of leveling pads, panels or SRW units, coping, bin walls, slip joints, etc. If necessary, include details on working drawings for concrete barrier rail with moment slab, reinforcement splices if allowed for the chosen MSE wall system, reinforcement connected to end bent caps and obstructions extending through walls or interfering with reinforcement, leveling pads, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. At least one analysis is required for each wall section with different reinforcement lengths. When designing MSE walls with computer software other than MSEW, use MSEW, version 3.0 with update 14.93 or later, manufactured by ADAMA Engineering, Inc. to verify the design. At least one MSEW analysis is required per 100 ft of wall length with at least one analysis for the wall section with the longest reinforcement. Submit electronic MSEW input files and PDF output files with design calculations.

C. Preconstruction Meeting

Before starting MSE wall construction, hold a preconstruction meeting to discuss the construction and inspection of the MSE walls. If this meeting occurs before all MSE wall submittals have been accepted, additional preconstruction meetings may be

required before beginning construction of MSE walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and MSE Wall Installer Superintendent will attend preconstruction meetings.

4.0 CORROSION MONITORING

Corrosion monitoring is required for MSE walls with steel reinforcement. The Engineer will determine the number of monitoring locations and where to install the instrumentation. Contact M&T before beginning wall construction. M&T will provide the corrosion monitoring instrumentation kits and if necessary, assistance with installation.

5.0 SITE ASSISTANCE

Unless otherwise approved, provide an MSE Wall Vendor representative to assist and guide the MSE Wall Installer on-site for at least 8 hours when the first panels or SRW units and reinforcement layer are placed. If problems are encountered during construction, the Engineer may require the vendor representative to return to the site for a time period determined by the Engineer.

6.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of MSE walls. Direct run off away from MSE walls, aggregate and backfill. Contain and maintain aggregate and backfill and protect material from erosion.

Excavate as necessary for MSE walls in accordance with the accepted submittals. If applicable and at the Contractor's option, use temporary shoring for wall construction instead of temporary slopes to construct MSE walls. Define "temporary shoring for wall construction" as temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience.

Unless required otherwise in the plans, install foundations located in the reinforced zone before placing aggregate or reinforcement. Brace piles in the reinforced zone to maintain alignment when placing and compacting aggregate. Secure piles together with steel members near top of piles. Clamp members to piles instead of welding if bracing is at or below pile cut-off elevations.

Notify the Engineer when foundation excavation is complete. Do not place leveling pad concrete, aggregate or reinforcement until excavation dimensions and foundation material are approved.

Construct cast-in-place concrete leveling pads at elevations and with dimensions shown in the accepted submittals and in accordance with Section 420 of the *Standard Specifications*. Cure leveling pads at least 24 hours before placing panels or SRW units.

Erect and support panels and stack SRW units so the final wall position is as shown in the accepted submittals. Stagger SRW units to create a running bond by centering SRW units

over joints in the row below as shown in the accepted submittals. Space bearing pads in horizontal panel joints as shown in the accepted submittals and cover all panel joints with filtration geotextiles as shown in the accepted submittals. Attach filtration geotextiles to back of panels with adhesives, tapes or other approved methods.

Construct MSE walls with the following tolerances:

- A. SRW units are level from front to back and between units when checked with a 4 ft long level,
- B. Vertical joint widths are 1/4" maximum for SRW units and 3/4", $\pm 1/4$ " for panels,
- C. Final wall face is within 3/4" of horizontal and vertical alignment shown in the accepted submittals when measured along a 10 ft straightedge and
- D. Final wall plumbness (batter) is not negative (wall face leaning forward) and within 0.5° of vertical unless otherwise approved.

Place reinforcement at locations and elevations shown in the accepted submittals and within 3" of corresponding connection elevations. Install reinforcement with the direction shown in the accepted submittals. Place reinforcement in slight tension free of kinks, folds, wrinkles or creases. Reinforcement may be spliced once per reinforcement length if shown in the accepted submittals. Use reinforcement pieces at least 6 ft long. Contact the Engineer when unanticipated existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid obstructions, deflect, skew or modify reinforcement as shown in the accepted submittals.

Place aggregate in the reinforced zone in 8" to 10" thick lifts. Compact fine aggregate in accordance with Subarticle 235-3(C) of the *Standard Specifications*. Use only hand operated compaction equipment to compact aggregate within 3 ft of panels or SRW units. At a distance greater than 3 ft, compact aggregate with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting aggregate. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of aggregate. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. If a drain is required, install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*.

Install dowels as necessary for SRW units and place and construct coping and leveling concrete as shown in the accepted submittals. Construct leveling concrete in accordance with Section 420 of the *Standard Specifications*. Construct cast-in-place concrete coping in accordance with Subarticle 452-3(C) of the *Standard Specifications*. When single faced precast concrete barrier is required in front of and against MSE walls, stop coping just

above barrier so coping does not interfere with placing barrier up against wall faces.

When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed. Seal joints above and behind MSE walls between coping and concrete slope protection with silicone sealant.

7.0 MEASUREMENT AND PAYMENT

MSE Retaining Wall No. ___ will be measured and paid in square feet. MSE walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of leveling pad elevations. Define "top of wall" as top of coping or top of panels or SRW units for MSE walls without coping.

The contract unit price for *MSE Retaining Wall No. ___* will be full compensation for providing designs, submittals, labor, tools, equipment and MSE wall materials, excavating, backfilling, hauling and removing excavated materials and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, bearing pads, coping, miscellaneous components and any incidentals necessary to construct MSE walls. The contract unit price for *MSE Retaining Wall No. ___* will also be full compensation for reinforcement connected to and aggregate behind end bent caps in the reinforced zone, if required.

No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for *MSE Retaining Wall No. ___*.

The contract unit price for *MSE Retaining Wall No. ___* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind the reinforced zone from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

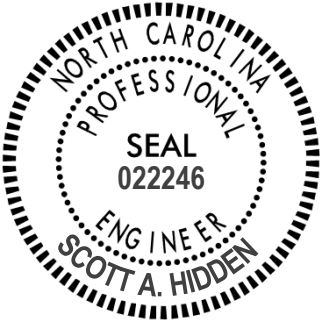
Payment will be made under:

Pay Item

MSE Retaining Wall No. ___

Pay Unit

Square Foot



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5/19/2016

SEGMENTAL GRAVITY RETAINING WALLS**(3-17-15)****1.0 GENERAL**

Construct segmental gravity retaining walls consisting of segmental retaining wall (SRW) units supported by aggregate footings. Provide cast-in-place concrete slope protection as required. If the plans do not include Standard Detail No. 453.02 or 453.03, design and construct segmental gravity retaining walls based on actual elevations, wall dimensions and batter in accordance with the contract and accepted submittals. Otherwise, construct segmental gravity retaining walls based on actual elevations, wall dimensions and batter in accordance with the contract, accepted submittals and Standard Detail No. 453.02 or 453.03.

Define "block wall" as a segmental gravity retaining wall and "standard block wall" as a block wall that meets a standard segmental gravity retaining wall drawing (Standard Detail No. 453.02 or 453.03). Define "blocks" as SRW units, "cap blocks" as SRW cap units and "Block Vendor" as the vendor licensing the block producer. Define "slope protection" as cast-in-place concrete slope protection.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Curing Agents	1026
Geotextiles, Type 2	1056
Joint Filler	1028-1
Portland Cement Concrete, Class B	1000
Segmental Retaining Wall Units	1040-4
Select Material, Class VI	1016
Subsurface Drainage Materials	815-2
Wire Staples	1060-8(D)

Provide Type 2 geotextile for separation geotextiles. Use Class VI select material for No. 57 stone and Class B concrete for slope protection. Provide PVC pipes, fittings, outlet pipes and concrete pads for subsurface drainage materials. For PVC pipes behind block walls, use pipes with perforations that meet AASHTO M 278.

Provide cap blocks that meet the material requirements for blocks. Use blocks from producers approved by the Department and licensed by the Block Vendor. Notify the Engineer of the name and NCDOT ID number of the SRW unit production facility before beginning block production. Unless required otherwise in the plans, provide blocks with a depth (front to back) of at least 12" and cap blocks with a depth of at least 8".

Use approved SRW units for standard block walls. Blocks for standard block walls are approved for either 2 ft or 4 ft maximum design heights with the design height as shown in Standard Detail No. 453.02 or 453.03. The list of approved SRW units with maximum

design heights is available from:

connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Do not mix blocks from different Block Vendors on the same block wall. Damaged blocks with excessive discoloration, chips or cracks as determined by the Engineer will be rejected.

Provide adhesives recommended by the Block Vendor. Store adhesives in accordance with the manufacturer's instructions. Load, transport, unload and store block wall materials so materials are kept clean and free of damage.

3.0 PRECONSTRUCTION REQUIREMENTS

A. Block Wall Surveys

The plans typically show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each block wall. Before beginning block wall design or construction, survey existing ground elevations along wall face locations and other elevations in the vicinity of block wall locations as needed. For proposed slopes above or below block walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual block wall dimensions, details and batter, submit wall envelopes for acceptance. Use accepted wall envelopes for design, if required, and construction.

B. Block Wall Designs

If the plans do not include Standard Detail No. 453.02 or 453.03, submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each for block wall designs at least 30 days before starting block wall construction. Do not begin block wall construction until a design submittal is accepted.

Design block walls in accordance with the plans and Article 11.11 of the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Neglect material above top of footing for stability computations. Design block walls for the wall batter required by the Block Vendor and clearances shown in the plans. Do not locate blocks or footings outside right-of-way or easement limits.

Use No. 57 stone for aggregate footings beneath blocks. Use 10" thick footings that are continuous at steps and extend at least 6" in front of and at least 9" behind bottom row of blocks. Unless required otherwise in the plans, embed bottom of footings at least 18" below bottom of walls shown in the plans. When noted in the plans, locate a 4" diameter continuous perforated PVC drain pipe in the No. 57 stone in back of footings.

Fill block core spaces with No. 57 stone and between and behind blocks with No. 57 stone for a horizontal distance of at least 12" so stone is continuous in all directions. Assume a unit weight of 100 lb/cf for No. 57 stone. Separation geotextiles are required between No. 57 stone and backfill or natural ground and between stone and overlying fill or pavement section except when concrete pavement, full depth asphalt or cement

treated base is placed directly on stone.

Use cap blocks at top of walls. Step top of walls as shown in the plans and double stack cap blocks at steps so cap blocks are continuous at steps. Extend top of walls 4" to 12" above where finished grade intersects back of blocks or cap blocks. When single faced precast concrete barrier is required in front of and against block walls, fill voids between barrier and wall faces with No. 57 stone.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with required resistances, typical sections, No. 57 stone and geotextile locations and details of footings, blocks, cap blocks, etc. If necessary, include details on working drawings for slope protection and obstructions extending through walls or interfering with footings. Submit design calculations for each wall section with different geometry or material parameters. When designing block walls with computer software, a hand calculation is required for the tallest wall section. Provide block wall designs sealed by an engineer licensed in the state of North Carolina.

4.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of block walls. Direct run off away from block walls, No. 57 stone and backfill. Contain and maintain stone and backfill and protect material from erosion.

Excavate as necessary for block walls in accordance with the plans and accepted submittals. Notify the Engineer when foundation excavation is complete. Do not place No. 57 stone for footings until excavation dimensions and foundation material are approved.

Construct aggregate footings at elevations and with dimensions shown in the plans and accepted submittals. If a drain is required, install wall drainage systems consisting of drains and outlet components as shown in the plans and accepted submittals and in accordance with Section 815 of the *Standard Specifications*. Compact No. 57 stone for footings with a vibratory compactor to the satisfaction of the Engineer.

Stack blocks with no negative wall batter (wall face leaning forward) so the final wall position is as shown in the plans and accepted submittals. Place blocks with a maximum vertical joint width of 3/8". Stagger blocks to create a running bond by centering blocks over joints in the row below as shown in the plans and accepted submittals. Construct block walls with the following tolerances:

- A. Blocks are level from front to back and between blocks when checked with a 4 ft long level,
- B. Final wall face is within 2" of horizontal and vertical alignment shown in the plans and accepted submittals, and

C. Wall batter is within 2° of batter required by the Block Vendor.

Overlap adjacent separation geotextiles at least 18" at seams and hold geotextiles in place with wire staples or anchor pins as needed. Place No. 57 stone between and behind blocks in 8" to 10" thick lifts. Compact stone with hand operated compaction equipment to the satisfaction of the Engineer. Backfill for block walls behind No. 57 stone in accordance with Article 410-8 of the *Standard Specifications*.

Set cap blocks with a 1/2" to 1-1/2" overhang as shown in the plans and accepted submittals. Place cap blocks using adhesive in accordance with the manufacturer's instructions. Do not place cap blocks if surfaces caps will be attached to are wet or frozen or the air temperature measured at the wall location in the shade away from artificial heat is below 40°F. Before applying adhesive, clean surfaces cap blocks will adhere to and ensure surfaces are dry and free of oil, grease, dust and debris.

Pave slopes above and behind block walls with slope protection as shown in the plans and accepted submittals and in accordance with Article 462-3 of the *Standard Specifications*. Construct slope protection joints at a spacing of 10 ft. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction joints that meet Subarticle 825-10(B) for the remaining joints.

5.0 MEASUREMENT AND PAYMENT

Segmental Gravity Retaining Walls will be measured and paid in square feet. Block walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of footing elevations. Define "top of wall" as top of cap blocks.

The contract unit price for *Segmental Gravity Retaining Walls* will be full compensation for providing designs, if required, submittals, labor, tools, equipment and block wall materials, excavating, backfilling, hauling and removing excavated materials and supplying footings, blocks, No. 57 stone, wall drainage systems, geotextiles, cap blocks, slope protection and any incidentals necessary to construct block walls.

The contract unit price for *Segmental Gravity Retaining Walls* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with block walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind No. 57 stone from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

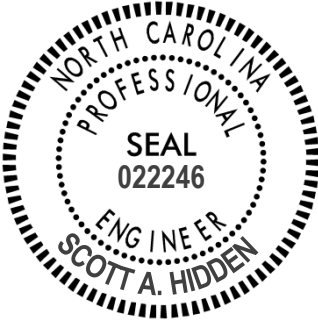
Payment will be made under:

Pay Item

Pay Unit

Segmental Gravity Retaining Walls

Square Foot



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5/19/2016

SOIL NAIL RETAINING WALLS**(SPECIAL)****1.0 GENERAL**

Construct soil nail retaining walls consisting of soil nails spaced at a regular pattern and connected to a cast-in-place reinforced concrete face. A soil nail consists of a steel bar grouted in a drilled hole inclined at an angle below horizontal. Use shotcrete for temporary support of excavations during construction. Design and construct soil nail retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Anchored Wall Contractor to construct soil nail retaining walls. Define "soil nail wall" as a soil nail retaining wall and "Soil Nail Wall Contractor" as the Anchored Wall Contractor installing soil nails and applying shotcrete. Define "nail" as a soil nail and "concrete facing" as a cast-in-place reinforced concrete face.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Curing Agents	1026
Geocomposites	1056
Joint Materials	1028
Masonry	1040
Grout, Type 2	1003
Portland Cement Concrete, Class A	1000
Reinforcing Steel	1070
Select Material, Class VI	1016
Shotcrete	1002
Shoulder Drain Materials	816-2
Steel Plates	1072-2
Welded Stud Shear Connectors	1072-6

Provide Class VI select material (standard size No. 57 stone) for leveling pads. Use Class A concrete for concrete facing and neat cement grout for Type 2 grout.

Provide soil nails consisting of grouted steel bars and nail head assemblies. Use epoxy coated or encapsulated deformed steel bars that meet AASHTO M 275 or M 31, Grade 60 or 75. Splice bars in accordance with Article 1070-9 of the *Standard Specifications*. Provide epoxy coated bars that meet Article 1070-7 of the *Standard Specifications*.

For encapsulated bars, use nonperforated corrugated HDPE sheaths at least 0.04" thick that meet AASHTO M 252. Provide at least 0.4" of grout cover between bars and sheathing and at least 0.8" of grout cover between sheathing and drill hole walls.

Fabricate centralizers from schedule 40 PVC plastic pipe or tube, steel or other material not detrimental to steel bars (no wood). Size centralizers to position bars within 1" of drill hole

centers and allow tremies to be inserted to ends of holes. Use centralizers that do not interfere with grout placement or flow around bars. Centralizers are required both inside and outside sheaths for encapsulated nails.

Provide nail head assemblies consisting of nuts, washers and bearing plates with welded stud shear connectors. Use steel plates for bearing plates and steel washers and hex nuts recommended by the Soil Nail Manufacturer.

Provide Type 3 material certifications for soil nail materials in accordance with Article 106-3 of the *Standard Specifications*. 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 soil nail wall materials so materials are kept clean and free of damage. Do not crack, fracture or otherwise damage grout inside sheaths of encapsulated nails. Bent, damaged or defective materials will be rejected.

3.0 PRECONSTRUCTION REQUIREMENTS

A. Soil Nail Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each soil nail wall. Before beginning soil nail wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of soil nail wall locations as needed. For proposed slopes above or below soil nail walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual soil nail wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. Soil Nail Wall Designs

For soil nail wall designs, submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each at least 30 days before the preconstruction meeting. Do not begin soil nail wall construction until a design submittal is accepted.

Use a prequalified Anchored Wall Design Consultant to design soil nail walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Anchored Wall Design Consultant.

Design soil nail walls in accordance with the plans and allowable stress design method in the *FHWA Geotechnical Engineering Circular No. 7 "Soil Nail Walls"* (Publication No. FHWA-IF-03-017) unless otherwise required. Design soil nail walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*.

Design soil nails that meet the following unless otherwise approved:

1. Minimum Soil Nail Length of at least 10 ft.

2. Horizontal and vertical spacing of at least 3 ft,
3. Inclination of at least 12° below horizontal,
4. Clearance between ends of bars and drill holes of at least 6" and
5. Diameter of 6" to 10".

Four inch diameter soil nails may be approved for nails in rock at the discretion of the Engineer. Do not extend nails beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with nails, maintain a clearance of at least 6" between obstructions and nails.

When noted in the plans, design soil nail walls for a live load (traffic) surcharge of 250 lb/sf. For steel beam guardrail with 8 ft posts above soil nail walls, analyze walls for a horizontal load of 300 lb/ft of wall. For concrete barrier rail above soil nail walls, analyze walls for a horizontal load of 500 lb/ft of wall.

Provide wall drainage systems consisting of geocomposite drain strips, drains and outlet components. Place drain strips with a horizontal spacing of no more than 10 ft and center strips between adjacent nails. Attach drain strips to excavation faces and connect strips to leveling pads. Locate a continuous aggregate shoulder drain along the base of concrete facing in front of leveling pads. Provide drains and outlet components in accordance with Standard Drawing No. 816.02 of the *Roadway Standard Drawings*.

Use shotcrete at least 4" thick and reinforce shotcrete with #4 waler bars around nail heads. Two waler bars (one on each side of nail head) in the horizontal and vertical directions are required for a total of 4 bars per nail.

Use No. 57 stone for aggregate leveling pads. Use 6" thick leveling pads beneath concrete facing. Unless required otherwise in the plans, embed top of leveling pads at least 12" below bottom of walls shown in the plans.

Use concrete facing with the dimensions shown in the plans and attach facing to nail heads with welded stud shear connectors. When concrete barrier rail is required above soil nail walls, use concrete barrier rail with moment slab as shown in the plans.

Submit working drawings and design calculations including unit grout/ground bond strengths for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with nail locations including known test nail locations, typical sections and details of nails, drainage, shotcrete, leveling pads and concrete facing. If necessary, include details on working drawings for concrete barrier rail with moment slab and obstructions extending through walls or interfering with nails, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. At least one analysis is required for each wall section with different nail lengths.

When designing soil nail walls with computer software other than SnailWin, use SnailWin version 3.10 or later, developed by the California Department of Transportation (CALTRANS) to verify the design. Use SnailWin in accordance with the following:

1. Pre-factored yield stress (150, 75 or 60 ksi) and punching shear for reinforcement (nail) strengths,
2. Allowable bond strengths for bond stress,
3. Default value of 1.0 for bond stress factor and
4. Pullout controls for all nails, i.e., yield stress or punching shear do not control.

Determine $T_{\max-s}$ from SnailWin as shown in Table D.4 of FHWA GEC 7 and use the factored maximum design nail force ($T_{\max-s}/0.55$) for design. At least one SnailWin analysis is required per 100 ft of wall length with at least one analysis for the wall section with the longest nails. Submit electronic SnailWin input files and PDF output files with design calculations.

C. Soil Nail Wall Construction Plan

Submit 4 copies and a PDF copy of a soil nail wall construction plan at least 30 days before the preconstruction meeting. Do not begin soil nail wall construction until the construction plan submittal is accepted. Provide detailed project specific information in the soil nail wall construction plan that includes the following:

1. Overall description and sequence of soil nail wall construction;
2. List and sizes of excavation equipment, drill rigs and tools, tremies and grouting equipment;
3. Procedures for excavations, drilling and grouting, soil nail and wall drainage system installation and facing construction;
4. Details of shotcrete equipment and application including mix process, test panels, thickness gauges and shooting methods;
5. Shotcrete nozzleman with certification in accordance with Article 1002-1 of the *Standard Specifications*;
6. Plan and methods for nail testing with calibration certificates dated within 90 days of the submittal date;
7. Examples of construction and test nail records to be used in accordance with Sections 4.0(F) and 5.0(E) of this provision;
8. Approved packaged grout or grout mix design with acceptable ranges for flow and density that meets Section 1003 of the *Standard Specifications*;
9. Shotcrete mix design that meets Section 1002 of the *Standard Specifications*; and
10. Other information shown in the plans or requested by the Engineer.

If alternate construction procedures are proposed or necessary, a revised soil nail wall construction plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend soil nail wall construction until a revised plan is accepted.

D. Preconstruction Meeting

Before starting soil nail wall construction, hold a preconstruction meeting to discuss the construction, inspection and testing of the soil nail walls. If this meeting occurs before all soil nail wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of soil nail walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Soil Nail Wall Contractor Superintendent will attend preconstruction meetings.

4.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of soil nail walls. Direct run off away from soil nail walls and areas above and behind walls.

Notify the Engineer before blasting in the vicinity of soil nail walls. Perform blasting in accordance with the contract. Unless required otherwise in the plans, install foundations located behind soil nail walls before beginning wall construction.

Install soil nail walls in accordance with the accepted submittals and as directed. Do not excavate behind soil nail walls. If overexcavation occurs, repair walls with an approved method and a revised soil nail wall design or construction plan may be required.

A. Excavation

Excavate for soil nail walls from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with no negative batter (excavation face leaning forward). Excavate lifts in accordance with the following:

1. Heights not to exceed vertical nail spacing,
2. Bottom of lifts no more than 3 ft below nail locations for current lift and
3. Horizontal and vertical alignment within 2" of location shown in the accepted submittals.

Remove any cobbles, boulders, rubble or debris that will protrude more than 2" into the required shotcrete thickness.

If blasting is required to excavate rock for soil nail wall construction, perform blasting in accordance with Section 220 of the Standard Specifications and in such manner not to damage the soil nails already installed. Exercise care not to overexcavate. Backfill any overexcavation by concrete or shotcrete approved for use in this soil nail wall construction.

Apply shotcrete to excavation faces within 24 hours of excavating each lift unless otherwise approved. Shotcreting may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.

If an excavation becomes unstable at any time, suspend soil nail wall construction and temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soil nail wall design or construction plan may be required.

Do not excavate the next lift until nail installations and testing and shotcrete application for the current lift are accepted and grout and shotcrete for the current lift have cured at least 3 days and 1 day, respectively.

B. Soil Nails

Install soil nails in the same way as acceptable test nails. Drill and grout nails the same day and do not leave drill holes open overnight.

Control drilling and grouting to prevent excessive ground movements, damaging structures and pavements or fracturing rock and soil formations. If ground heave or subsidence occurs, suspend soil nail wall construction and take corrective action to minimize movement. If property damage occurs, make repairs with an approved method and a revised soil nail wall design or construction plan may be required.

1. Drilling

Use drill rigs of the sizes necessary to install soil nails and with sufficient capacity to drill through whatever materials are encountered. Drill straight and clean holes with the dimensions and inclination shown in the accepted submittals. Drill holes within 6" of locations and 2° of inclination shown in the accepted submittals unless otherwise approved.

Stabilize drill holes with temporary casings if unstable, caving or sloughing material is anticipated or encountered. Do not use drilling fluids to stabilize drill holes or remove cuttings.

2. Steel Bars

Center steel bars in drill holes with centralizers. Securely attach centralizers along bars at no more than 8 ft centers. Attach uppermost and lowermost centralizers 18" from excavation faces and ends of holes.

Do not insert steel bars into drill holes until hole locations, dimensions, inclination and cleanliness are approved. Do not vibrate, drive or otherwise force bars into holes. If a steel bar cannot be completely and easily inserted into a drill hole, remove the bar and clean or redrill the hole.

3. Grouting

Remove oil, rust inhibitors, residual drilling fluids and similar foreign materials from holding tanks/hoppers, stirring devices, pumps, lines, tremie pipes and any other equipment in contact with grout before use. Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute/American Petroleum Institute Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

Inject grout at the lowest point of drill holes through tremies, e.g., grout tubes, casings, hollow-stem augers or drill rods, in one continuous operation. Fill drill holes progressively from ends of holes to excavation faces and withdraw tremies at a slow even rate as holes are filled to prevent voids in grout. Extend tremies into grout at least 5 ft at all times except when grout is initially placed in holes.

Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing). Cold joints in grout are not allowed except for test nails. Remove any temporary casings as grout is placed and record grout volume for each drill hole.

4. Nail Heads

Weld stud shear connectors to bearing plates of nails in accordance with Article 1072-6 of the *Standard Specifications*. Install nail head assemblies after shotcreting. Before shotcrete reaches initial set, seat bearing plates and tighten nuts so plates contact shotcrete uniformly. If uniform contact is not possible, install nail head assemblies on mortar pads so nail heads are evenly loaded.

C. Wall Drainage Systems

Install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. Before installing shotcrete reinforcement, place geocomposite drain strips with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, drain strips may be placed after shotcreting over weep holes through the shotcrete. Hold drain strips in place with anchor pins so strips are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous drain strips are not allowed. If splices are needed, overlap drain strips at least 12" so flow is not impeded. Connect drain strips to leveling pads by embedding strip ends at least 4" into No. 57 stone.

D. Shotcrete

Clean ungrouted zones of drill holes and excavation faces of loose materials, mud, rebound and other foreign material. Moisten surfaces to receive shotcrete. Install shotcrete reinforcement in accordance with the contract and accepted submittals.

Secure reinforcing steel so shooting does not displace or vibrate reinforcement. Install approved thickness gauges on 5 ft centers in the horizontal and vertical directions to measure shotcrete thickness.

Apply shotcrete in accordance with the contract, accepted submittals and Subarticle 1002-3(F) of the *Standard Specifications*. Use approved shotcrete nozzlemen who made satisfactory preconstruction test panels to apply shotcrete. Direct shotcrete at right angles to excavation faces except when shooting around reinforcing steel. Rotate nozzle steadily in small circular patterns and apply shotcrete from bottom of lifts up.

Make shotcrete surfaces uniform and free of sloughing or sagging. Completely fill ungrouted zones of drill holes and any other voids with shotcrete. Taper construction joints to a thin edge over a horizontal distance of at least the shotcrete thickness. Wet joint surfaces before shooting adjacent sections.

Repair surface defects as soon as possible after shooting. Remove any shotcrete which lacks uniformity, exhibits segregation, honeycombing or lamination or contains any voids or sand pockets and replace with fresh shotcrete to the satisfaction of the Engineer. Protect shotcrete from freezing and rain until shotcrete reaches initial set.

E. Leveling Pads and Concrete Facing

Construct aggregate leveling pads at elevations and with dimensions shown in the accepted submittals. Compact leveling pads with a vibratory compactor to the satisfaction of the Engineer.

Construct concrete facing in accordance with the accepted submittals and Section 420 of the *Standard Specifications*. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi. Unless required otherwise in the plans, provide a Class 2 surface finish for concrete facing that meets Subarticle 420-17(F) of the *Standard Specifications*. Construct concrete facing joints at a spacing of 10 ft to 12 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction or sawed joints that meet Subarticle 825-10(B) or 825-10(E) respectively for the remaining joints. Stop reinforcing steel for concrete facing 2" on either side of expansion joints.

If a brick veneer is required, construct brick masonry in accordance with Section 830 of the *Standard Specifications*. Anchor brick veneers to soil nail walls with approved brick to concrete type anchors in accordance with the manufacturer's instructions. Space anchors no more than 16" apart in the vertical direction and no more than 32" apart in the horizontal direction with each row of anchors staggered 16" from the row above and below.

Seal joints above and behind soil nail walls between concrete facing and slope protection with silicone sealant.

F. Construction Records

Provide 2 copies of soil nail wall construction records within 24 hours of completing each lift. Include the following in construction records:

1. Names of Soil Nail Wall Contractor, Superintendent, Nozzleman, Drill Rig Operator, Project Manager and Design Engineer;
2. Wall description, county, Department's contract, TIP and WBS element number;
3. Wall station and number and lift location, dimensions, elevations and description;
4. Nail locations, dimensions and inclinations, bar types, sizes and grades, corrosion protection and temporary casing information;
5. Date and time drilling begins and ends, steel bars are inserted into drill holes, grout and shotcrete are mixed and arrives on-site and grout placement and shotcrete application begins and ends;
6. Grout volume, temperature, flow and density records;
7. Ground and surface water conditions and elevations if applicable;
8. Weather conditions including air temperature at time of grout placement and shotcrete application; and
9. All other pertinent details related to soil nail wall construction.

After completing each soil nail wall or stage of a wall, provide a PDF copy of all corresponding construction records.

5.0 NAIL TESTING

Test soil nails in accordance with the contract and as directed. "Verification tests" are performed on nails not incorporated into soil nail walls, i.e., sacrificial nails and "proof tests" are performed on nails incorporated into walls, i.e., production nails. Define "verification test nail" and "proof test nail" as a nail tested with either a verification or proof test, respectively. Define "test nails" as verification or proof test nails.

Verification tests are typically required for at least one nail per soil type per soil nail wall or 2 nails per wall, whichever is greater. Proof tests are typically required for at least one nail per nail row per soil nail wall or at least 5% of production nails, whichever is greater. More or less test nails may be required depending on subsurface conditions encountered. The Engineer will determine the number and locations of verification and proof tests required. The approximate known test nail locations are shown in the plans.

Do not test nails until grout and shotcrete attain the required 3 day compressive strength. Do not install any production nails until verification tests are accepted.

A. Test Equipment

Use the following equipment to test nails:

1. Two dial gauges with rigid supports,
2. Hydraulic jack and pressure gauge,
3. Jacking block or reaction frame and
4. Electrical resistance load cell (verification tests only).

Provide dial gauges with enough range and precision to measure the maximum test nail movement to 0.001". Use pressure gauges graduated in 100 psi increments or less. Submit identification numbers and calibration records for load cells, jacks and pressure gauges with the soil nail wall construction plan. Calibrate each jack and pressure gauge as a unit.

Align test equipment to uniformly and evenly load test nails. Use a jacking block or reaction frame that does not damage or contact shotcrete within 3 ft of nail heads. Place dial gauges opposite each other on either side of test nails and align gauges within 5° of bar inclinations. Set up test equipment so resetting or repositioning equipment during nail testing is not needed.

B. Test Nails

Test nails include both unbonded and bond lengths. Grout only bond lengths before nail testing. Provide unbonded and bond lengths of at least 3 ft and 10 ft, respectively.

Steel bars for production nails may be overstressed under higher test nail loads. If necessary, use larger size or higher grade bars with more capacity for test nails instead of shortening bond lengths to less than the minimum required.

C. Verification Tests

Install verification test nails with the same equipment, installation methods and drill hole diameter and inclination as production nails.

Determine maximum bond length for verification test nails (L_{BVT}) using the following:

$$L_{BVT} \leq (C_{RT} \times A_t \times f_y) / (Q_{ALL} \times 3)$$

Where,

L_{BVT} = bond length (ft),

C_{RT} = reduction coefficient, 0.9 for Grade 60 and 75 bars or 0.8 for Grade 150 bars,

A_t = bar area (in²),

f_y = bar yield stress (ksi) and

Q_{ALL} = allowable unit grout/ground bond strength (kips/ft).

Determine design test load for verification test nails (DTL_{VT}) based on as-built bond length and allowable unit grout/ground bond strength using the following:

$$DTL_{VT} = L_{BVT} \times Q_{ALL}$$

Where,

DTL_{VT} = design test load (kips).

Perform verification tests by incrementally loading nails to failure or a load of 300% of DTL_{VT} based on the following schedule:

Load	Hold Time
AL*	1 minute
0.25 DTL_{VT}	10 minutes
0.50 DTL_{VT}	10 minutes
0.75 DTL_{VT}	10 minutes
1.00 DTL_{VT}	10 minutes
1.25 DTL_{VT}	10 minutes
1.50 DTL_{VT}	60 minutes (creep test)
1.75 DTL_{VT}	10 minutes
2.00 DTL_{VT}	10 minutes
2.50 DTL_{VT}	10 minutes
3.00 DTL_{VT}	10 minutes
AL*	1 minute

* Alignment load (AL) is the minimum load needed to align test equipment and should not exceed 0.05 DTL_{VT} .

Reset dial gauges to zero after applying alignment load. Record test nail movement at each load increment and permanent set after load is reduced to alignment load. Monitor verification test nails for creep at the 1.5 DTL_{VT} load increment. Measure and record movement during creep test at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. Repump jack as needed to maintain load during hold times.

D. Proof Tests

Determine maximum bond length for proof test nails (L_{BPT}) using the following:

$$L_{BPT} \leq (C_{RT} \times A_t \times f_y) / (Q_{ALL} \times 1.5)$$

Where variables are defined in Section 5.0(C) above.

Determine design test load for proof test nails (DTL_{PT}) based on as-built bond length and allowable unit grout/ground bond strength using the following:

$$DTL_{PT} = L_{BPT} \times Q_{ALL}$$

Where variables are defined in Section 5.0(C) above.

Perform proof tests by incrementally loading nails to failure or a load of 150% of DTL_{PT} based on the following schedule:

Load	Hold Time
AL*	Until movement stabilizes
0.25 DTL_{PT}	Until movement stabilizes
0.50 DTL_{PT}	Until movement stabilizes

0.75 DTL _{PT}	Until movement stabilizes
1.00 DTL _{PT}	Until movement stabilizes
1.25 DTL _{PT}	Until movement stabilizes
1.50 DTL _{PT}	10 or 60 minutes (creep test)
AL*	1 minute

* Alignment load (AL) is the minimum load needed to align test equipment and should not exceed 0.05 DTL_{PT}.

Reset dial gauges to zero after applying alignment load. Record test nail movement at each load increment and monitor proof test nails for creep at the 1.5 DTL_{PT} load increment. Measure and record movement during creep test at 1, 2, 3, 5, 6 and 10 minutes. If test nail movement between 1 and 10 minutes is greater than 0.04", maintain the 1.5 DTL_{PT} load increment for an additional 50 minutes and record movement at 20, 30, 50 and 60 minutes. Repump jack as needed to maintain load during hold times.

E. Test Nail Acceptance

Submit 2 copies of test nail records including load versus movement and time versus creep movement plots within 24 hours of completing each verification or proof test. The Engineer will review the test nail records to determine if test nails are acceptable. Test nail acceptance is based in part on the following criteria.

1. For verification tests, total movement during creep test is less than 0.08" between the 6 and 60 minute readings and creep rate is linear or decreasing throughout hold time.
2. For proof tests, total movement during creep test is less than 0.04" between the 1 and 10 minute readings or less than 0.08" between the 6 and 60 minute readings and creep rate is linear or decreasing throughout hold time.
3. Total movement at maximum load exceeds 80% of the theoretical elastic elongation of the unbonded length.
4. Pullout failure does not occur at or before the 2.0 DTL_{VT} or 1.5 DTL_{PT} load increment. Define "pullout failure" as the inability to increase load while movement continues. Record pullout failure load as part of test nail data.

For proof test nails, maintain stability of unbonded lengths for subsequent grouting. If a proof test nail is accepted but the unbonded length cannot be satisfactorily grouted, do not incorporate the proof test nail into the soil nail wall and add another production nail to replace the test nail.

If the Engineer determines a verification test nail is unacceptable, revise the soil nail design or installation methods. Submit a revised soil nail wall design or construction plan for acceptance and provide acceptable verification test nails with the revised design or installation methods.

If the Engineer determines a proof test nail is unacceptable, either perform additional proof tests on adjacent production nails or revise the soil nail design or installation methods for the production nails represented by the unacceptable proof test nail as determined by the Engineer. Submit a revised soil nail wall design or construction plan for acceptance, provide an acceptable proof test nail with the revised design or installation methods and install additional production nails for the nails represented by the unacceptable proof test nail.

After completing nail testing for each soil nail wall or stage of a wall, provide a PDF copy of all corresponding test nail records.

6.0 MEASUREMENT AND PAYMENT

Soil Nail Retaining Walls will be measured and paid in square feet. Soil nail walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of leveling pad elevations. Define “top of wall” as top of concrete facing.

The contract unit price for *Soil Nail Retaining Walls* will be full compensation for providing designs, submittals, labor, tools, equipment and soil nail wall materials, excavating, blasting if necessary, hauling and removing excavated materials, backfilling of overexcavation by concrete or shotcrete, installing soil nails, grouting, shotcreting and supplying wall drainage systems, leveling pads, concrete facing and any incidentals necessary to construct soil nail walls. The contract unit price for *Soil Nail Retaining Walls* will also be full compensation for brick veneers, if required. No additional payment will be made and no extension of completion date or time will be allowed for repairing property damage, overexcavations or unstable excavations, unacceptable test nails or thicker shotcrete or concrete facing.

The contract unit price for *Soil Nail Retaining Walls* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with soil nail walls as these items will be paid for elsewhere in the contract.

Soil Nail Verification Tests and *Soil Nail Proof Tests* will be measured and paid in units of each. Soil nail testing will be measured as the number of initial verification or proof tests performed and accepted by the Engineer. The contract unit prices for *Soil Nail Verification Tests* and *Soil Nail Proof Tests* will be full compensation for initial nail testing. No payment will be made for subsequent nail testing performed on the same or replacement test nails.

The Engineer will review and determine the need for additional *Soil Nail Proof Tests* for nails installed prior to blasting. No payment will be made for material and additional work necessary to access nails proof tested before blasting. The cost is incidental to the cost of *Soil Nail Proof Tests*.

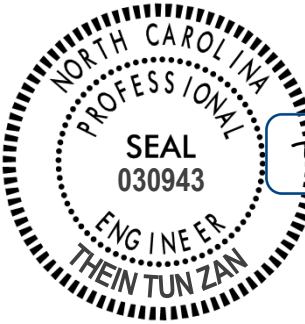
Payment will be made under:

Pay Item

Soil Nail Retaining Walls
Soil Nail Verification Tests
Soil Nail Proof Tests

Pay Unit

Square Foot
Each
Each



DocuSigned by:

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5/20/2016

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

Geotextiles

Section

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

Geotextile for Pavement Stabilization

Pay Unit

Square Yard



DocuSigned by:
Scott A. Hidden
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5/20/2016

STEEL SHEET PILE RETAINING WALLS**(SPECIAL)****1.0 GENERAL**

Design and construct steel sheet pile retaining walls consisting of steel sheet piles and including the use of passive unstressed anchors or tie rods connected to a deadman system for portions of the wall when necessary. Design and construct steel sheet pile retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Design deadman systems as reinforced concrete blocks, piles, or other approved method.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Curing Agents	1026
Joint Materials	1028
Portland Cement Concrete, Class A	1000
Reinforcing Steel	1070
Steel Sheet Piles	1084-2
Steel Piles	1084-1

All shapes, plates, tie rod assemblies, bolts, nuts, and washers shall meet the requirements of Section 1072 of the *Standard Specifications*. Use type 1 or type 3 high strength bolts, nuts, and washers. Nuts for tie rods shall be capable of developing 100% of the guaranteed minimum ultimate tensile strength of the rod. All shapes, plates, tie rod assemblies, bolts, nuts, and washers shall be galvanized in accordance with Section 1076 of the *Standard Specifications*. Steel tie rods shall be deformed steel bars meeting the requirements of ASTM A722. Splicing of rods is not allowed.

Provide Type 3 material certifications for new materials in accordance with Article 106-3 of the *Standard Specifications*. 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 wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

3.0 PRECONSTRUCTION REQUIREMENTS**A. Steel Sheet Pile Wall Surveys**

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for the steel sheet pile wall. Before beginning steel sheet pile wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of steel sheet pile wall locations as needed. For proposed slopes above or below steel sheet pile walls, survey existing ground elevations to at least 10 ft. beyond slope stake points. Based on these elevations,

finished grades and actual steel sheet pile wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design and construction.

B. Steel Sheet Pile Wall Designs

For steel sheet pile wall designs, submit 7 copies of working drawings and 3 copies of design calculations and a PDF copy of each at least 30 days before the preconstruction meeting. Do not begin steel sheet pile wall construction until a design submittal is accepted.

Use a prequalified Geotechnical Engineer to provide pressure diagram for the design of the steel sheet pile retaining wall. Provide design sealed by a Professional Engineer in North Carolina.

Design steel sheet pile walls in accordance with the plans and the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Do not extend necessary tie rods and deadman beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with tie rods, maintain a clearance of at least 6" between obstructions and tie rods or deadman.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with steel sheet pile and tie rod and deadman including locations, typical sections and details. Submit design calculations including showing resistance capacity developed by the deadman in soil for a minimum factor of safety of 2.

C. Steel Sheet Pile Wall Construction Plan

Submit 4 copies and a PDF copy of steel sheet pile wall construction plan at least 30 days before the preconstruction meeting. Do not begin steel sheet pile wall construction until the construction plan submittal is accepted. Provide detailed project specific information in the steel sheet pile wall construction plan.

4.0 CONSTRUCTION METHODS

A. Sheet Pile Installation

Install sheet piles with tolerances that meet Subarticles 450-3(B)(1) and 450-3(B)(2) of the *Standard Specification*. Install sheet piles with the minimum required pile tip elevations in accordance with Subarticle 450-3(D).

B. Concrete Coping

Construct concrete coping in accordance with the plans and Section 420 and 452-3(C) of the *Standard Specification*.

C. Backfilling and Sealing Joints

Do not backfill until concrete attains a compressive strength of at least 3000 psi. Backfill behind sheet pile and tie rods in accordance with Article 410-8. Seal any joints along sheet pile walls with joint sealer.

5.0 MEASUREMENT AND PAYMENT

Steel Sheet Pile Retaining Walls will be measured and paid in square feet of exposed wall face area with the height equal to the difference between the top and bottom of wall elevation. Define "top of wall" elevation as the top of concrete coping. Define "bottom of wall" elevation as shown in the plans and no measurement will be made for portions of sheet pile walls below bottom of wall elevations.

The contract unit price for *Steel Sheet Pile Retaining Walls* will be full compensation for all work including but not limited to providing designs, submittals, labor, tools, equipment and steel sheet pile wall materials, installing steel sheet piles, concrete coping, tie rods, and deadman system, excavating, hauling and any incidentals necessary to construct steel sheet pile walls. Backfilling will be paid separately in accordance with Embankments of Section 235 of the Standard Specifications.

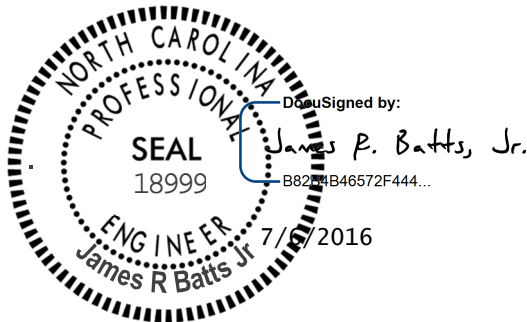
Payment will be made under:

Pay Item

Steel Sheet Pile Retaining Walls

Pay Unit

Square Foot





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Ronald W. King
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5/11/2016

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 1/2 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:

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

Where f_a = 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 $M = P \times D_2$.

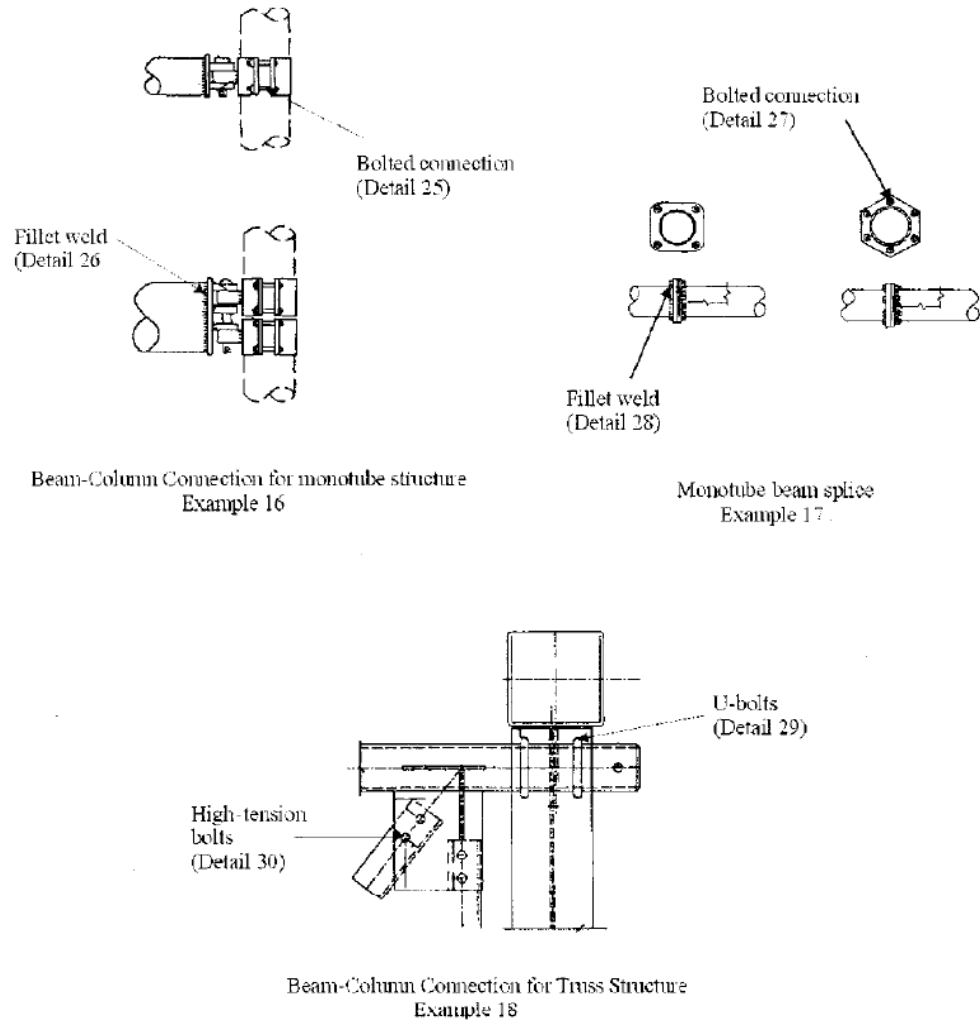
- M - bending moment at the critical section of the base plate induced by one anchor bolt
- P - anchoring force of each anchor bolt
- D_1 - horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside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

<u>Construction</u>	<u>Detail</u>	<u>Stress Category</u>	<u>Application</u>	<u>Example</u>
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:



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* @ _____. 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 @ _____ Lump Sum



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5/11/2016

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*.

Payment will be made under:

Pay Item
Overhead Footings

Pay Unit
Cubic Yard

TC-1

U-2524D

Guilford County

WORK ZONE TRAFFIC CONTROL Project Special Provisions

TRAFFIC CONTROL DEVICES REMAINING FROM PREVIOUS PROJECT:

(02/06/2013)

Description

Accept ownership, monitor, maintain, replace, and remove the following traffic control devices, which are remaining from the previous project (**U-2524C**) in accordance with the plans and specifications.

- 1- Drums
- 2- Work Zone Signs Stationary
- 3- Barricades Type III
- 4- Work Zone Barricade Mounted Signing

Materials

Replace any of the above mentioned devices which do not meet the material requirements of their respective specifications as directed by the Engineer.

Construction Methods

Accept ownership and maintenance responsibilities of the above mentioned devices and retain ownership at the completion of the project.

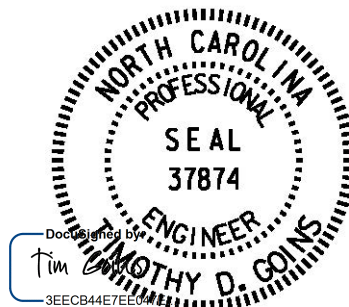
Section 1105-3 of the 2012 Standard Specifications applies to this special provision.

Maintenance

Maintain the above mentioned devices in accordance with Section 1105-4 of the 2012 Standard Specifications.

Basis of Payment

No separate payment will be made for the maintenance, replacement, and removal of the above mentioned devices. Such work will be considered as incidental to the other traffic control items listed in the contract.



5/10/2016

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Timothy D. Goins

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TC-2

U-2524D

Guilford County

WORK ZONE TRAFFIC CONTROL Project Special Provisions

TRAFFIC CONTROL DEVICES TO REMAIN ON PROJECT:

(02/05/2013)

Description

Furnish, install, maintain during the life of the project, and leave Traffic Control Devices on the project at its completion in accordance with the plans and specifications.

Construction Methods

Install and leave on the project the Traffic Control Devices necessary to accommodate the traffic pattern shown on sheet PMP-11 & PMP-12 of the **Final Pavement Marking Plan**, unless otherwise directed by the Engineer.

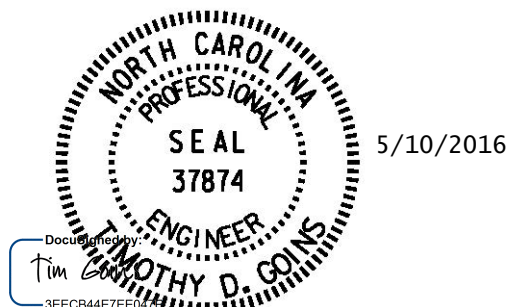
Provide devices to remain on the project, which meet the requirements of their respective specifications in the 2012 Standard Specifications or their respective special provisions.

Provide devices to remain on the project that are in good condition and subject to the approval of the Engineer.

The devices required to remain on the project at its completion will become the property of the Department.

Basis Of Payment

No additional payment will be made specifically for leaving devices on the project. These devices will be paid under their respective pay items in the Contract which will include full compensation for furnishing, installing, maintaining during the life of the project, and leaving the devices on the project at its completion.



TC-3

(U-2524D)

Guilford County

WORK ZONE TRAFFIC CONTROL Project Special Provisions

Protective Canopy:

(06/28/2013)

Description

The Contractor shall provide a protective canopy to protect pedestrians from falling debris along the existing sidewalk beneath the -LREV- over -Y8- bridge structure at all times during construction.

Construction Methods

The protective canopy shall be constructed in accordance with local governing building codes, and requirements of the Americans with Disabilities Act (ADA). The protective canopy shall be adequately lit for nighttime use. At no time shall materials or equipment be stored on the canopy roof. All waste or falling debris is to be removed from the canopy roof on a daily basis or as directed by the engineer. The Contractor is to investigate and secure all necessary permits required by the governing bodies aforementioned prior to commencing work.

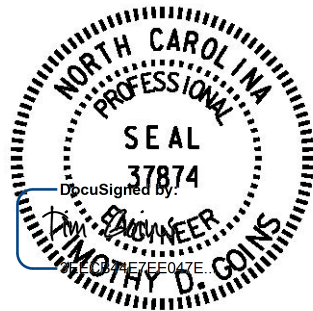
Measurement and Payment

The measurement and payment for the Protective Canopy shall be Lump Sum. The Lump Sum price shall include any costs associated with the installation, maintenance and removal.

Pay Item

Pay Unit

Protective Canopy.....Lump Sum



6/20/2016

PROJECT SPECIAL PROVISIONS

Utility Construction

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**DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED**

Revise the 2012 Standard Specifications as follows:**Page 10-58, Sub-article 1036-1 General**

Add the following sentence:

All materials in contact with potable water shall be in conformance with Section 1417 of the Safe Drinking Water Act.

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

Add the following sentences:

The utility owner is the City of Greensboro. For work involving Greensboro's facilities, the Contractor shall contact the City of Greensboro Service Center at (336) 373-2033, the City of Greensboro Water Resources Department Administration at (336) 373-2055, and the City of Greensboro Water and Sewer Inspections Department at (336) 373-2377.

A representative from the City of Greensboro shall witness all tests performed on their water and sewer facilities. Test results shall be provided to the City of Greensboro for any tests involving their facilities.

Page 15-2, Sub-article 1500-9 Placing Pipelines into Service

Add the following sentence:

Obtain approval from the NCDENR-Public Water Supply Section prior to placing a new water line into service. Use backflow prevention assemblies for temporary connections to isolate new water lines from existing water line.

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization

Change the allowable leakage formula to:

$$W = LD\sqrt{P} \div 148,000$$

PROJECT SPECIAL PROVISIONS

Utility Construction

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization, sixth paragraph:

Replace the paragraph with the following:

Sterilize water lines in accordance with Section 1003 of The Rules Governing Public Water supply and AWWA C651 Section 4.4.3, the Continuous Feed Method. Provide a chlorine solution with between 50 parts per million and 100 parts per million in the initial feed. If the chlorine level drops below 10 parts per million during a 24 hour period, then flush, refill with fresh chlorine solution, and repeat for 24 hours. Provide certified bacteriological and contaminant test results from a state-approved or state-certified laboratory. Operate all valves and controls to assure thorough sterilization.

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization, seventh paragraph:

Delete the words “may be performed concurrently or consecutively.” and replace with “shall be performed consecutively.”

Page 15-7, sub-article 1515-2 Materials,

Replace paragraph beginning “Double check valves...” with the following:

Double Check valves (DCV) and Reduced Pressure Zone principal (RPZ) backflow prevention assemblies shall be listed on the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research list of approved backflow devices.

Page 15-11, Sub-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.

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 Progress (Distribution)
- B) Duke Energy Progress (Transmission)
- C) AT&T Of NC (Telephone)
- D) Time Warner (Cablevision)
- E) Piedmont Natural Gas (Distribution)
- F) Piedmont Natural Gas (Transmission)
- G) Level 3 Communications (Fiber Optic-Internet)

The conflicting facilities of these concerns will be 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 owners. All utilities are shown on the plans from the best available information.

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

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans. These utility relocations will be completed prior to date of availability of this project unless otherwise noted.

A) Duke Energy Progress (Distribution)

- 1) At -Y5- Old Battleground Road, Duke Energy will relocate their alignment to the west side of Old Battleground Road and will span the -L- Line at that location. The three phase aerial line at -Y8- Lawndale Drive will be relocated east of the proposed interchange construction and will span the -L- Line from south to north and will reconnect with existing facilities on the north side of Lawndale Drive. New underground power distribution cables will be installed within the PUE north of the -L- Line from -Y5- Old Battleground Road to -Y8- Lawndale Drive. A new power cable will also be buried within the PUE south of the -L- Line from -L- 469+50 140' Right east to Lawndale Drive. Buried services to homes and businesses will be addressed as needed. All relocation work for Duke Energy is

PROJECT SPECIAL PROVISIONS

Utilities by Others

expected to be complete prior to September 1, 2016.

- 2) The contact person for Duke Energy Progress (Distribution) is Donnie Williams at (336) 269-0284.

B) Duke Energy Progress (Transmission)

- 1) The existing transmission tower located on the south side of the -L- Line within the proposed CA at approximate Sta. -L- 478+50 108' Right will be moved outside of the CA south of the project limits within the existing Duke Transmission easement. The tower will also be elevated to a maximum height within their specifications in order to better accommodate construction activities underneath the lines. Duke Transmission requests that the roadway contractor maintain a vertical and horizontal distance of 30 feet to be maintained if possible between the power conductors and any construction equipment operating under the Duke facility. Also, Duke Energy requests that signage warning of high voltage lines be erected on the borders of the Duke Transmission easement. Duke Transmission will be complete with the relocation of their facilities by December 16, 2016.
- 2) The contact person for Duke Energy Progress (Transmission) is Jeremy Sabo at (704) 382-8396.

C) AT&T of NC (Telephone)

- 1) At -Y5- Old Battleground Road, AT&T will relocate to the new Duke pole line which will cross the -L- Line west of existing Battleground Road. The relocation work at -Y- 5 will be complete before September 1, 2016. The fiber splice vault located along Cotswold Avenue will be relocated to Lawndale Drive at approximate station -Y8- 13+60 90' Right in new right of way. This work will be completed prior to September 1, 2016. The AT&T aerial facility on Lawndale Drive will be temporarily relocated and will remain aerial until the culvert is constructed. AT&T will need one (1) week notice from the roadway contractor prior to completion of the culvert at Lawndale Drive to mobilize and is anticipated to take two (2) weeks to permanently bury the telephone lines over the completed culvert on the west side of Lawndale Drive.
- 2) The contact person for AT&T of NC is Butch Bunton Of Telics at (336) 317-8142.

D) Time Warner Cablevision (Cablevision)

- 1) At -Y5- Old Battleground Road, Time Warner will relocate to the new Duke Energy pole line which will cross the -L- Line west of Battleground Road. The

PROJECT SPECIAL PROVISIONS

Utilities by Others

relocation work at -Y- 5 will be complete before September 1, 2016. Time Warner will bury their facility From Old Battleground Road to -Y8- Lawndale Drive within the PUE on the south side of the project. This work will be complete prior to September 1, 2016. The Time Warner aerial on Lawndale Drive will be relocated prior to September 1, 2016 aerially with AT&T temporarily until the culvert is constructed. Time Warner will permanently bury the cablevision lines over the completed culvert on the west side. Time Warner will need Two (2) weeks notice from the roadway contractor prior to completion of the culvert and is anticipated to take six (6) weeks to complete the permanent relocation of the cablevision lines on the west side of Lawndale Drive. Please note that Time Warner has a splicing moratorium from November 15th to January 15th. No relocation work can be performed during this time frame.

- 2) The contact person for Time Warner is Roger Stanfield at (336) 215-3742.

E) Piedmont Natural Gas-PNG (Distribution)

- 1) At -Y5- Old Battleground Road, Piedmont Natural Gas (PNG) will bore their new gas line deeper across the -L- Line parallel to Old Battleground Road to resolve the conflicts involving the existing gas line. This work is expected to be complete prior to September 1, 2016. The distribution lines and service taps along the north and south side of the -L- Line from Old Battleground Road to Lawndale Drive will be adjusted or eliminated as necessary prior to September 1, 2016. At -Y8- Lawndale Drive, PNG will phase their relocation to coincide with the construction of the culvert on the east side of Lawndale Drive. The existing four (4) inch and eight (8) inch gas lines will remain in place along Lawndale Drive while the culverts are being constructed beyond the conflicts with the utilities along Lawndale Drive. The contractor will need to temporarily cease construction of the culverts on the east and west sides of Lawndale Drive while the four (4) inch and eight (8) inch lines are relocated over the completed culvert on the east side of Lawndale Drive. (see drawings). Piedmont Natural Gas will need two (2) weeks notice from the roadway contractor prior to the phased completion of the culvert and will need eight (8) weeks to complete the permanent relocation of the four (4) inch and eight (8) inch gas lines.
- 2) The contact person for Piedmont Natural Gas (Distribution) is Andy Rumley at (336) 222-7108.

F) Piedmont Natural Gas-PNG Tansmission (Transmission)

- 1) PNG Transmission plans to relocate the existing 12 inch steel gas line in approximately the same alignment across the -L- line but will Directional bore

PROJECT SPECIAL PROVISIONS

Utilities by Others

the line approximately 35 feet deeper to avoid the cut along the -L- Line. PNG Transmission may need to go outside their existing easement to make the crossing but will negotiate any additional needed right of way using PNG right of way personnel. This work is expected to be complete on or before December 31, 2016.

- 2) The contact person for Piedmont Natural Gas (Transmission) is Aaron Weldon at (704) 731-4153.

G) Level 3 Communications (Fiber Optic-Internet)

- 1) A buried Level 3 fiber optic cable is present on UO-2 serving an apartment complex. The line will be adjusted during the project construction as necessary. Level 3 will need one (1) week notice from the roadway contractor and one (1) week to perform the relocation prior to the grading work in this area.
- 2) The contact person for Level 3 Communications is Mike Weaver at (919) 710-8891.

**Project Special Provisions
Erosion Control**

STABILIZATION REQUIREMENTS:

(3-11-2016)

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:

(East)

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.

All Roadway Areas

March 1 - August 31		September 1 - February 28	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		September 1 - February 28	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Serengeti
2 nd Millennium	Essential	Kalahari	Shelby
3 rd Millennium	Evergreen 2	Kitty Hawk 2000	Sheridan
Apache III	Falcon IV	Legitimate	Signia
Avenger	Falcon NG	Lexington	Silver Hawk
Barlexas	Falcon V	LSD	Sliverstar
Barlexas II	Faith	Magellan	Shenandoah Elite
Bar Fa	Fat Cat	Matador	Sidewinder
Barrera	Festnova	Millennium SRP	Skyline
Barrington	Fidelity	Monet	Solara
Barrobusto	Finelawn Elite	Mustang 4	Southern Choice II
Barvado	Finelawn Xpress	Ninja 2	Speedway
Biltmore	Finesse II	Ol' Glory	Spyder LS
Bingo	Firebird	Olympic Gold	Sunset Gold
Bizem	Firecracker LS	Padre	Taccoa
Blackwatch	Firenza	Patagonia	Tanzania
Blade Runner II	Five Point	Pedigree	Trio
Bonsai	Focus	Picasso	Tahoe II
Braveheart	Forte	Piedmont	Talladega
Bravo	Garrison	Plantation	Tarheel
Bullseye	Gazelle II	Proseeds 5301	Terrano
Cannavaro	Gold Medallion	Prospect	Titan ltd
Catalyst	Grande 3	Pure Gold	Titanium LS
Cayenne	Greenbrooks	Quest	Tracer
Cessane Rz	Greenkeeper	Raptor II	Traverse SRP
Chipper	Gremlin	Rebel Exeda	Tulsa Time
Cochise IV	Greystone	Rebel Sentry	Turbo
Constitution	Guardian 21	Rebel IV	Turbo RZ
Corgi	Guardian 41	Regiment II	Tuxedo RZ
Corona	Hemi	Regenerate	Ultimate
Coyote	Honky Tonk	Rendition	Venture
Darlington	Hot Rod	Rhambler 2 SRP	Umbrella
Davinci	Hunter	Rembrandt	Van Gogh
Desire	Inferno	Reunion	Watchdog
Dominion	Innovator	Riverside	Wolfpack II
Dynamic	Integrity	RNP	Xtremegreen
Dynasty	Jaguar 3	Rocket	
Endeavor	Jamboree	Scorpion	

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from 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. Sweet Sudan Grass, 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 on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. 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 10-20-20 analysis and as directed.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas 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*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding 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 4 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

Response for Erosion Control

Pay Unit

Each

ENVIRONMENTALLY SENSITIVE AREAS:**Description**

This project is located in an *Environmentally Sensitive Area*. This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading operations within the Environmentally Sensitive Areas identified on the plans and as designated by the Engineer. This also requires special procedures to be used for seeding and mulching and staged seeding within the project.

The Environmentally Sensitive Area shall be defined as a 50-foot buffer zone on both sides of the stream or depression measured from top of streambank or center of depression.

Construction Methods**(A) Clearing and Grubbing**

In areas identified as Environmentally Sensitive Areas, the Contractor may perform clearing operations, but not grubbing operations until immediately prior to beginning grading operations as described in Article 200-1 of the *Standard Specifications*. Only clearing operations (not grubbing) shall be allowed in this buffer zone until immediately prior to beginning grading operations. Erosion control devices shall be installed immediately following the clearing operation.

(B) Grading

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

(C) Temporary Stream Crossings

Any crossing of streams within the limits of this project shall be accomplished in accordance with the requirements of Subarticle 107-12 of the *Standard Specifications*.

(D) Seeding and Mulching

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

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

(E) Stage Seeding

The work covered by this section shall consist of the establishment of a vegetative cover on cut and fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 feet in height measured along the slope, or greater than 2 acres in area. Each stage shall not exceed the limits stated above.

Additional payments will not be made for the requirements of this section, as the cost for this work shall be included in the contract unit prices for the work involved.

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

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 1630-3 of the *Standard Specifications*.

CLEAN WATER DIVERSION:

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of clean water diversions. The clean water diversions shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

(See Project Special Provisions for Revised Section 1056 Geosynthetics)

Construction Methods

The Contractor shall install the clean water diversions in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the excavated material shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Line clean water diversion with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical 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 6" 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.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*.

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

Stabilization of the excavated material will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the clean water diversions.

TEMPORARY PIPE FOR CLEAN WATER DIVERSION:

(05-04-2016)

Description

This work consists of furnishing, installing, reinstalling, maintaining and removing any and all temporary pipe, anchoring, connection and outlet protection used on this project in conjunction with the clean water diversions. The temporary pipe for clean water diversion shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Provide flexible plastic pipe and fittings meeting AASHTO M 294 of minimum size as stated in the erosion control plans.

Refer to Division 10

Item

Corrugated HDPE Pipe	1032
Geotextile for Soil Stabilization, Type 2	1056
Rip Rap Class '1'	1042

(See Project Special Provisions for Revised Section 1056 Geosynthetics)

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe for clean water diversion shall provide a passageway for offsite stormwater runoff to be routed around or through the work-site. The minimum size requirements will be as stated on the erosion control plans. Install pipe at the outlet of Clean Water Diversions or connect to existing pipes as shown on the plans. Anchor the

pipe in accordance with 1622.01 of the *Roadway Standard Drawings*. Construct pipe outlet geotextile and stone in accordance with 876.02 of the *Roadway Standard Drawings*. The pipe shall remain in place unless an area is under active construction and may be temporarily moved for construction operations as approved by the Engineer. The pipe shall be connected prior to any rainfall event and as directed.

Measurement and Payment

__" *Temporary Pipe for Clean Water Diversion* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

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

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Reinstallation of Temporary Pipe for Clean Water Diversion shall be measured and paid for at the contract unit price per linear foot of pipe reinstalled at locations shown on the plans and as directed and approved by the Engineer. Such price and payment shall be full compensation of the reinstallation of the pipe.

Payment will be made under:

Pay Item	Pay Unit
__" Temporary Pipe	Linear Foot
Reinstallation of Temporary Pipe for Clean Water Diversion	Linear Foot

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. Posts shall be installed a minimum of 2 ft. into the ground. 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)(5) 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

PERMANENT SOIL REINFORCEMENT MAT:**Description**

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a 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 D4355	≥80	%
Porosity (Permanent Net)	ECTC Guidelines	≥85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0	lb/ft ²
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0	ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

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

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying

in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item	Pay Unit
Permanent Soil Reinforcement Mat	Square Yard

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

(See Project Special Provisions for Revised Section 1056 Geosynthetics)

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. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. 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 drain pipe, 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 drain pipe, 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

(See Project Special Provisions for Revised Section 1056 Geosynthetics)

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 drain pipe 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. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. 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 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

EARTHEN DAM WITH SKIMMER:

Description

Provide an earthen dam with a skimmer attached to a barrel pipe at the outlet of a proposed roadway ditch to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Earthen Dam with Skimmer Detail sheet provided in the erosion control plans. Work includes constructing earthen dam, installation of coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of ditch underneath skimmer device, providing and placing geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, removing earthen dam, coir fiber baffles, geotextile liner and skimmer device, and disposing of excess materials.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056
Staples	1060-8
Coir Fiber Mat	1060-14
Coir Fiber Baffle	1640

(See Project Special Provisions for Revised Section 1056 Geosynthetics)

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 proposed ditch according to the roadway plans and cross sections with ditch surface free of obstructions, debris, and pockets of low-density material. Construct earthen dam and install the primary spillway according to the Earthen Dam with Skimmer 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*. Accumulated silt behind the earthen dam and baffles shall be removed regularly 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. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. 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 impounded in the ditch. 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 ditch. 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 ditch according to the Earthen Dam with Skimmer 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.

Measurement and Payment

The construction of the earthen dam will be paid for as *Borrow Excavation* as provided in Section 230 of the *Standard Specifications* or included in the lump sum price for grading.

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 ditch 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.

Stone for Erosion Control, Class ___ will be measured and paid for in accordance with Article 1610-4 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

STORMWATER BASIN EROSION CONTROL:**Description**

Provide a skimmer to remove sediment from construction site runoff in permanent stormwater basins at locations shown in the erosion control plans. Work includes constructing basin, installation of coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, stabilizing side slopes of basin with matting and seed, disposing of excess materials, removing coir fiber baffles, and skimmer device.

Materials

Item	Section
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
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.

Construction Methods

Construct permanent stormwater basin according to the plans with basin surface free of obstructions, debris, and pockets of low-density material. 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 the coupling connection provided with the skimmer 1 ft. from the bottom of the basin and attach to permanent stormwater drainage structure. Attach the 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. 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 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.

All bare side slope sections of the stormwater basin shall be seeded with a permanent seed mix as directed and in accordance with Articles 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.

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.

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*.

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 WATTLES WITH POLYACRYLAMIDE (PAM):**Description**

Coir Fiber Wattles are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting. Coir Fiber Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Coir Fiber 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 coir fiber wattles, matting installation, PAM application, and removing wattles.

Materials

Coir Fiber Wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12 in.
Minimum Density	3.5 lb/ft ³ +/- 10%
Net Material	Coir Fiber
Net Openings	2 in. x 2 in.
Net Strength	90 lbs.
Minimum Weight	2.6 lbs./ft. +/- 10%

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

Coir Fiber 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 coir fiber 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 coir fiber 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 coir fiber 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

Coir Fiber 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 *Coir Fiber 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 coir fiber 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
Coir Fiber Wattle	Linear Foot

SILT FENCE COIR FIBER WATTLE BREAK:
 (8-21-12) 1605,1630

Description

Silt fence coir fiber wattle breaks are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting and used in conjunction with temporary silt fence at the toe of fills to intercept runoff. Silt fence coir fiber wattle breaks 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, maintenance and removing Silt fence coir fiber wattle breaks.

Materials

Coir fiber wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12"
Minimum Length	10 ft
Minimum Density	3.5 lb/cf ± 10%
Net Material	Coir Fiber
Net Openings	2" x 2"
Net Strength	90 lb.
Minimum Weight	2.6 lb/ft ± 10%

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

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 a trench the entire length of each wattle with a depth of 1" to 2" for the wattle to be placed. Secure silt fence coir fiber wattle breaks to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the silt fence coir fiber wattle break according to the detail

provided in the plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Install temporary silt fence in accordance with Section 1605 of the *2012 Standard Specifications* and overlap each downslope side of silt fence wattle break by 6".

Maintain the silt fence coir fiber wattle breaks until the project is accepted or until the silt fence coir fiber wattle breaks are removed, and remove and dispose of silt accumulations at the silt fence coir fiber wattle breaks when so directed in accordance with Section 1630 of the *2012 Standard Specifications*.

Measurement and Payment

Coir Fiber Wattle will be measured and paid as the actual number of linear feet of wattles installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the silt fence coir fiber wattle break.

Payment will be made under:

Pay Item Coir Fiber Wattle	Pay Unit Linear Foot
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COIR FIBER WATTLE BARRIER:
(5-20-13) 1630

Description

Coir fiber wattle barriers are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber or synthetic netting and used at the toe of fills or on slopes to intercept runoff. Coir fiber wattle barriers 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, maintenance and removing coir fiber wattle barriers.

Materials

Coir fiber wattle shall meet the following specifications:

Inner Material	100% Coir (Coconut) Fibers
Minimum Diameter	18"
Minimum Length	10 ft.
Minimum Density	5 lb./c.f. ± 10%
Net Material	Coir (Coconut) or Synthetic
Net Openings	2" x 2"
Net Strength	90 lb.
Minimum Weight	10 lb./ft. ± 10%

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

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

Align coir fiber wattle barriers in an overlapping and alternating pattern. Excavate a trench the entire length of each wattle with a depth of 2" to 3" for the wattle to be placed. Secure coir fiber wattle barriers to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the coir fiber wattle barriers according to the detail provided in the plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

For coir fiber wattle barriers used to reduce runoff velocity for large slopes, use a maximum spacing of 25 ft. for the barrier measured along the slope.

Maintain the coir fiber wattle barriers until the project is accepted or until the coir fiber wattle barriers are removed, and remove and dispose of silt accumulations at the coir fiber wattle barriers when so directed in accordance with Section 1630 of the *2012 Standard Specifications*.

Measurement and Payment

Coir Fiber Wattle Barrier will be measured and paid as the actual number of linear feet of coir fiber wattle barrier installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the coir fiber wattle barrier.

Payment will be made under:

Pay Item	Pay Unit
Coir Fiber Wattle Barrier	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

TEMPORARY PIPE FOR CULVERT CONSTRUCTION:

Description

This work consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction.

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passageway for the stream through the work-site. The minimum size requirements will be as stated on the erosion control plans.

Measurement and Payment

___" *Temporary Pipe* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Payment will be made under:

Pay Item	Pay Unit
___" Temporary Pipe	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

CONCRETE WASHOUT STRUCTURE:

(12-01-15)

Description

Concrete washout structures are enclosures above or below grade to contain concrete waste water and associated concrete mix from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids, so that this material does not migrate to surface waters or into the ground water. These enclosures are not intended for concrete waste not associated with wash out operations.

The concrete washout structure may include constructed devices above or below ground and or commercially available devices designed specifically to capture concrete waste water.

Materials

Item	Section
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall meet the following minimum physical properties for low permeability; it shall consist of a polypropylene or polyethylene 10 mil thick geomembrane. If the minimum setback dimensions can be achieved the liner is not required. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

Construction Methods

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed.

Install temporary silt fence around the perimeter of the enclosure in accordance with the details and as directed if structure is not located in an area where existing erosion and sedimentation control devices are capable to containing any loss of sediment.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/details/

Alternate details for accommodating concrete washout may be submitted for review and approval.

The alternate details shall include the method used to retain and dispose of the concrete waste water within the project limits and in accordance with the minimum setback requirements. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. Grade the earth material to match the existing contours and permanently seed and mulch area.

Measurement and Payment

Concrete Washout Structure will be paid for per each enclosure installed in accordance with the details. If alternate details are approved then those details will also be paid for per each approved and installed device.

Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

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

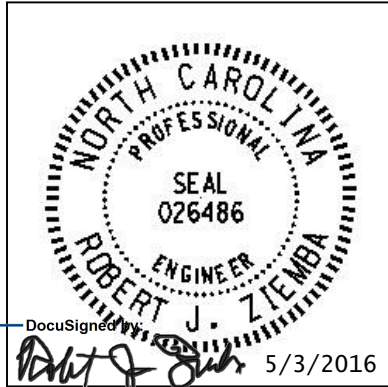
Payment will be made under:

Pay Item	Pay Unit
Concrete Washout Structure	Each

U-2524D

Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 12.5)

Prepared By: iou
3-May-16



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UNLESS ALL SIGNATURES COMPLETED

Contents

- 1. 2012 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES.....3
 - 1.1. POLYMER CONCRETE (PC) JUNCTION BOXES (1091-5(B)).....3
 - 1.2. SUBMITTAL REQUIREMENTS (1098-1(B))3
 - 1.3. JUNCTION BOXES (1098-5).....3
 - 1.4. CONTROLLERS WITH CABINETS – MATERIAL (1751-2)3
 - 1.5. PEDESTALS (1098-14)3
 - 1.6. PEDESTALS (1743)5
- 2. SIGNAL HEADS.....6
 - 2.1. MATERIALS6
 - A. General:.....6
 - B. Vehicle Signal Heads:.....8
 - C. Pedestrian Signal Heads:10
 - D. Signal Cable:11
- 3. MICROWAVE VEHICLE DETECTOR – SINGLE ZONE12
 - 3.1. DESCRIPTION12
 - 3.2. MATERIALS12
 - 3.3. CONSTRUCTION METHODS12
 - 3.4. MEASUREMENT AND PAYMENT12
- 4. TRAFFIC SIGNAL SUPPORTS.....13
 - 4.1. METAL TRAFFIC SIGNAL SUPPORTS – ALL POLES13
 - A. General:.....13
 - B. Materials:15
 - C. Construction Methods:16
 - 4.2. METAL POLE UPRIGHTS (VERTICAL MEMBERS)16
 - A. Materials:16
 - B. Construction Methods:18
 - 4.3. DRILLED PIER FOUNDATIONS FOR METAL TRAFFIC SIGNAL POLES.....18
 - A. Description:19
 - B. Soil Test and Foundation Determination:19
 - C. Drilled Pier Construction:21
 - 4.4. CUSTOM DESIGN OF TRAFFIC SIGNAL SUPPORTS21
 - A. General:.....21
 - B. Metal Poles:.....22
 - 4.5. METAL SIGNAL POLE REMOVALS24
 - A. Description:24
 - B. Construction Methods:25
 - 4.6. POLE NUMBERING SYSTEM25
 - 4.7. MEASUREMENT AND PAYMENT25

5. CONTROLLERS WITH CABINETS26

5.1. MATERIALS – TYPE 2070L CONTROLLERS26

5.2. MATERIALS – GENERAL CABINETS26

5.3. MATERIALS – TYPE 170E CABINETS27

 A. *Type 170 E Cabinets General:*.....27

 B. *Type 170 E Cabinet Electrical Requirements:*.....28

 C. *Type 170 E Cabinet Physical Requirements:*.....34

 D. *Model 2018 Enhanced Conflict Monitor:*35

5.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS45

5.5. MATERIALS – TYPE 2070E CONTROLLERS45

1. 2012 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2012 Standard Specifications are revised as follows:

1.1. Polymer Concrete (PC) Junction Boxes (1091-5(B))

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.”

1.2. Submittal Requirements (1098-1(B))

Page 10-208, replace paragraph on line 34 with the following:

Submit for approval catalog cuts and/or shop drawings for materials proposed for use on the project. Allow 40 days for review of each submittal. Do not fabricate or order material until receipt of Engineer’s approval.

Submit 4 copies of each catalog cut and/or drawing and show for each component the material description, brand name, stock-number, size, rating, manufacturing specification and the intended use (identified by labeling all components with the corresponding contract line item number). Present the submittals neatly arranged in the same order as the contract bid items. Electronic submittals of catalog cuts and drawings may be accepted in lieu of hard copies.

One hard copy and an electronic (PDF) copy of reviewed submittals will be returned to the Engineer from the ITS and Signals Unit.

1.3. Junction Boxes (1098-5)

Page 10-212, sub-Section 1098-5(C) Oversized Junction Boxes

Revise sentence to read, “Provide oversized junction boxes and covers with minimum inside dimensions of 28"(l) x 15"(w) x 22"(h).”

1.4. Controllers with Cabinets – Material (1751-2)

Page 17-37, Section 1751-2 Material

Add the following paragraph:

When the plans or specifications require a Type 2070L controller, contractor may provide a Type 2070E controller. Unless otherwise allowed by the Engineer, provide controllers of only one type.

1.5. Pedestals (1098-14)

Page 10-218, sub-Section 1098-14(A) Pedestal Shaft

Replace “6063-T6” with “6061-T6” in the second paragraph on line 24.

Page 10-219, sub-Section 1098-14(B) Transformer Bases

Revise paragraph 2, lines 19 to 21 to read: “Provide a minimum access opening for all transformer bases of 8”x 8” with an access door that is attached with a 1/4” x 3/4” long stainless steel vandal proof screw to secure access door.”

Add the following sentence after the second sentence of paragraph 3 on line 24: “Include a set screw prep and 3/8”-16 x 1” stainless steel set screw to secure the pedestal post to the pedestal base.”

Page 10-219-220, sub-Section 1098-14 (C) Anchor Bolts

Replace entire paragraph on page 219, line 45-49 and page 220, line 1-5 with the following paragraphs:

For each pedestal, provide four (4) anchor bolts meeting the requirements of ASTM F1554, Grade 55, of the size and length specified in *Roadway Standard Drawings* No. 1743. Provide anchor bolts with coarse threads meeting the bolt/thread criteria specified by AISC. Provide threads for a minimum length of 4" on each end of the bolt. All thread anchor rods may be used. Ensure anchor bolts are hot-dipped galvanized in accordance with ASTM A153.

For each anchor bolt:

- Provide three (3) heavy hex nuts; one at the top, and 2 at the bottom (embedded end) of the anchor bolt. Provide hex nuts with coarse threads that match the anchor bolt thread requirements above. Provide hex nuts that meet the requirements of ASTM A563 Grade DH, ASTM A194, Grade 2H or equivalent. Galvanize all heavy hex nuts in accordance with ASTM A153.
- Provide one (1) standard size washer that meets the requirements of ASTM F436 for use between the two heavy hex nuts on the embedded end of the anchor bolt. Galvanize in accordance with ASTM A153.
- Provide one (1) extra thick, oversized washer for use over the slotted opening of the pedestal base. Fabricate washer to meet the chemical, physical, and heat treating requirements of ASTM F436. Fabricate the washer to the diameter and thickness needed. Galvanize fabricated washer in accordance with ASTM A153. Heat treat to the same requirements as F436 (i.e. 26 to 45 HRC).

For a $\frac{3}{4}$ " diameter anchor bolt mounted in a $1\frac{1}{2}$ " slotted opening, the dimensional requirements for an extra thick, oversized washer are as follows:

- The minimum Outside Diameter (OD) required is $2\frac{3}{4}$ ".
- The hole Inside Diameter (ID) = Nominal Bolt Diameter + $\frac{1}{16}$ " = 0.812".
- The minimum washer thickness required is $\frac{3}{8}$ ".

If anchor bolts less than $\frac{3}{4}$ " in diameter are proposed for use to anchor pedestal bases, provide a washer calculation to ensure the washer thickness is adequate. To account for any pedestal manufacturing differences, verify the actual slotted opening width of the pedestal base anchoring points, and include it in the calculation. Anchor bolts that are less than $\frac{1}{2}$ " in diameter may not be used as they are not structurally adequate to support the pedestal and may inhibit the performance of the breakaway base.

The fabrication process for thick washers makes the washer slightly tapered (i.e. the top OD and the bottom OD are not the same). Install thick washers with the larger diameter face down against the pedestal base casting.

Do not use standard washers over the slotted opening of the pedestal base. Do not substitute or stack thin washers to achieve the required thickness specified or required.

In addition to the submittal requirements of Section 1098-1(B), provide Mill Certifications, Galvanization Certifications, and Heat Treating Certifications for all anchor bolts, fabricated washers, and structural hardware.

1.6. Pedestals (1743)

Page 17-34, Add the following new sub-Section:

1743-4 - Screw-In Helical Foundation Anchor Assembly

Description:

Furnish and install screw-in helical foundation as an alternative to the standard reinforced concrete foundation specified in Article 1743 "Pedestals" of the Standard Specifications, for supporting Type I and Type II Pedestals. Do not use for Type III Pedestals.

Materials for Type I – Pedestrian Pushbutton Post:

Fabricate pipe assembly consisting of a 4" diameter x 56" long pipe, single helical blade and square fixed attachment plate. Furnish pipe in accordance with ASTM A-53 ERW Grade B and include a 2" x 3" cable opening in the pipe at 18" below the attachment plate. Furnish steel attachment plate and helical blade in accordance with ASTM A-36. Include (4) slotted mounting holes in the attachment plate to fit bolt circles ranging from 7-3/4" to 14-3/4" diameter. Furnish additional 3/4" keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish (4) 3/4"-10NC x 3" square head anchor bolts to meet the requirements of ASTM 325. Provide (4) 3/4" plain flat galvanized washers, (4) 3/16" thick galvanized plate washers and (4) 3/4" galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

Construction Methods for Type I – Pedestrian Pushbutton Post:

Advance or mechanically screw foundation into soil up until top of attachment plate is level with finished grade. Slide the anchor bolt heads through the keyhole openings and under the attachment plate with threads pointing up. Bolt the pedestal base to the foundation attachment plate. For further construction methods, see manufacturer's installation drawings.

Materials for Type II – Normal-Duty Pedestal:

Fabricate pipe assembly consisting of a 6" diameter x 60" long, single helical blade, 1-1/4" diameter stinger rod and square fixed attachment plate. Furnish pipe in accordance with ASTM A-53 ERW Grade B using schedule 40 wall thickness and include a 2" x 3" cable opening in the pipe at 18" below the attachment plate. Furnish steel attachment plate, helical blade and stinger rod in accordance with ASTM A-36. Include (4) slotted mounting holes in the attachment plate to fit bolt circles ranging from 10" to 15" diameter. Furnish additional 1-1/4" keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish (4) 1"-8NC x 4" galvanized Grade 5 square head anchor bolts. Provide (4) 1" plain flat galvanized washers and (4) 1" galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

Construction Methods for Type II – Normal-Duty Pedestal:

Advance or mechanically screw foundation into soil up until top of attachment plate is level with finished grade. Slide the anchor bolt heads through the keyhole openings and under the attachment plate with threads pointing up. Bolt the pedestal base to the foundation attachment plate.

For further construction methods, see manufacturer's installation drawings.

Page 17-34, revise Measurement and Payment to sub-Section 1743-5.

Revise the last paragraph to read:

No measurement will be made for pedestal foundations, pedestal screw-in helical foundations, grounding systems and any peripheral pedestal mounting hardware as these are incidental to furnishing and installing pedestals.

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, wire outlet bodies, wire entrance fitting brackets and end caps when supplied as components of messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538) a minimum of 2.5 to 3.5 mils thick. Do not apply paint to the latching hardware, rigid vehicle signal head mounting brackets for mast-arm attachments, messenger cable hanger components or balance adjuster components.

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, “Enamel Heat Resisting, Instrument Black.”

Where required, provide polycarbonate signal heads and visors that comply with the provisions pertaining to the aluminum signal heads listed on the QPL with the following exceptions:

Fabricate signal head housings, end caps, and visors from virgin polycarbonate material. Provide UV stabilized polycarbonate plastic with a minimum thickness of 0.1 ± 0.01 inches that is highway yellow (Federal Standard 595C, Color Chip 13538). Ensure the color is incorporated into the plastic material before molding the signal head housings and end caps. Ensure the plastic formulation provides the following physical properties in the assembly (tests may be performed on separately molded specimens):

Test	Required	Method
Specific Gravity	1.17 minimum	ASTM D 792
Flammability	Self-extinguishing	ASTM D 635
Tensile Strength, yield, PSI	8500 minimum	ASTM D 638
Izod impact strength, ft-lb/in [notched, 1/8 inch]	12 minimum	ASTM D 256

For pole mounting, provide side of pole mounting assemblies with framework and all other hardware necessary to make complete, watertight connections of the signal heads to the poles and pedestals. Fabricate the mounting assemblies and frames from aluminum with all necessary hardware, screws, washers, etc. to be stainless steel. Provide mounting fittings that match the positive locking device on the signal head with the serrations integrally cast into the brackets. Provide upper and lower pole plates that have a 1 ¼-inch vertical conduit entrance hubs with the

hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions, and can accommodate a minimum of ten Number 14 AWG conductors.

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.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List 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
 - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

(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 new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. 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 Qualified Products List (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 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 messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

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.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal 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 2012 or most recent Qualified Products List. 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.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ 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.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal 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 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red arrow	12	9
12-inch green arrow	11	11

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for “Pedestrian Traffic Control Signal Indications” and the following sections of the ITE standard for “Vehicle Traffic Control Signal Heads” in effect on the date of advertisement:

- Section 3.00 - “Physical and Mechanical Requirements”
- Section 4.01 - “Housing, Door, and Visor: General”
- Section 4.04 - “Housing, Door, and Visor: Materials and Fabrication”
- Section 7.00 - “Exterior Finish”

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

Provide standard R10-3 signs with mounting hardware that comply with the MUTCD in effect on the date of advertisement. Provide R10-3E signs for countdown pedestrian heads and R10-3B for non-countdown pedestrian heads.

Design the LED pedestrian traffic signal modules (hereafter referred to as modules) for installation into standard pedestrian traffic signal sections that do not contain the incandescent signal section reflector, lens, eggcrate visor, gasket, or socket. Provide modules that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp. Use LEDs that are of the latest aluminum indium gallium phosphorus (AlInGaP) technology for the Portland Orange hand and countdown displays. Use LEDs that are of the latest indium gallium nitride (InGaN) technology for the Lunar White walking man displays. 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.

Design all modules to operate using a standard 3 - wire field installation. Provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard pedestrian signal housing. 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.

Provide modules in the following configuration: 16-inch displays which have the solid hand/walking man overlay on the left and the countdown on the right. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal 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 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9
Countdown Indication	16	13

Note: Use a wattmeter having an accuracy of $\pm 1\%$ 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.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

D. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

3. MICROWAVE VEHICLE DETECTOR – SINGLE ZONE

3.1. DESCRIPTION

Furnish and install a microwave vehicle detection unit and manufacturer recommended cables and hardware in accordance with the plans and specifications.

3.2. MATERIALS

Furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Provide a detector for either side-fire or forward-fire configuration. Ensure the detector will detect vehicle in sunny, cloudy, rainy, snowy, and foggy weather conditions with self-tuning to auto-adjust in changing environmental conditions. Ensure the detector can operate from the voltage supplied by a NEMA and Type-170 traffic signal cabinet. Ensure the detector can provide detection calls to the traffic signal controller within a NEMA and Type-170 cabinet. Ensure the detector will put out a constant call in the event of a component failure or loss of power. Ensure the detector has an operating temperature range of -20 to 150 degrees F. Ensure a water resistant housing for the detector.

For advance pulse detection, ensure the detector senses vehicles in motion at a range of 200 feet with an operating frequency of 10.525 GHz +/- 25MHz.

For stop bar presence detection, ensure the detector outputs a constant call while a vehicle is in the detection zone. Ensure the presence detection unit can cover a detection zone as shown on the plans and has an effective range of at least 75 feet from the detector unit to the aim point on the road surface.

For units without an integrated card rack interface, provide Form C output relay contacts rated a minimum of 3A, 24VDC.

If a laptop is used to adjust detector settings, ensure that software is licensed for use by the Department and by any other agency responsible for maintaining or operating the microwave detection system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

3.3. CONSTRUCTION METHODS

Install the microwave vehicle detector in accordance with the manufacturer’s recommendations.

Monitor and maintain the detector unit during construction to ensure microwave vehicle detector is functioning properly and aimed for the detection zone shown in the plans. Refer to Subarticle 1700-3 (D) Maintenance and Repair of Materials of the *Standard Specifications* for failure to maintain the microwave detection system.

3.4. MEASUREMENT AND PAYMENT

Actual number of microwave vehicle detector units furnished, installed, and accepted.

No measurement will be made of cables or hardware, as these will be considered incidental to furnishing and installing microwave vehicle detectors.

Payment will be made under:

Microwave Vehicle Detector – Single Zone..... Each

4. TRAFFIC SIGNAL SUPPORTS

4.1. METAL TRAFFIC SIGNAL SUPPORTS – ALL POLES

A. General:

Furnish and install metal strain poles and metal poles with mast arms, grounding systems, and all necessary hardware. The work covered by this special provision includes requirements for the design, fabrication, and installation of both standard and custom/site specifically designed metal traffic signal supports and associated foundations.

Provide metal traffic signal 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 shown on signal plans are estimated from available data for bid purposes. Prior to furnishing metal signal poles, use field measurements and adjusted cross-sections to determine whether pole heights are sufficient to obtain required clearances. If pole heights are not sufficient, the Contractor should immediately notify the Engineer of the required revised pole heights.

Ensure that metal signal 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 grommited, and oversized to fit around the 2” diameter grommited 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. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the 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 retapped as necessary after galvanizing. Perform repair of damaged galvanizing that complies with the following:

Repair of GalvanizingArticle 1076-7

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 *2012 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as 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 detail drawing only, 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, signal 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 Signal Plan/Loading Diagram	1	1	All structure design information needs to reflect the latest approved signal plans
Custom Pole Shop Drawings	4 sets	1 set	Show NCDOT inventory number(s), contractor's name and relevant revision number in the title block. All drawings must have a unique <u>drawing</u> number for each project and identified for multiple pages.
Standard Pole Shop Drawings (from the QPL)	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT inventory number(s), contractor's name and relevant revision number in the title block. All drawings must have a <u>unique drawing</u> number for each project and identified for multiple pages.
Structure Calculations	1 set	1 set	Not required for Standard QPL Poles
Standard Pole Foundation Drawings	1 set	1 set	Submit drawings on 11" x 17" format media. Submit a completed Standard Foundation Selection form for each pole using foundation table on Metal Pole Drawing M-8.
Custom Foundation Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT inventory number(s), contractor's name and relevant revision number in the title block. All drawings must have a <u>unique drawing</u> number for each project and identified for multiple pages. If QPL Poles are used, include the corresponding QPL pole shop drawings with this submittal.
Foundation Calculations	1	1	Submit copies of LPILE input, output and pile tip deflection graph per Section 11.4 of this specification for each foundation. 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 drawings 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. Boring reports should include the following: Engineer's summary, boring location maps, soil classification per AASHTO Classification System, hammer efficiency, and Metal Pole Standard Foundation Selection Form. Incomplete submittals will be returned without review. The Reviewer has the right to request additional analysis and copies of the calculations to expedite the approval process.

B. Materials:

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 continuously weld 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. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 6th Edition AASHTO. 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 and mast arm connecting plates from plate steel meeting, as a minimum, the requirements of ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr50, 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.

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 2 washers and 2 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 4 heavy hex nuts and 4 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.

C. Construction Methods:

Erect signal support poles 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.

For further construction methods, see construction methods for Metal Strain Pole.

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.

4.2. METAL POLE UPRIGHTS (VERTICAL MEMBERS)

A. Materials:

- Provide tapered tubular shafts and fabricated of steel conforming to ASTM A-595 Grade A or an approved equivalent.
- Hot-dip galvanize poles 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 Specification* except that no field welding on any part of the pole will be permitted.
- Have Shafts with no circumferential welds except at the lower end joining the shaft to the base.

- Have anchor bases for steel poles fabricated from plate steel meeting as a minimum the requirements of ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent.

Provide a grounding lug(s) in the approximate vicinity of the messenger cable clamp for bonding and grounding messenger cable. Lugs must accept #4 or #6 AWG wire to bond messenger cables to the pole in order to provide an effective ground fault circuit path. Refer to Metal Pole Standard Drawing Sheet M6 for construction details.

Have poles permanently stamped above the hand holes with the identification tag details as shown on Metal Pole Standard Drawing Sheet M2.

Provide liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or approved equivalent to isolate conductors feeding luminaires.

Fabricate poles from a single piece of steel or aluminum 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.

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.

Install grounding lugs that will accept #4 or #6 AWG wire to electrically bond messenger cables to the pole. Refer to Metal Pole Standard Drawing Sheet M6 for construction details.

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.

When required by the plans, furnish couplings 42 inches above the bottom of the base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1-1/2 inch internally threaded half-couplings that comply with the NEC and that are mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required galvanizing. Provide a threaded plug in each mounting point. Ensure that the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed hole to accommodate a standard wrench.

1. STRAIN POLE SHAFTS

Provide 2 messenger cable (span wire) clamps and associated hardware for attachment of messenger cable. Ensure that diameter of the clamp is appropriate to its location on the pole and is appropriately designed to be adjustable from 1'-6" below the top, down to 6'-6" below the top of the pole. Do not attach more than one support cable to a messenger cable clamp.

Provide a minimum of three (3) 2 inch (50 mm) holes equipped with an associated coupling and weatherhead on the messenger cable load side of the pole to accommodate passage of signal cables from inside the pole. Provide galvanized threaded plugs for all unused couplings at pole entrance points. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Ensure that allowable pole deflection does not exceed that allowed per 6th Edition AASHTO. Ensure maximum deflection at the top of the pole does not exceed 2.5 percent of the pole height.

B. Construction Methods:

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 1 degree 40 minutes (1°40') of vertical. Install poles with the manufacturer's recommended "rake." Use threaded leveling nuts to establish rake if required.

4.3. DRILLED PIER FOUNDATIONS FOR METAL TRAFFIC SIGNAL POLES

Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. 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.

For lateral analysis, use LPILE Plus V6.0 or later. Inputs, results and corresponding graphs are to be submitted with the design calculations.

Skin Friction is to be calculated using the α -method for cohesive soils and the β -method for cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the " α " and " β " methods can be found in *FHWA-NHI-10-016*.

Omit first 2.5ft for cohesive soils when calculating skin friction.

When hammer efficiency is not provided, assume a value of 0.70.

Design all custom foundations to carry the maximum capacity of each metal pole. For standard case strain poles only, if a custom foundation is designed, use the actual shear, axial and moment reactions from the Standard Foundation Selection Table shown on Standard Drawing No. M8.

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.

Have the contractor notify the engineer if the proposed foundation is to be installed on a slope other than 8H: 1V or flatter.

A. Description:

Furnish and install foundations for NCDOT metal poles with all necessary hardware in accordance with the plans and specifications.

Metal Pole Standards have been developed and implemented by NCDOT for use at signalized intersections in North Carolina. If the plans call for a standard pole, then a standard foundation may be selected from the plans. However, the Contractor is not required to use a standard foundation. If the Contractor chooses to design a non-standard site-specific foundation for a standard pole or if the plans call for a non-standard site-specific pole, design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standard Drawings and Section B7 (Non-Standard Foundation Design) below. If non-standard site specific foundations are designed for standard QPL approved strain poles, the foundation designer must use the design moment specified by load case on Metal Pole Standard Drawing Sheet M8. Failure to conform to this requirement will be grounds for rejection of the design.

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

B. Soil Test and Foundation Determination:

1. General:

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

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

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.

2. Soil Test:

Perform a soil test at each proposed metal pole location. Complete all required fill placement and excavation at each signal 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.
- A total of 50 blows have been applied with < 3-in. penetration.

Describe each intersection as the “Intersection of (*Route or SR #*), (*Street Name*) and (*Route or SR #*), (*Street Name*), _____ County, Signal Inventory No. _____”. Label borings with “B- *N, S, E, W, NE, NW, SE or SW*” corresponding to the quadrant location within the intersection. 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 (hand written or typed) boring log signed and sealed 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, depth of water table and a general description of the soil types encountered using the AASHTO Classification System.

3. Standard Foundation Determination:

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

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

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

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

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

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

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

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 2 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 2 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.

If standard NCDOT strain poles are shown on the plans and the Contractor chooses to use standard foundations, determine a drilled pier length, “L,” for each signal pole from the Standard Foundations Chart (sheet M 8) based on the Design N-value and the predominant soil type. For each standard pole location, submit a completed “Metal Pole Standard Foundation Selection Form” signed by the Contractor’s representative. Signature on form is for verification purposes only. Include the Design N-value calculation and resulting drilled pier length, “L,” on each form.

If non-standard site-specific poles are shown on the plans, submit completed boring logs collected in accordance with Section 2 (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, the Standard Foundations Chart shown on the plans may not be used and a non-standard foundation may be required. In such case, contact the Engineer.

- The Design N-value is less than 4.
- The drilled pier length, “L”, determined from the Standard Foundations Chart, is greater than the depth of the corresponding boring.

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

Foundation designs are based on level ground around the traffic signal 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.

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

<http://www.ncdot.gov/doh/preconstruct/highway/geotech/formdet/misc/MetalPole.pdf>

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (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-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use the computer software gINT V8i 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. Contact the Engineer for pole loading diagrams for standard poles to be used for non-standard foundation designs. Submit any non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval before construction.

C. Drilled Pier Construction:

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

4.4. CUSTOM DESIGN OF TRAFFIC SIGNAL SUPPORTS

A. General:

Design traffic signal supports with foundations consisting of metal strain poles.

The lengths of the metal signal 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 revised 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 NCDOT Inventory number followed by the pole number shown on the traffic signal or ITS (non-signalized locations) plan.

Design all traffic signal support structures using the following 6th Edition AASHTO specifications:

- Design for a 50 year service life as recommended by Table 3.8.3-2.
- Use the wind pressure map developed from 3-second gust speeds, as provided in Article 3.8.
- Ensure signal support structures include natural wind gust loading and truck-induced gust loading in the fatigue design, as provided for in Articles 11.7.1.2 and 11.7.1.3, 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 signal 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 and mast arms.

Unless otherwise specified by special loading criteria, the computed surface area for ice load on signal heads is:

- 3-section, 12-inch, Surface area: 26.0 ft² (17.0 ft² without back plate)
- 4-section, 12-inch, Surface area: 32.0 ft² (21.0 ft² without back plate)
- 5-section, 12-inch, Surface area: 42.0 ft² (29.0 ft² without back plate)

The ice loading for signal heads defined above includes the additional surface area that back plates will induce. Special loading criteria may be specified in instances where back plates will not be installed on signal heads. Refer to the Loading Schedule on each Metal Pole Loading Diagram for revised signal head surface areas. The pole designer should revise ice loads accordingly in this instance. Careful examination of the plans when this is specified is important as this may impact sizing of the metal support structure and foundation design which could affect proposed bid quotes. All maximum stress ratios of 0.9 still apply.

Assume the combined minimum weight of a messenger cable bundle (including messenger cable, signal cable and detector lead-in cables) is 1.3 lbs/ft. Assume the combined minimum diameter of this cable bundle is 1.3 inches.

Ensure that designs provide a removable pole cap with stainless steel attachment screws for each pole top and mast arm end.

B. Metal Poles:

Submit design drawings for approval including pre-approved QPL pole drawings. Show all the necessary details and calculations for the metal poles including the foundation and connections. Include NCDOT 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 as a result 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 and arms. 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, provide designs with provisions for pole plates and associated gussets and fittings for mast arm attachment. As part of each mast arm attachment, provide a grommeted 2" diameter hole on the shaft side of the connection to allow passage of the signal cables from the pole to the arm.

Where ice is present, assume wind loads as shown in Figure 3.9.4.2-3 of the 6th Edition AASHTO Specification for Group III loading.

For each strain pole, provide two messenger cable clamps and associated hardware to attach the messenger support cable. Ensure that the diameter of the clamps is appropriately designed to be adjustable from 1'-6" inches below the top, down to 6'-6" below the top of the pole. Do not attach more than one messenger support cable to a messenger cable clamp.

Provide a grounding lug(s) in the approximate vicinity of the messenger cable clamp for bonding and grounding messenger cable. Lugs must accept #4 or #6 AWG wire to bond messenger cables to the pole in order to provide an effective ground fault circuit path. Refer to Metal Pole Standard Drawing Sheet M6 for construction details.

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

D₁ = 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 dual mast arm supports, or for single mast arm supports 50' or greater, use a minimum 8 bolt orientation with 2" diameter anchor bolts, and a 2" thick base plate.
- For all metal poles with mast arms, 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.

When required, design couplings on the pole for mounting pedestrian pushbuttons at a height of 42 inches above the bottom of the base. Provide mounting points consisting of 1-1/2 inch internally threaded half-couplings that comply with the NEC that are mounted within the poles. Ensure the couplings are essentially flush with the outside surfaces of the poles and are installed before any required galvanizing. Provide a threaded plug for each half coupling. Ensure that the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed hole to accommodate a standard wrench.

4.5. METAL SIGNAL POLE REMOVALS

A. Description:

Remove existing metal signal poles, and remove and dispose of existing foundations, associated anchor bolts, electrical wires and connections. The metal signal poles, if salvageable, shall be returned to the Division or the City of Greensboro (based on ownership of the existing poles) for possible future use. If the Division and/or City of Greensboro do not take possession of the poles or

they are determined to be unacceptable for future use, the Contractor shall assume ownership of the metal poles.

Metal signal poles and foundations shall be removed at the following locations:

- Lawndale Drive at Regents Park Lane (GBO-041): 2 Metal Strain Signal Poles
- Lawndale Drive at Cotswold Avenue (GBO-010): 2 Metal Strain Signal Poles and 1 CCTV Camera Metal Pole

B. Construction Methods:

1. Foundations:

Remove and promptly dispose of the metal signal pole foundations including reinforcing steel, electrical wires, and anchor bolts to a minimum depth of two feet below the finished ground elevation. At the Contractor’s option, remove the complete foundation.

2. Metal Poles:

Remove the metal signal poles and promptly transport the metal signal poles from the project. Use methods to remove the metal signal poles and attached traffic signal equipment that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no additional cost to the Department.

Transport and properly dispose of the materials.

Backfill and compact disturbed areas to match the finished ground elevation. Seed unpaved areas.

Use methods to remove the foundations that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no cost to the Department.

4.6. POLE NUMBERING SYSTEM

Attach an identification tag to each pole shaft and mast arm section as shown on Metal Pole Standard Drawing Sheet M2 “Typical Fabrication Details Common To All Metal Poles”.

4.7. MEASUREMENT AND PAYMENT

Actual number of metal strain signal poles (without regard to height or load capacity) furnished, installed and accepted.

Actual number of soil tests with SPT borings drilled furnished and accepted.

Actual volume of concrete poured in cubic yards of drilled pier foundation furnished, installed and accepted.

Actual number of metal signal pole foundations removed and disposed.

Actual number of metal signal poles removed and disposed.

No measurement will be made for foundation designs prepared with metal pole designs, as these will be considered incidental to designing signal support structures.

Payment will be made under:

Metal Strain Signal PoleEach

Soil Test	Each
Drilled Pier Foundation.....	Cubic Yard
Metal Pole Foundation Removal	Each
Metal Pole Removal.....	Each

5. CONTROLLERS WITH CABINETS

5.1. MATERIALS – TYPE 2070L CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications (TEES)* (dated August 16, 2002, plus Errata 1 dated October 27, 2003 and Errata 2 dated June 08, 2004) except as required herein.

Furnish Model 2070L controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide model 2070L controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070 1B, CPU Module, Single Board
- MODEL 2070-2A, Field I/O Module (FI/O)
 - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is “off”)
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4A, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

5.2. MATERIALS – GENERAL CABINETS

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

5.3. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40° F to +185° F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....20,000A
- Occurrences (8x20µs waveform).....10 minimum @ 20,000A
- Maximum Clamp Voltage.....395VAC
- Operating Current.....15 amps
- Response Time.....< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (6 times, 8x20µs)
 - (Differential Mode).....400A
 - (Common Mode).....1,000A
- Occurrences (8x20µs waveform).....500 min @ 200A
- Maximum Clamp Voltage
 - (Differential Mode @400A).....35V
 - (Common Mode @1,000A).....35V
- Response Time.....< 5 nanoseconds
- Maximum Capacitance.....35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20 μ s).....10,000A
- Occurrences (8x20 μ s waveform).....100 min @ 2,000A
- Maximum Clamp Voltage.....Rated for equipment protected
- Response Time.....< 1 nanosecond
- Maximum Capacitance.....1,500 pF
- Maximum Series Resistance.....15 Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20 μ s).....10,000A
- Occurrences (8x20 μ s waveform).....100 @ 2,000A
- Maximum Clamp Voltage.....30V
- Response Time.....< 1 nanosecond

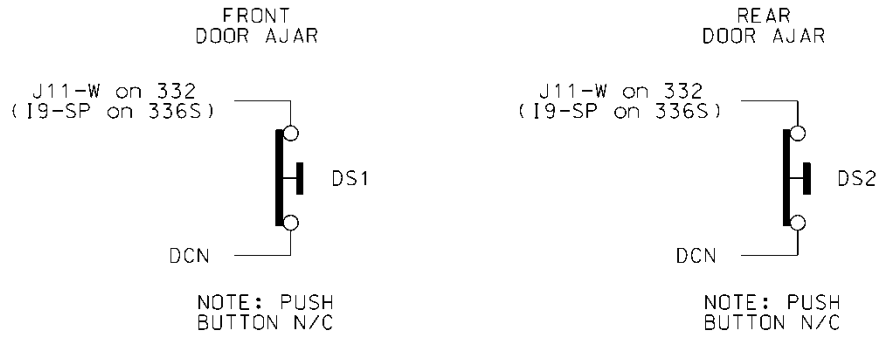
Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20 μ s).....20,000A
- Maximum Clamp Voltage.....350VAC
- Response Time.....< 200 nanoseconds
- Discharge Voltage.....<200 Volts @ 1,000A
- Insulation Resistance..... \geq 100 M Ω

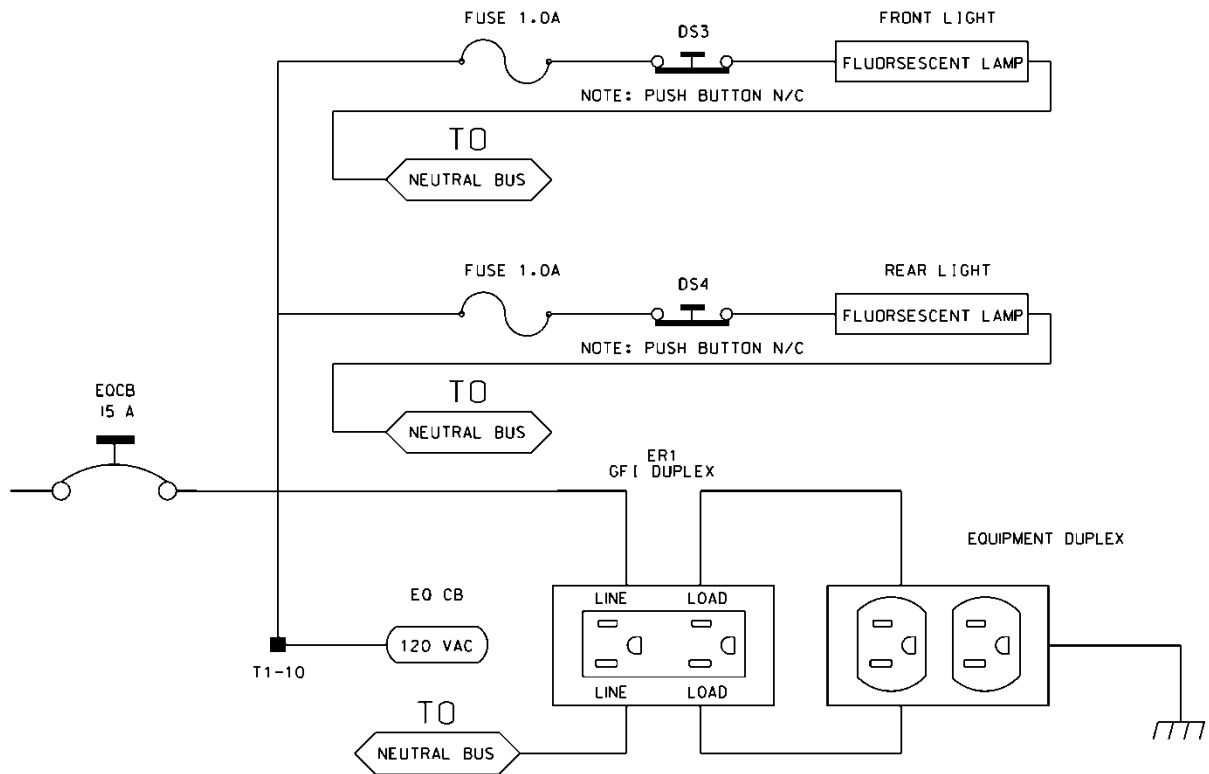
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

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

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician’s ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. Ensure that the police panel door permits access to the police panel when the main door is closed. Ensure that no rainwater can enter the cabinet even with the police panel door open. Provide a police panel door hinged on the right side as viewed from the front. Provide a police panel door lock that is keyed to a standard police/fire call box key. In addition to the requirements of LA Specification No. 54-053-08, provide the police panel with a

toggle switch connected to switch the intersection operation between normal stop-and-go operation (AUTO) and manual operation (MANUAL). Ensure that manual control can be implemented using inputs and software such that the controller provides full programmed clearance times for the yellow clearance and red clearance for each phase while under manual control.

Provide a 1/4-inch locking phone jack in the police panel for a hand control to manually control the intersection. Provide sufficient room in the police panel for storage of a hand control and cord.

For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

Connect detector test switches for cabinets as follows:

332 Cabinet	
Detector Call Switches	Terminals
Phase 1	I1-W
Phase 2	I4-W
Phase 3	I5-W
Phase 4	I8-W
Phase 5	J1-W
Phase 6	J4-W
Phase 7	J5-W
Phase 8	J8-W

Provide the PCB 28/56 connector for the conflict monitor unit (CMU) with 28 independent contacts per side, dual-sided with 0.156 inch contact centers. Provide the PCB 28/56 connector contacts with solder eyelet terminations. Ensure all connections to the PCB 28/56 connector are soldered to the solder eyelet terminations.

Ensure that all cabinets have the CMU connector wired according to the 332 cabinet connector pin assignments (include all wires for auxiliary output file connection). Wire pins 13, 16, R, and U of the CMU connector to a separate 4 pin plug, P1, as shown below. Provide a second plug, P2, which will mate with P1 and is wired to the auxiliary output file as shown below. Provide an additional plug, P3, which will mate with P1 and is wired to the pedestrian yellow circuits as shown below. When no auxiliary output file is installed in the cabinet, provide wires for the green and yellow inputs for channels 11, 12, 17, and 18, the red inputs for channels 17 and 18, and the wires

for the P2 plug. Terminate the two-foot wires with ring type lugs, insulated, and bundled for optional use.

	P1		P2		P3	
PIN	FUNCTION	CONN TO	FUNCTION	CONN TO	FUNCTION	CONN TO
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

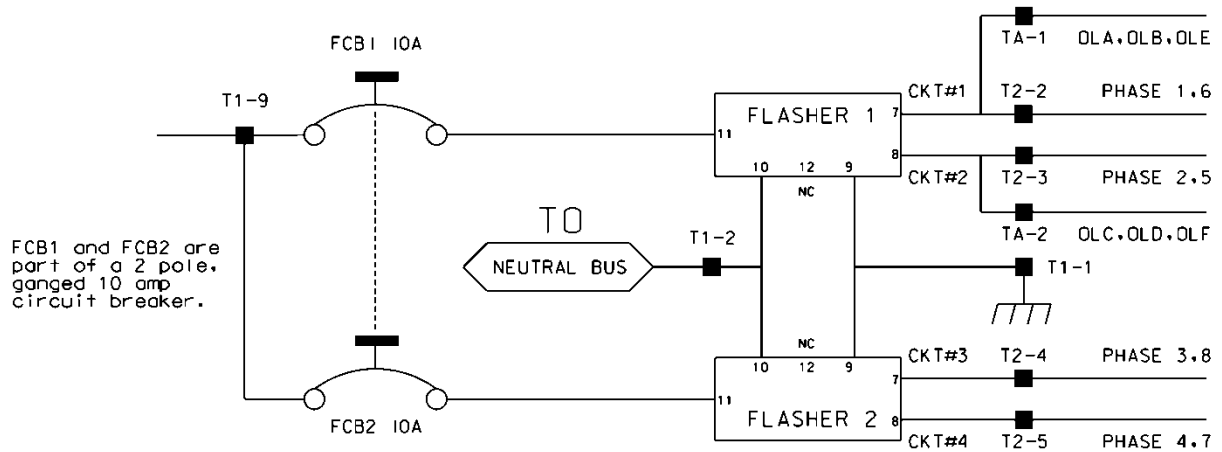
P20 Connector					
PIN	FUNCTION	CONN TO	PIN	FUNCTION	CONN TO
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE	
TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	FUNCTION
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	WATTAGE
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' *Transportation Electrical Equipment Specifications* dated March 12, 2009 with Erratum 1.

C. Type 170 E Cabinet Physical Requirements:

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Furnish unpainted, natural, aluminum cabinet shells. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125 inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to

each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070L controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070L controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)
- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150 ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150 ms (210 mode).

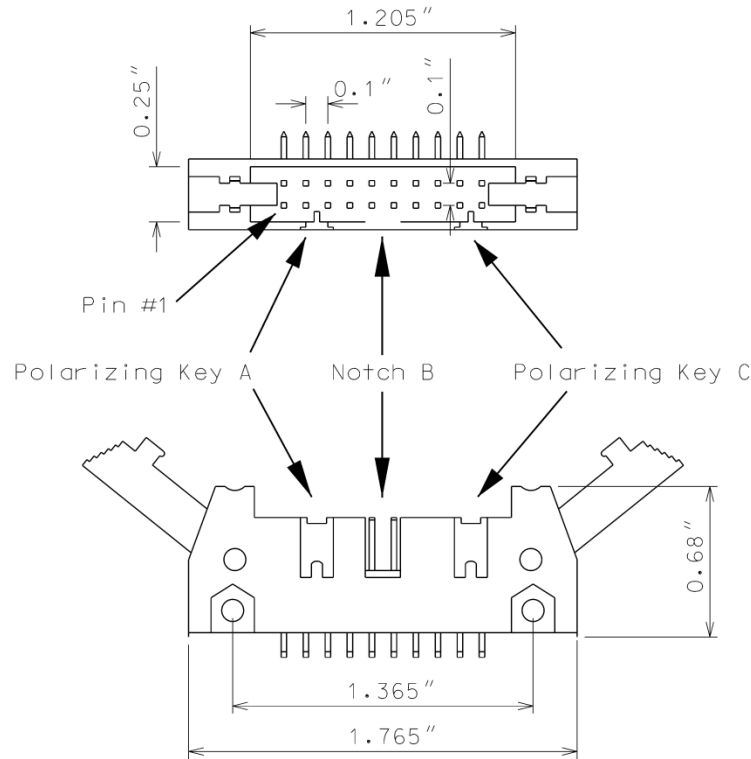
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17 ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered 'Active' at a voltage greater than 70 Vrms and 'Not Active' at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered 'Active' at a voltage less than 50 Vrms and 'Not Active' at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS' 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right angle solder tails are designed for a 0.062" thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10" and pitch is 0.10". Ensure the mating length of the connector pins is 0.24". Ensure the pins are finished with gold plating 30μ" thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function

input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less than 250 ms. A Special Function input is undefined by these specifications and may or may not be sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an “on” condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an “off” condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an “on” condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an “off” condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS’ 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no “on” voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070 controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less than 700 ms when used with a 170 controller and 1200 ms when used with a 2070 controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:
 - a) Red Enable input to monitor is active (Red Enable voltages are “on” at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and
 - b) Neither Special Function 1 nor Special Function 2 inputs are active.
 - c) Pin #EE (output relay common) is not active
2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1 -second accuracy). If a channel fails to detect an “on” signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an “on” signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing

yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.

3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as “on” at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of $2 \text{ Hz} \pm 20\%$ with a 50% duty cycle when the AC Line voltage falls below the “drop-out” level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the “restore” level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the “restore” level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 10 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of $4 \text{ Hz} \pm 20\%$ with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the “restore” level. If the watchdog input has not made 5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel pair for the following fault conditions: Conflict, Flash Rate Detection, Red Fail, Dual Indication, and Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 9 Red	Channel 10 Red	Channel 11 Red	Channel 12 Red
Yellow Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Flashing Yellow Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

FYAc mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
Flashing Yellow Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green
Green Arrow	Channel 9 Green	Channel 9 Yellow	Channel 10 Green	Channel 10 Yellow

If a FYA channel pair is enabled for FYA operation, the conflict monitor will monitor the FYA logical channel pair for the additional following conditions:

1. **Conflict:** Channel conflicts are detected based on the permissive programming jumpers on the program card. This operation remains unchanged from normal operation except for the solid Yellow arrow (FYA clearance) signal.
2. **Yellow Change Interval Conflict:** During the Yellow change interval of the Permissive Turn channel (flashing Yellow arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active. These conflicting channels shall be determined by the program card compatibility programming of the Permissive Turn channel (flashing Yellow arrow). During the Yellow change interval of the Protected Turn channel (solid Green arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active as determined by the program card compatibility programming of the Protected Turn channel (solid Green arrow).

3. **Flash Rate Detection:** The conflict monitor unit shall monitor for the absence of a valid flash rate for the Permissive turn channel (flashing Yellow arrow). If the Permissive turn channel (flashing Yellow arrow) is active for a period greater than 1600 milliseconds, ensure the conflict monitor triggers and puts the intersection into flash. If the Permissive turn channel (flashing Yellow arrow) is active for a period less than 1400 milliseconds, ensure the conflict monitor does not trigger. Ensure the conflict monitor will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input. Provide a jumper or switch that will enable and disable the Flash Rate Detection function. Ensure that when the jumper is not present or the switch is in the OFF position the Flash Rate Detection function is enabled. Ensure that when the jumper is present or the switch is in the ON position the Flash Rate Detection function is disabled.
4. **Red Monitoring or Absence of Any Indication (Red Failure):** The conflict monitor unit shall detect a red failure if there is an absence of voltage on all four of the inputs of a FYA channel pair (RA, YA, FYA, GA).
5. **Dual Indications on the Same Channel:** The conflict monitor unit shall detect a dual indication if two or more inputs of a FYA channel pair (RA, YA, FYA, GA) are “on” at the same time.
6. **Short/Missing Yellow Indication Fault (Clearance Error):** The conflict monitor unit shall monitor the solid Yellow arrow for a clearance fault when terminating both the Protected Turn channel (solid Green arrow) interval and the Permissive Turn channel (flashing Yellow arrow) interval.

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

For conflict monitors used within an Ethernet communications system, provide a conflict monitor with an Ethernet 10/100 Mbps, RJ-45 port for data communication access to the monitor by a local notebook computer and remotely via a workstation or notebook computer device connected to the signal system local area network. The Ethernet port shall be electrically isolated from the conflict monitor’s electronics and shall provide a minimum of 1500 Vrms isolation. Integrate monitor with Ethernet network in cabinet. Provide software to retrieve the time and date from a network server in order to synchronize the on-board times between the conflict monitor and the controller. Furnish and install the following Windows based, graphic user interface software on workstations and notebook computers where the signal system client software is installed: 1) software to view and retrieve all event log information, 2) software that will search and display a list of conflict monitor IP addresses and IDs on the network, and 3) software to change the conflict monitor’s network parameters such as IP address and subnet mask.

For non-Ethernet connected monitors, provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070 controller or to a Department-furnished laptop computer.

Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070). Furnish and connect a serial cable from the conflict monitor's DB-9 connector to Comm Port 1 of the 2070 controller. Ensure conflict monitor communicates with the controller. Provide a Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	Function	I/O
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

MONITOR BOARD EDGE CONNECTOR

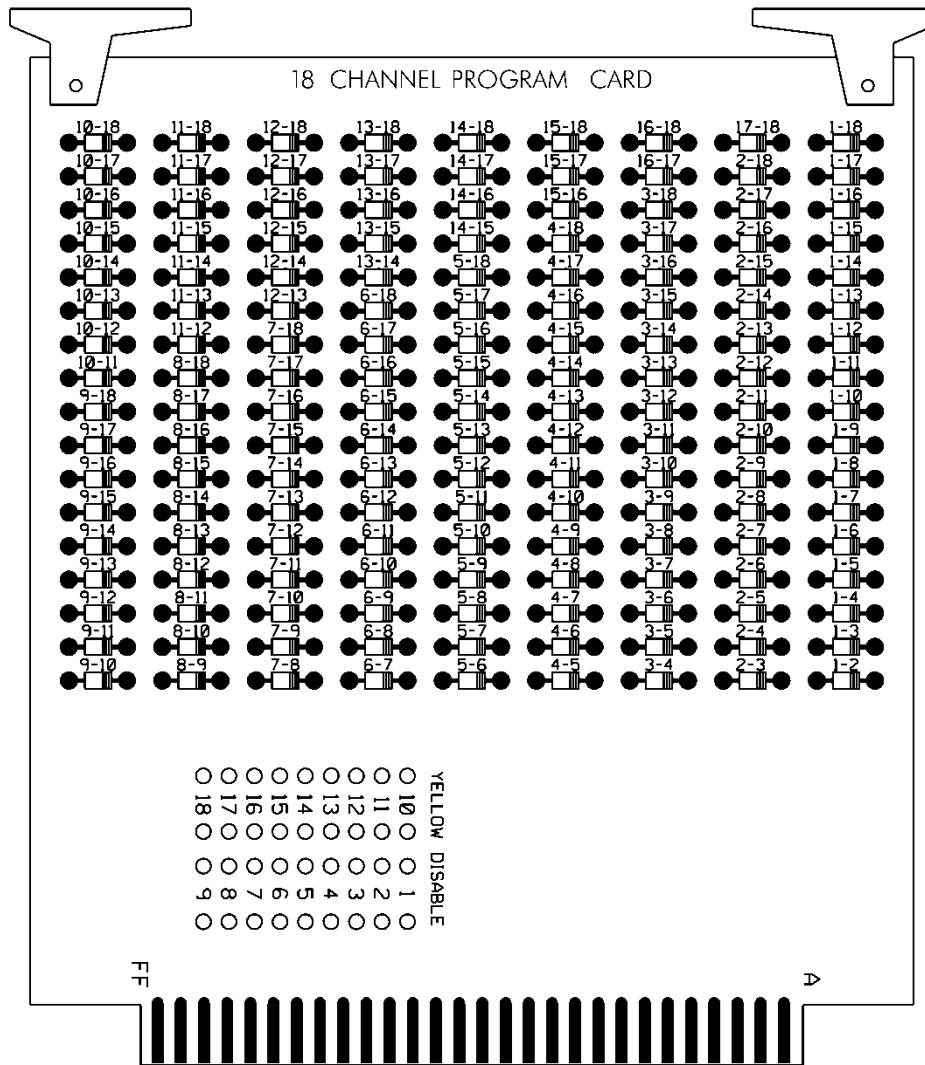
Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output, Side #2, Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



5.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS

Furnish detector sensor units that comply with Chapter 5 Section 1, “General Requirements,” and Chapter 5 Section 2, “Model 222 & 224 Loop Detector Sensor Unit Requirements,” of the CALTRANS “Transportation Electrical Equipment Specifications” dated March 12, 2009 with Erratum 1.

5.5. MATERIALS – TYPE 2070E CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications (TEES)* (dated March 12, 2009, plus Errata 1 dated January 21, 2010) except as required herein.

Furnish Model 2070E controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide Model 2070E controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1E, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2A or approved MODEL 2070-2E, Field I/O Module (FI/O)
 - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is “off”)
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

U-2524D

ITS-1

Guilford County



U-2524D

**INTELLIGENT TRANSPORTATION SYSTEMS
CCTV AND DMS INSTALLATIONS**

PROJECT SPECIAL PROVISIONS

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Contents

- 1. GENERAL REQUIREMENTS 7**
 - 1.1. DESCRIPTION 7
 - (A) *General* 7
 - (B) *Scope* 7
 - 1.2. MATERIALS 7
 - (A) *Qualified Products* 7
 - (B) *Information Technology Compliance* 8
 - 1.3. PLAN OF RECORD DOCUMENTATION 8
 - 1.4. WARRANTIES 8
- 2. UNDERGROUND CONDUIT 9**
 - 2.1. DESCRIPTION 9
 - 2.2. MATERIALS 9
 - 2.3. CONSTRUCTION METHODS 9
 - 2.4. MEASUREMENT AND PAYMENT 9
- 3. JUNCTION BOXES..... 11**
 - 3.1. DESCRIPTION 11
 - 3.2. MATERIALS 11
 - 3.3. CONSTRUCTION METHODS 11
 - 3.4. MEASUREMENT AND PAYMENT 11
- 4. WOOD PEDESTALS..... 13**
 - 4.1. DESCRIPTION 13
 - 4.2. MATERIALS 13
 - (A) *General* 13

(B) <i>Wood Pedestal</i>	13
4.3. CONSTRUCTION METHODS	13
4.4. MEASUREMENT AND PAYMENT	13
5. FIBER-OPTIC CABLE	14
5.1. DESCRIPTION	14
5.2. MATERIALS	14
5.3. CONSTRUCTION METHODS	14
5.4. MEASUREMENT AND PAYMENT	14
6. DELINEATOR MARKERS.....	15
6.1. DESCRIPTION	15
6.2. MATERIALS	15
6.3. CONSTRUCTION METHODS	15
6.4. MEASUREMENT AND PAYMENT	15
7. FIBER-OPTIC SPLICE CENTERS	16
7.1. DESCRIPTION	16
7.2. MATERIALS	16
(A) <i>Interconnect Centers</i>	16
(B) <i>Splice Enclosures</i>	16
7.3. CONSTRUCTION METHODS	16
7.4. MEASUREMENT AND PAYMENT	16
8. ELECTRICAL SERVICE.....	18
8.1. DESCRIPTION	18
8.2. MATERIALS	18
(A) <i>Meter Base/Disconnect Combination Panel</i>	18
(B) <i>Modify Existing Electrical Service Equipment</i>	19
(C) <i>Equipment Cabinet Disconnect</i>	19
(D) <i>4-Wire Copper Feeder Conductors</i>	19
(E) <i>3-Wire Copper Feeder Conductors</i>	19
(F) <i>Grounding System</i>	20
8.3. CONSTRUCTION METHODS	20
(A) <i>Meter Base/Disconnect Combination Panel</i>	20
(B) <i>Modify Existing Electrical Service Equipment</i>	20
(C) <i>Equipment Cabinet Disconnect</i>	20
(D) <i>4-Wire Copper Feeder Conductors</i>	21
(E) <i>3-Wire Copper Feeder Conductors</i>	21
(F) <i>Grounding System</i>	21
8.4. MEASUREMENT AND PAYMENT	21
9. CCTV CAMERA ASSEMBLY.....	23
9.1. DESCRIPTION	23
9.2. MATERIALS	23
(A) <i>General</i>	23
(B) <i>Camera and Lens</i>	23

(C) Camera Housing.....	24
(D) Pan and Tilt Unit.....	25
(E) Video Ethernet Encoder	25
(F) Ethernet Cable.....	26
(G) Surge Suppression	26
9.3. CONSTRUCTION METHODS	26
(A) General.....	26
(B) Electrical and Mechanical Requirements	26
9.4. MEASUREMENT AND PAYMENT	26
10. CCTV FIELD EQUIPMENT CABINET.....	28
10.1. DESCRIPTION	28
10.2. MATERIALS	28
(A) Shelf Drawer.....	28
(B) Cabinet Light.....	28
(C) Surge Protection for System Equipment.....	29
10.3. CONSTRUCTION METHODS	31
10.4. MEASUREMENT AND PAYMENT	31
11. CCTV METAL POLES AND FOUNDATION DESIGNS	32
11.1. DESCRIPTION	32
(A) CCTV Metal Poles.....	32
(B) Drilled Pier Foundations	32
11.2. MATERIALS AND REQUIREMENTS	35
(A) CCTV Metal Poles.....	35
11.3. CONSTRUCTION METHODS	39
(A) CCTV Metal Poles.....	39
(B) Drilled Pier Foundations	40
11.4. MEASUREMENT AND PAYMENT	40
12. DYNAMIC MESSAGE SIGN (DMS)	41
12.1. DESCRIPTION	41
12.2. MATERIALS	41
(A) Environmental Requirements	41
(B) Full Matrix LED Dynamic Message Sign (DMS)	41
(C) DMS Enclosure Structure Mounting	48
(D) DMS / DMS Controller Interconnect	48
(E) DMS Controller and DMS Cabinet	48
(F) Photo-Electric Sensors	56
(G) Equipment List.....	56
(H) Physical Description	56
(I) Parts List	57
(J) Character Set Submittal	57
(K) Wiring Diagrams.....	57
(L) Routine of Operation	57
(M) Maintenance Procedures.....	57

(N) <i>Repair Procedures</i>	57
(O) <i>Field Trial</i>	58
12.3. CONSTRUCTION METHODS	58
(A) <i>Description</i>	58
(B) <i>Layout</i>	58
(C) <i>Construction Submittal</i>	58
(D) <i>Conduit</i>	59
(E) <i>Wiring Methods</i>	59
(F) <i>Equipment and Cabinet Mounting</i>	59
(G) <i>Work Site Clean-Up</i>	60
12.4. MEASUREMENT AND PAYMENT	60
13. NTCIP REQUIREMENTS.....	61
13.1. REFERENCES.....	61
(A) <i>General Requirements</i>	62
(B) <i>NTCIP Acceptance Testing</i>	70
13.2. MEASUREMENT AND PAYMENT	70
14. DMS PEDESTAL STRUCTURE	71
14.1. DESCRIPTION.....	71
14.2. MATERIALS	71
14.3. CONSTRUCTION METHODS	71
(A) <i>General</i>	71
(B) <i>Design and Fabrication</i>	72
14.4. MEASUREMENT AND PAYMENT	76
15. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES	77
15.1. DESCRIPTION.....	77
15.2. MATERIALS	77
15.3. CONSTRUCTION METHODS	78
(A) <i>Drilled Piers</i>	78
(B) <i>Footings, Pedestals, Grade Beams and Wings</i>	80
(C) <i>Anchor Rod Assemblies</i>	80
15.4. MEASUREMENT AND PAYMENT	82
16. DYNAMIC MESSAGE SIGN FOUNDATIONS	83
16.1. DESCRIPTION.....	83
16.2. MATERIALS	83
(A) <i>Assumed Subsurface Conditions</i>	83
(B) <i>Subsurface Investigations</i>	83
(C) <i>Sign Foundation Designs</i>	83
16.3. CONSTRUCTION METHODS	84
16.4. MEASUREMENT AND PAYMENT	84
17. LOCAL AREA NETWORK EQUIPMENT	86
17.1. DESCRIPTION.....	86
17.2. MATERIALS	86

(A) <i>General</i>	86
(B) <i>Field Ethernet Switch</i>	86
17.3. CONSTRUCTION METHODS	88
(A) <i>General</i>	88
(B) <i>Requirements Definition Document</i>	88
(C) <i>Field Ethernet Switch</i>	89
17.4. MEASUREMENT AND PAYMENT	89
18. CENTRAL SYSTEM EQUIPMENT	90
18.1. DESCRIPTION.....	90
18.2. MATERIALS	90
(A) <i>Overhead Cable Tray</i>	90
(B) <i>Ethernet Core Switch Interface Module</i>	90
(C) <i>Rack-Mounted Video Decoder Chassis</i>	91
(D) <i>Central Video Decoder Unit</i>	91
(E) <i>Master Distribution Amplifier</i>	91
(F) <i>Central Media Converter</i>	94
18.3. CONSTRUCTION METHODS	94
(A) <i>Overhead Cable Tray</i>	94
(B) <i>Ethernet Core Switch Interface Module</i>	94
(C) <i>Rack-Mounted Video Decoder Chassis</i>	95
(D) <i>Central Video Decoder Unit</i>	95
(E) <i>Master Distribution Amplifier</i>	95
(F) <i>Central Media Converter</i>	95
18.4. MEASUREMENT AND PAYMENT	95
19. INTEGRATION AND CONFIGURATION.....	97
19.1. DESCRIPTION.....	97
19.2. CENTRAL INTEGRATION	97
19.3. CENTRAL CONFIGURATION	97
19.4. MEASUREMENT AND PAYMENT	98
20. TESTING & ACCEPTANCE	99
20.1. GENERAL TEST PROCEDURE.....	99
20.2. DESIGN APPROVAL TESTS	99
(A) <i>DMS System</i>	99
(B) <i>CCTV System</i>	100
(C) <i>Fiber-optic Communications</i>	100
(D) <i>Central Hardware</i>	100
20.3. COMPATIBILITY TESTS	100
(A) <i>DMS System</i>	100
(B) <i>CCTV System</i>	100
(C) <i>Fiber-optic Communications</i>	100
(D) <i>Central Hardware</i>	101
20.4. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING).....	101
(A) <i>DMS System</i>	101

U-2524D

ITS-6

Guilford County

(B) CCTV System..... 102
(C) Fiber-optic Communications..... 103
(D) Central Hardware 104
20.5. 30-DAY OBSERVATION PERIOD..... 104
20.6. FINAL ACCEPTANCE 105
20.7. MEASUREMENT AND PAYMENT 105

1 **1. GENERAL REQUIREMENTS**

2 **1.1. DESCRIPTION**

3 **(A) General**

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

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

11 Conform to the NCDOT and NC Statewide IT Policies and Standards as described at
12 <http://it.nc.gov>. The architecture of the IT modules must be approved by NCDOT IT and the
13 NC Office of Information Technology architecture groups.

14 **(B) Scope**

15 The scope of this project includes the installation of new fiber-optic communications cable,
16 four (4) new IP (Internet Protocol) based, closed circuit television (CCTV) cameras, and one
17 (1) new pedestal mount dynamic message sign (DMS). New fiber-optic cables will be installed
18 in new underground conduit and junction boxes. Both modifications to existing electrical
19 service (traffic signals) and new electrical service will be installed at new CCTV and DMS as
20 designated in the plans. The Contractor shall coordinate with the appropriate electric utility
21 company in the area to establish new service.

22 **Note that the locations of each proposed device shown in the Plans are an approximation.**
23 **Locate and mark proposed device locations in the field and receive approval from the**
24 **Regional ITS Engineer before performing any soil borings, foundation design and**
25 **construction. Do not construct any conduits or junction boxes to proposed devices until**
26 **the device locations are approved by the Regional ITS Engineer.**

27 Integrate the new fiber-optic cables with existing communications infrastructure so that the
28 new CCTV and new DMS devices are accessible and controlled by the existing computer and
29 network hardware and software at the NCDOT Triad Regional Transportation Management
30 Center (TRTMC) located at 201 S. Chimney Rock Road in Greensboro.

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

32 **1.2. MATERIALS**

33 **(A) Qualified Products**

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

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

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

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

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

7 **(B) Information Technology Compliance**

8 Conform to the State of North Carolina Information Technology (IT) policy and standards as
9 described at <http://it.nc.gov>. The architecture of the IT modules must be approved by the NC-
10 DOT IT and NC Office of Information Technology architecture groups.

11 **1.3. PLAN OF RECORD DOCUMENTATION**

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

14 **1.4. WARRANTIES**

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

U-2524D

ITS-10

Guilford County

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

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

8 Payment will be made under:

9 Pay Item	Pay Unit
10 Tracer Wire	Linear Foot
11 Unpaved Trenching (1) (2").....	Linear Foot
12 Unpaved Trenching (2) (2").....	Linear Foot
13 Unpaved Trenching (4) (1.25").....	Linear Foot
14 Unpaved Trenching (4) (1.25") & (1) (2")	Linear Foot
15 Directional Drill (1) (2")	Linear Foot
16 Directional Drill (2) (2")	Linear Foot
17 Directional Drill (4) (1.25").....	Linear Foot
18 Directional Drill (4) (1.25") & (1)(2").....	Linear Foot

1 **3. JUNCTION BOXES**

2 **3.1. DESCRIPTION**

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

5 **3.2. MATERIALS**

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

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

10 **3.3. CONSTRUCTION METHODS**

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

13 **Do not install conduits or junction boxes to ITS devices (CCTV cameras and DMSs) until the**
14 **location of the ITS devices has been confirmed by the Regional ITS Engineer.**

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

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

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

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

30 **3.4. MEASUREMENT AND PAYMENT**

31 *Junction Box* (_____) will be measured and paid as the actual number of junction boxes of each size
32 and type furnished, installed, and accepted.

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

U-2524D

ITS-12

Guilford County

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

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

7 Payment will be made under:

8 **Pay Item** **Pay Unit**

9 Junction Box (Standard Size).....Each

10 Junction Box (Oversized Heavy-Duty).....Each

1 **4. WOOD PEDESTALS**

2 **4.1. DESCRIPTION**

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

5 **4.2. MATERIALS**

6 **(A) General**

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

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

11 **(B) Wood Pedestal**

12 Furnish 6" x 6" x 8' wood pedestals for electrical service equipment as shown in the Plans and
13 *Standard Drawings*.

14 **4.3. CONSTRUCTION METHODS**

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

17 **4.4. MEASUREMENT AND PAYMENT**

18 *6" x 6" wood pedestal* will be measured and paid as the actual number of 6" x 6" x 8' wood
19 pedestals furnished, installed, and accepted.

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

22 Payment will be made under:

23 Pay Item	Pay Unit
24 6" x 6" Wood Pedestal.....	Each

1 **5. FIBER-OPTIC CABLE**

2 **5.1. DESCRIPTION**

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

5 **5.2. MATERIALS**

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

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

10 Provide communications cable identification markers with **336-315-7080** as the contact telephone
11 number.

12 **5.3. CONSTRUCTION METHODS**

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

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

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

20 **5.4. MEASUREMENT AND PAYMENT**

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

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

28
29 Payment will be made under:

Pay Item	Pay Unit
31 Communications Cable (6-Fiber)	Linear Foot
32 Communications Cable (144-Fiber)	Linear Foot

1 **6. DELINEATOR MARKERS**

2 **6.1. DESCRIPTION**

3 Furnish and install delineator markers with all necessary hardware.

4 **6.2. MATERIALS**

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

7 Provide delineator markers with **336-315-7080** as the contact telephone number.

8 **6.3. CONSTRUCTION METHODS**

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

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

13 **6.4. MEASUREMENT AND PAYMENT**

14 *Delineator marker* will be measured and paid as the actual number furnished, installed, and
15 accepted.

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

19 Payment will be made under:

20 Pay Item	Pay Unit
21 Delineator Marker	Each

U-2524D

ITS-17

Guilford County

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

5 Payment will be made under:

6 Pay Item	Pay Unit
7 Splice Enclosure.....	Each
8 Modify Splice Enclosure.....	Each
9 Interconnect Center (6-Fiber)	Each

1 **8. ELECTRICAL SERVICE**

2 **8.1. DESCRIPTION**

3 Install new electrical service equipment as shown in the Plans. Comply with the National Electrical
4 Code (NEC), the National Electrical Safety Code (NESC), the *Standard Specifications*, the Project
5 Special Provisions, and all local ordinances. All work involving electrical service shall be
6 coordinated with the appropriate utility company and the Engineer.

7 **8.2. MATERIALS**

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

9 Furnish and install new meter base/disconnect combination panels as shown in the Plans.
10 Provide meter base/disconnect combination panels that have a minimum of eight (8) spaces in
11 the disconnect. Furnish a single pole 15A circuit breaker at each CCTV location. Furnish a
12 double pole 50A circuit breaker at each DMS location. Furnish each with a minimum of
13 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R
14 enclosure. Ensure meter base/disconnect combination panel is listed as meeting UL Standard
15 UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are
16 listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply
17 dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All
18 exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a
19 minimum of four terminals and a minimum wire capacity range of number 12 through number
20 2/0 AWG.

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

- 25 ▪ Line, Load, and Neutral Terminals accept 2/0 AWG and smaller Copper/Aluminum
- 26 wire,
- 27 ▪ With or without horn bypass,
- 28 ▪ Made of galvanized steel,
- 29 ▪ Listed as meeting UL Standard US-414,
- 30 ▪ Overhead or underground service entrance specified.

31 At overhead service locations, furnish 1.5" watertight hub for threaded rigid conduit with meter
32 base.

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

- 35 ▪ Type of design.....Silicon Oxide Varistor
- 36 ▪ Voltage.....120/240 Single Phase, 3 wire
- 37 ▪ Maximum current.....100,000 amps

- 1 ▪ Maximum energy3,000 joules per pole
- 2 ▪ Maximum number of surgesUnlimited
- 3 ▪ Response time one milliamp test5 nanoseconds
- 4 ▪ Response time to clamp 10,000 amps10 nanoseconds
- 5 ▪ Response time to clamp 50,000 amps25 nanoseconds
- 6 ▪ Leak current at double the rated voltageNone
- 7 ▪ Ground wireSeparate

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

9 At CCTV-2, modify the existing electrical service by installing an additional 15A, single pole
10 circuit breaker in an existing service disconnect enclosure. At CCTV-3 and 4, modify the
11 existing electrical service by installing two additional 15A, single pole circuit breaker in an
12 existing service disconnect enclosure. Furnish circuit breakers with a minimum of 10,000
13 RMS symmetrical amperes short circuit current rating. Ensure circuit breakers are listed as
14 meeting UL-489. Install conduit between the existing service disconnect enclosure and an
15 adjacent junction box as shown in the plans.

16 **(C) Equipment Cabinet Disconnect**

17 Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double
18 pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV
19 locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish
20 circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current
21 rating in a lockable NEMA 3R enclosure. Ensure circuit breakers are listed as meeting UL-
22 489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint
23 finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must
24 be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals
25 and a minimum wire capacity range of number 8 through number 1/0 AWG.

26 **(D) 4-Wire Copper Feeder Conductors**

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

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

33 See the Plans for wire sizes and quantities.

34 **(E) 3-Wire Copper Feeder Conductors**

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

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

3 See the Plans for wire sizes and quantities.

4 **(F) Grounding System**

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

8 **8.3. CONSTRUCTION METHODS**

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

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

13 Install meter base/disconnect combination panels with lightning arrestors as called for in the
14 Plans. At all new CCTV locations, route the feeder conductors from the meter base/disconnect
15 to the CCTV and DMS equipment cabinet in conduit. Provide rigid galvanized conduit for
16 above ground and either PVC or HDPE for below ground depending on the installation method
17 required by the plans.

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

19 Coordinate with the Engineer and the utility company to de-energize the existing service
20 temporarily prior to starting the modification.

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

25 Install a new conduit system between the existing service disconnect and the new cabinet or
26 equipment cabinet disconnect as shown in the Plans. All above ground conduits, conduit
27 bodies and fittings must be rigid galvanized steel. Underground conduits and fittings can be
28 PVC or HDPE. Transition from rigid galvanized steel to PVC using rigid galvanized steel
29 sweeping elbows or in junction boxes. Install stranded copper feeder conductors from the
30 service disconnect to the new cabinet or equipment cabinet disconnect sized as shown in the
31 Plans.

32 **(C) Equipment Cabinet Disconnect**

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

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

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

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

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

11 **(F) Grounding System**

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

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

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

19 **8.4. MEASUREMENT AND PAYMENT**

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

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

33 *Equipment cabinet disconnect* will be measured and paid as the actual number of complete and
34 functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed
35 vertical conduit runs to the cabinet and any remaining hardware and conduit to connect the
36 equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet
37 subpanel.

38 *4-Wire copper feeder conductors* will be measured and paid as the actual linear feet of 4-wire
39 THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all four
40 conductors. Measurement will be for the actual linear footage of combined conductors after all

U-2524D

ITS-22

Guilford County

1 terminations are complete. No separate payment will be made for each individual conductor. No
2 separate payment will be made for different wire sizes. No payment will be made for excess wire in
3 the cabinets.

4 *3-Wire copper feeder conductors* will be measured and paid as the actual linear feet of 3-wire
5 THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three
6 conductors. Measurement will be for the actual linear footage of combined conductors after all
7 terminations are complete. No separate payment will be made for each individual conductor. No
8 separate payment will be made for different wire sizes. No payment will be made for excess wire
9 in the cabinets.

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

13 *#4 solid bare grounding conductor* will be measured and paid as the actual linear feet of #4 AWG
14 solid bare copper grounding conductor furnished, installed and accepted. Measurement will be
15 along the approximate centerline from the base of the electrical service disconnect to the last
16 grounding electrode.

17 Payment will be made under:

18 Pay Item	Pay Unit
19 Meter Base/Disconnect Combination Panel (Wood Pedestal Mount).....	Each
20 Modify Existing Electrical Service Equipment	Each
21 Equipment Cabinet Disconnect.....	Each
22 4-Wire Copper Feeder Conductors	Linear Foot
23 3-Wire Copper Feeder Conductors	Linear Foot
24 5/8" X 10' Grounding Electrode.....	Each
25 #4 Solid Bare Grounding Conductor	Linear Foot

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

17 **(2) Zoom Lens**

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

- 21 • Aperturef/1.6 – f/2.9,
- 22 • Focal length:.....4.45 mm (wide) and 89 mm (tele.),
- 23 minimum,
- 24 • Horizontal viewing angle:.....55.4° (wide) and 2.9° (tele),
- 25 minimum,
- 26 • Zoom30X optical, 12X digital, minimum
- 27 • Preset positioning:.....64 Presets, minimum.

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

34 **(C) Camera Housing**

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

1 **(F) Ethernet Cable**

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

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

12 **(G) Surge Suppression**

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

14 **9.3. CONSTRUCTION METHODS**

15 **(A) General**

16 Obtain approval of the camera locations and orientation from the Engineer prior to performing
17 any soil tests, foundation designs, pole designs or installing the CCTV camera assemblies.

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

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

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

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

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

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

35 **9.4. MEASUREMENT AND PAYMENT**

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

U-2524D

ITS-27

Guilford County

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

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

7 Payment will be made under:

8	Pay Item	Pay Unit
9	CCTV Camera Assembly	Each
10	Furnish CCTV Camera Assembly	Each

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

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

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

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

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

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

4 **(2) Ground Bus**

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

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

10 Within each CCTV field equipment cabinet, furnish and install one rack mounted UPS
11 that meets the following minimum specifications:

12 **Output**

- 13 • Output Power Capacity480 Watts / 750 VA,
- 14 • Max Configurable Power480 Watts / 750 VA,
- 15 • Nominal Output Voltage.....120V,
- 16 • Output Voltage Distortion.....Less than 5% at full load,
- 17 • Output Frequency (sync to mains).....57 - 63 Hz for 60 Hz nominal,
- 18 • Crest Factorup to 5:1,
- 19 • Waveform TypeSine wave,
- 20 • Output Connections(4) NEMA 5-15R,

21 **Input**

- 22 • Nominal Input Voltage120V,
- 23 • Input Frequency50/60 Hz +/- 3 Hz (auto sensing),
- 24 • Input ConnectionsNEMA 5-15P,
- 25 • Cord Length6 feet,
- 26 • Input voltage range for
- 27 main operations82 - 144V,
- 28 • Input voltage adjustable range for
- 29 main operation75 -154 V,

30 **Battery Type**

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

- 32 • Typical recharge time2 hours,

1 **Communications & Management**

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

5 **Surge Protection and Filtering**

- 6 • Surge energy rating480 Joules,

7 **Environmental**

- 8 • Operating Environment.....32 - 104° F,
- 9 • Operating Relative Humidity0 - 95%,
- 10 • Storage Temperature5 - 113° F,
- 11 • Storage Relative Humidity0 - 95%,

12 **Conformance**

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

14 **10.3. CONSTRUCTION METHODS**

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

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

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

24 **10.4. MEASUREMENT AND PAYMENT**

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

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

31 Payment will be made under:

32 Pay Item	Pay Unit
33 CCTV Field Equipment Cabinet.....	Each

1 **11. CCTV METAL POLES AND FOUNDATION DESIGNS**

2 **11.1. DESCRIPTION**

3 **(A) CCTV Metal Poles**

4 Furnish and install CCTV metal poles, grounding systems, and all necessary hardware. The
5 work covered by this special provision includes requirements for the design, fabrication, and
6 installation of custom designed CCTV metal poles.

7 Provide designs of completed assemblies with hardware that equals or exceeds *AASHTO*
8 *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic*
9 *Signals* 6th Edition, 2013 (hereafter called 6th Edition AASHTO), including the latest interim
10 revisions. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a
11 multi sided cross section with no less than six sides. The sides may be straight, convex, or
12 concave.

13 Standard Drawings for metal poles and metal pole foundations are available that supplement
14 these project special provisions. These drawings are located on the Department's website:

15 <https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx>

16
17 **(B) Drilled Pier Foundations**

18 Furnish and install foundations for CCTV metal poles with all necessary hardware in
19 accordance with the plans and specifications. The work covered by this special provision
20 includes requirements for the design, fabrication, and installation of custom designed
21 foundations for CCTV metal poles.

22 Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI code and
23 the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual.
24 Design methods based on engineering publications or research papers needs to have prior
25 approval from NCDOT, who reserves the right to accept or disapprove any method used for the
26 analysis.

27 It is assumed that all foundation designs will be drilled pier foundations unless site-specific soil
28 test information does not allow for a drilled pier foundation design. If an alternative
29 foundation design is required, notify the Engineer immediately. Prior approval from the
30 Engineer is required to receive additional compensation for an alternate foundation design.

31 Design all CCTV pole foundations using actual soil conditions at each pole location. Perform
32 soil tests in accordance with sub-section (1) (b) Soil Test of this Special Provision.

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

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

35 For lateral analysis, use LPILE Plus V6.0 or later. Inputs, results and corresponding graphs are
36 to be submitted with the design calculations.

1 Skin Friction is to be calculated using the α -method for cohesive soils and the β -method for
2 cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the “ α ”
3 and “ β ” methods can be found in *FHWA-NHI-10-016*.

4 Omit first 2.5ft for cohesive soils when calculating skin friction.

5 When hammer efficiency is not provided, assume a value of 0.70.

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

7 When poor soil conditions are encountered which could create an excessively large foundation
8 design, consideration may be given to allowing an exemption to the maximum capacity design.
9 The contractor must gain approval from the Engineer before reducing a foundation’s capacity.
10 Where poor soil is known to be present, it is advisable that the contractor receive approval for
11 foundation designs before releasing poles for fabrication.

12 (1) Soil Test

13 (a) General

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

16 The contractor-selected pole fabricator is responsible for determining if the addition
17 of wing walls is necessary for the supporting foundations.

18 (b) Soil Test

19 Perform a soil test at each proposed metal pole location. Complete all required fill
20 placement and excavation at each pole location to finished grade before drilling
21 each boring. Soil tests performed that are not in compliance with this requirement
22 may be rejected and will not be paid. Drill one boring to a depth of 26 feet within a
23 25 foot radius of each proposed foundation.

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

- 27 – A total of 100 blows have been applied in any 2 consecutive 6-in. intervals
- 28 – A total of 50 blows have been applied with < 3-in. penetration

29 Submit completed boring logs collected in accordance with these Project Special
30 Provisions along with pole loading diagrams from the plans to the contractor-
31 selected pole fabricator to assist in the pole and foundation design.

32 Describe each CCTV pole location along the project corridor in a manner that is
33 easily discernible to both the contractor’s designer and NCDOT reviewers. If a
34 CCTV pole is at an intersection, label the boring the “Intersection of (Route or SR
35 #), (Street Name) and (Route or SR #), (Street Name), _____ County. Label
36 borings with “B- N, S, E, W, NE, NW, SE or SW” corresponding to the quadrant
37 location within the intersection.

1 Pole numbers should be made available to the geotechnical drilling Contractor.
 2 Include pole numbers in the boring label if they are available. If they are not
 3 available, ensure the boring labels can be cross-referenced to corresponding pole
 4 numbers or pole locations.

5 For each boring, submit a legible (hand written or typed) boring log signed and
 6 sealed by a licensed Geologist or Professional Engineer registered in North
 7 Carolina. Include on each boring the SPT blow counts and N-values at each depth,
 8 depth of the boring, and a general description of the soil types encountered.

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

12 (2) Foundation Determination

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

$$14 N_{AVG} = \frac{(N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})}{15 \text{ Total Number of N-values}}$$

$$17 Y = (N@1')^2 + (N@2.5')^2 + \dots + (N@Deepest \text{ Boring Depth})^2$$

$$18 Z = (N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})$$

$$21 N_{STD \text{ DEV}} = \left[\frac{(Total \text{ Number of N-values} \times Y) - Z^2}{22 (Total \text{ Number of N-values}) \times (Total \text{ Number of N-values} - 1)} \right]^{0.5}$$

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

$$24 N_{AVG} - (N_{STD \text{ DEV}} \times 0.45)$$

25 *Or*

$$26 \text{ Average of First Four N-Values} = \frac{(N@1' + N@2.5' + N@5' + N@7.5')}{27 4}$$

28 *Note: If less than 4 N-values are obtained because of criteria listed in Section 2 above,*
 29 *use average of N-values collected for second condition. Do not include the N-value*
 30 *at the deepest boring depth for above calculations if the boring is discontinued at or*
 31 *before the required boring depth because of criteria listed in Section 1 above. Use*
 32 *N-value of zero for weight of hammer or weight of rod. If N-value is greater than*
 33 *50, reduce N-value to 50 for calculations.*

34 Submit completed boring logs collected in accordance with sub-section (1) (b) Soil Test
 35 above along with pole loading diagrams to the Contractor-selected pole fabricator to
 36 assist in the pole and foundation design.

37 (3) Foundation Design

38 Design foundations based upon site-specific soil test information collected in accordance
 39 with sub-section (1) (b) **Soil Test** above. Design drilled piers for side resistance only in

1 accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway*
2 *Bridges*.

3 Use the computer software LPILE version 6.0 or latest version manufactured by Ensoft,
4 Inc. to analyze drilled piers.

5 Use the computer software gINT V8i or latest manufactured by Bentley Systems, Inc.
6 with the current NCDOT gINT library and data template to produce SPT boring logs.

7 Provide a drilled pier foundation for each pole with a length and diameter that result in a
8 horizontal lateral movement of less than 1 inch at the top of the pier and a horizontal
9 rotational movement of less than 1 inch at the edge of the pier.

10 Submit foundation designs including drawings, calculations, and soil boring logs to the
11 Engineer for review and approval before construction. Foundations installed without
12 prior approval may be rejected.

13 Base foundation designs on level ground around the metal pole. If the slope around the
14 edge of the drilled pier is steeper than 8:1 (H:V) or the proposed foundation will be less
15 than 10 feet from the top of an embankment slope, the Contractor is responsible for
16 providing slope information to the foundation designer and to the Engineer so it can be
17 considered in the design.

18 **11.2. MATERIALS AND REQUIREMENTS**

19 **(A) CCTV Metal Poles**

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

21 Provide tapered, tubular shafts fabricated from coil or plate steel to meet the requirements of
22 ASTM A595 Grade A. For structural steel shapes, plates and bars use A572 Gr 50 min or
23 ASTM A709 Gr 50 min. Design tapers for all pole shafts that begin at the base with diameters
24 that decrease uniformly at the rate of 0.14 inch per foot of length. Construct shafts from one
25 piece of single ply plate or coil so there are no circumferential weld splices.

26 Ensure that allowable pole deflection does not exceed that allowed per 6th Edition AASHTO.
27 Ensure that maximum deflection at the top of the pole does not exceed 2.5 percent of the pole
28 height at the maximum wind speed as prescribed for the project area.

29 Use the submerged arc process or other NCDOT previously approved process suitable for pole
30 shafts to continuously weld pole shafts along their entire length. Ground or roll smooth and
31 flush any exposed welds flush with the base metal. The longitudinal seam weld will be finished
32 flush to the outside contour of the base metal. Ensure shafts have no circumferential welds
33 except at the lower end joining the shaft to the pole base. Use full penetration groove welds
34 with backing ring for all tube-to-transverse-plate connections in accordance with the 6th Edition
35 AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications*,
36 except that no field welding on any part of the pole will be permitted unless approved by a
37 qualified engineer.

38 Fabricate anchor bases from plate steel meeting, as a minimum, the requirements of ASTM
39 A572 Gr 50, AASHTO M 270 Gr 50, ASTM A709 Gr50, or an approved equivalent. Conform

- 1 to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet
2 M2.
- 3 Unless otherwise required by the design, ensure each anchor rod is 2" diameter and 60" length.
4 Provide 10" minimum thread projection at the top of the rod, and 8" minimum at the bottom of
5 the rod. Use anchor rod assembly and drilled pier foundation materials that meet the
6 *Foundations and Anchor Rod Assemblies for Metal Poles* provision.
- 7 Provide a circular anchor bolt lock plate that will be secured to the anchor bolts at the
8 embedded end with 2 washers and 2 nuts. Provide a base plate template that matches the bolt
9 circle diameter of the anchor bolt lock plate. Construct plates and templates from 1/4" minimum
10 thick steel with a minimum width of 4 inches. Galvanizing is not required for anchor bolt lock
11 plates.
- 12 Provide 4 heavy hex nuts and 4 flat washers for each anchor bolt. For nuts, use AASHTO M
13 291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M 293 or
14 equivalent material. Ensure that anchor bolts have required diameters, lengths and positions,
15 and will develop strengths comparable to their respective poles.
- 16 Provide a 2 inch hole equipped with an associated coupling and conduit fittings/bodies
17 approximately 18 inches above the base of the pole to accommodate passage of CCTV cables
18 from the CCTV cabinet to the inside of the pole. Refer to Metal Pole Standard Drawing Sheet
19 M3 for fabrication details.
- 20 Have poles permanently stamped above the base hand hole with the identification tag details as
21 shown on Metal Pole Standard Drawing Sheet M2.
- 22 For each pole, provide a 1/2 inch minimum thread diameter, coarse thread stud and nut for
23 grounding which will accommodate #6 AWG ground wire. Ensure that the lug is electrically
24 bonded to the pole and is conveniently located inside the pole at the hand hole.
- 25 Provide a removable pole cap with stainless steel attachment screws for the top of each pole.
26 Ensure that the cap is cast aluminum conforming to Aluminum Association Alloy 356.0F.
27 Furnish cap attached to the pole with a sturdy chain or cable approved by the Engineer. Ensure
28 that the chain or cable is long enough to permit the cap to hang clear of the pole-top opening
29 when the cap is removed.
- 30 Ensure that metal pole designs permit cables to be installed inside the poles. For holes in the
31 poles used to accommodate cables, provide full-circumference grommets.
- 32 Ensure all hardware is galvanized steel or stainless steel. The Contractor is responsible for
33 ensuring that the designer/fabricator specifies connecting hardware and/or materials that do not
34 create a dissimilar metal corrosive reaction.
- 35 For each structural bolt and other steel hardware, hot dip galvanizing shall conform to the
36 requirements of AASHTO M 232 (ASTM A153). Ensure end caps for poles are constructed of
37 cast aluminum conforming to Aluminum Alloy 356.0F.
- 38 After fabrication, have steel poles and all parts used in the assembly hot-dip galvanized per
39 section 1076 of the Standard Specifications. Design structural assemblies with weep holes
40 large enough and properly located to drain molten zinc during galvanization process. Provide

1 hot-dip galvanizing on structures that meets or exceeds ASTM A123. Provide galvanizing on
2 hardware that meets or exceeds ASTM A153. Ensure that threaded material is brushed and
3 retapped as necessary after galvanizing.

4 Perform repair of damaged galvanizing that complies with Article 1076-7 of the Standard
5 Specifications.

6 Where ice is present, assume wind loads as shown in Figure 3.9.4.2-3 of the 6th Edition
7 AASHTO Specification for Group III loading.

8 Design a base plate for each pole. The minimum base plate thickness for all poles is
9 determined by the following criteria:

10 Case 1 Circular or rectangular solid base plate with the upright pole welded to the top
11 surface of base plate with full penetration butt weld and where no stiffeners are provided. A
12 base plate with a small center hole, which is less than 1/3 of the upright diameter, and located
13 concentrically with the upright pole, may be considered as a solid base plate.

14 The magnitude of bending moment in the base plate, induced by the anchoring force of each
15 anchor bolt is $M = (P \times D_1) / 2$, where:

16 M = bending moment at the critical section of the base plate induced by one anchor bolt

17 P = anchoring force of each anchor bolt

18 D_1 = horizontal distance between the anchor bolt center and the outer face of the upright,
19 or the difference between the bolt circle radius and the outside radius of the upright

20 Locate the critical section at the face of the anchor bolt and perpendicular to the bolt circle
21 radius. The overlapped part of two adjacent critical sections is considered ineffective.

22 Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to
23 the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base
24 plate with a center hole that is larger in diameter than 1/3 of the upright diameter.

25 The magnitude of bending moment induced by the anchoring force of each anchor bolt is $M =$
26 $P \times D_2$, where

27 P = anchoring force of each anchor bolt

28 D_2 = horizontal distance between the face of the upright and the face of the anchor
29 bolt nut

30 Locate the critical section at the face of the anchor bolt top nut and perpendicular to the radius
31 of the bolt circle. The overlapped part of two adjacent critical sections is considered
32 ineffective.

33 If the base plate thickness calculated for Case 2 is less than Case 1, use the thickness calculated
34 for Case 1.

35 The following additional requirements apply to pole base plate designs:

- 36 • Ensure that whichever case governs as defined above, the anchor bolt diameter is set to
37 match the base plate thickness. If the minimum diameter required for the anchor bolt

U-2524D

ITS-38

Guilford County

1 exceeds the thickness required for the base plate, set the base plate thickness equal to
2 the required bolt diameter.

- 3 • Ensure that designs have anchor bolt holes with a diameter 1/4 inch larger than the
4 anchor bolt diameters in the base plate.

5 Furnish shop drawings for approval. Comply with article 1098-1B of the *Standard*
6 *Specifications* for submittal requirements. Furnish necessary details and calculations for the
7 metal poles including the foundation and connections. Ensure that shop drawings include
8 material specifications for each component and identifies welds by type and size on the
9 drawing details, not in table format. Provide an itemized bill of materials for all structural
10 components and associated connecting hardware on the drawings.

11 Provide the copies and summary of information as summarized below for metal pole and
12 foundation design reviews:

13

Item	Hardcopy Submittal	Electronic Submittal	Comments / Special Instructions
Sealed, Approved ITS Plan/Loading Diagram	2 sets	1 set	All structure design information needs to reflect the latest approved ITS plans.
Custom Pole Shop Drawings	3 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block. All drawings must have a unique drawing number for each project and identifier for multiple pages.
Structure Calculations	2 sets	1 set	Submit calculations on 8 1/2" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.
Custom Foundation Drawings	3 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block. All drawings must have a unique drawing number for each project and identifier for multiple pages.
Foundation Calculations	2 sets	1 set	Submit copies of LPILE input, output and pile tip deflection graph per Section 14.1 (B) of this specification for each foundation. Submit calculations on 8 1/2" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.

Soil Boring Logs and Report	2 sets	1 set	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.
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1

2 All shop drawings and custom foundation design drawings must be sealed by a Professional
3 Engineer licensed in the state of North Carolina. All geotechnical information must be sealed
4 by either a Professional Engineer or geologist licensed in the state of North Carolina.

5 Immediately bring to the attention of the Engineer any structural deficiency that becomes
6 apparent in any assembly or member of any assembly as a result of the design requirements
7 imposed by these specifications, the plans, or the typical drawings. Said Professional Engineer
8 is wholly responsible for the design of all poles. Review and acceptance of these designs by
9 the Department does not relieve the said Professional Engineer of his responsibility. **Do not**
10 **fabricate the assemblies until receipt of the Department's approval of the design**
11 **drawings.**

12 Include a title block and revision block on the shop drawings and foundation designs showing
13 the NCDOT inventory number.

14 Shop drawings and foundation drawings may be submitted together or separately for approval.
15 However, shop drawings must be approved before foundations can be reviewed. Foundation
16 designs will be returned without review if the associated shop drawing has not been approved.

17 Boring reports should include the following: Engineer's summary, boring location maps, soil
18 classification per AASHTO Classification System, hammer efficiency, and Metal Pole
19 Standard Foundation Selection Form located at the following website:

20 [https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES](https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES%20-%20Standard%20Foundation%20Selection.pdf)
21 [%20-%20Standard%20Foundation%20Selection.pdf](https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES%20-%20Standard%20Foundation%20Selection.pdf)

22 Incomplete submittals will be returned without review. The reviewer has the right to request
23 additional analysis and copies of the calculations to expedite the approval process.

24 11.3. CONSTRUCTION METHODS

25 (A) CCTV Metal Poles

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

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

30 Erect CCTV metal poles only after concrete has attained a minimum allowable compressive
31 strength of 3,000 psi. Connect poles to grounding electrodes and bond them to the electrical
32 service grounding electrodes.

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

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

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

7 Perform repair of damaged galvanizing that complies with the *Standard Specifications*, Article
8 1076-7 "Repair of Galvanizing."

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

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

13 Install CCTV metal poles, hardware, and fittings as shown on the manufacturer's shop
14 drawings. Install poles so that when the pole is fully loaded it is within 1 degree 40 minutes (1°
15 40') of vertical. Install poles with the manufacturer's recommended "rake." Use threaded
16 leveling nuts to establish rake if required.

17 **(B) Drilled Pier Foundations**

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

20 **11.4. MEASUREMENT AND PAYMENT**

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

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

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

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

29 Payment will be made under:

Pay Item	Pay Unit
31 CCTV Metal Pole	Each
32 Soil Test	Each
33 Drilled Pier Foundation.....	Cubic Yard

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

3 **(1) DMS Enclosure**

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

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

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

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

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

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

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

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

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

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

1 (a) Internal Temperature Sensors

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

17 (b) Housing Cooling System

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

40 (c) LED Display Cooling System

41 Provide the DMS with an LED display cooling system which directs air across the
42 LED display modules whenever LED board temperature exceeds a user-
43 programmable threshold. Direct fan-forced air vertically across the backside of the

1 entire LED display matrix using multiple ball-bearing fans. Program the field
 2 controller to activate the LED cooling fan system whenever LED board temperature
 3 exceeds +90° F and to deactivate the system whenever LED board temperature falls
 4 to +85° F. Locate cooling fans so as not to hinder removal of LED display modules
 5 and driver boards.

6 (d) Front Face Panel Defog/Defrost System

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

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

19 (3) **Front Panel**

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

23 Furnish polycarbonate panels with the following characteristics:

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

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

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

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

20 **(4) Display Modules**

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

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

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

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

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

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

1 **(5) Discrete LEDs**

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

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

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

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

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

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

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

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

30 **(6) LED Power Supplies**

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

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

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

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

9 **(7) LED Pixels**

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

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

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

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

23 **(8) Character Display**

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

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

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

33 **(9) Display Capabilities**

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

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

1 **(10) DMS Mini Controller**

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

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

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

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

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

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

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

24 Design the DMS structure to conform to the applicable requirements of the *Standard*
25 *Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 5th
26 Edition, 2009, and the latest Interim Specifications, and the section titled "DMS Assemblies"
27 of these Project Special Provisions.

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

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

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

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

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

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

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

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

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

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

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

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

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

1 turn on and turn off. Mount it in an easily accessible location, but not within 6 inches of the
2 fan.

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

6 **(1) Wiring**

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

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

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

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

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

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

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

36 Label all equipment and equipment controls clearly.

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

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

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

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

11 **(3) Circuit Breakers**

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

16 **(4) Surge Suppressor**

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

20 Provide power line surge protector that meets the following requirements:

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

21 *Capable of handling the continuous current to the equipment

22 **(5) Radio Interference Suppressor**

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

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

10 **(6) Communications Surge Protector**

11 Equip the cabinet with properly labeled hybrid data line surge protectors that meet the
 12 following general requirements:

Surge current occurrences at 2000 ampere, 8 x 20 microsecond waveform	> 80
Surge current occurrences at 400 ampere, 10x700 microsecond waveform	> 80
Peak surge current for 8 x 20 microsecond waveform	10,000 A (2500 A/line)
Peak surge current for 10x700 microsecond waveform	500 A/line
Response time	< 1 nanosecond
Series resistance	< 15 Ω
Average capacitance	1500 pF
Temperature range	-10°F to 150°F
Clamp Voltage	As required to match equipment in application

13 **(7) Lightning Arrester**

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

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single phase, 3 wires
Maximum current	100,000 amps
Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds

U-2524D

ITS-54

Guilford County

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

1 **(8) Uninterruptible Power Supply (UPS)**

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

Input Voltage Range	120VAC +12%, -25%
Power Rating	1000 VA, 700 Watts
Input Frequency	45 to 65 Hz
Input Current	7.2A
Output Voltage	120VAC +/- 3%
Output Frequency	50/60 +/-1 Hz
Output Current	8.3A
Output Crest Factor Ratio	@50% Load Up to 4.8:1 @75% Load Up to 3.2:1 @100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.
Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input/Output Short Circuit Input/Output Overload Excessive Battery Discharge

Specifications	UL1778, FCC Class A, IEE 587
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1

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

4 **(9) Controller Communications Interface**

5 Provide the controller with the following interface ports:

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

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

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

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

26 **(11) Controller Address**

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

31 **(12) Controller Functions**

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

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

5 **(13) DMS Controller Memory**

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

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

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

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

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

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

25 **(G) Equipment List**

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

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

34 **(H) Physical Description**

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

1 (I) Parts List

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

9 (J) Character Set Submittal

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

13 (K) Wiring Diagrams

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

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

20 (L) Routine of Operation

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

27 (M) Maintenance Procedures

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

32 (N) Repair Procedures

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

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

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

6 **(O) Field Trial**

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

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

15 **12.3. CONSTRUCTION METHODS**

16 **(A) Description**

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

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

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

29 **(B) Layout**

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

35 **(C) Construction Submittal**

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

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

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

7 **(D) Conduit**

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

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

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

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

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

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

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

28 **(E) Wiring Methods**

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

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

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

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

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

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

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

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

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

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

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

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

18 **(G) Work Site Clean-Up**

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

22 **12.4. MEASUREMENT AND PAYMENT**

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

31 Payment will be made under:

32 Pay Item	Pay Unit
33 Dynamic Message Sign.....	Each

1 **13. NTCIP REQUIREMENTS**

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

4 **13.1. REFERENCES**

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

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

9 **Table 1: NTCIP Standards**

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 Internet Transport Profile (TCP/IP and UDP/IP)
NTCIP 2301	NTCIP 2301	AP-STMF AP for Simple Transportation Management Framework

1 **(A) General Requirements**

2 **(1) Subnet Level**

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

- 8 • Hayes AT - Command Set,
- 9 • MNP5,
- 10 • MNP10, and
- 11 • V.42bis.

12 Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a null-
13 modem connection with data rates of 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps,
14 1200 bps, 600 bps, and 300 bps.

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

17 Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

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

23 **(2) Transport Level**

24 Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

25 NTCIP Components may support additional Transport Profiles at the manufacturer's
26 option. Ensure Response datagrams use the same Transport Profile used in the request.
27 Ensure each NTCIP Component supports the receipt of datagrams conforming to any of
28 the identified Transport Profiles at any time.

29 **(3) Application Level**

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

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

1 **(4) Information Level**

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

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

9 **Table 2: Modified Object Ranges for Mandatory Objects**

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Contains at least one row with moduleType equal to 3 (software). The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the modelVersion indicates the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	At least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	At least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	At least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	At least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	At least 20 when no messages are stored.
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4
DmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Support at least the following modes: - Local - External Central - Central Override

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

3 **Table 3: Content of Permanent Messages**

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

4 **Table 4: Required MULTI Tags**

Code	Feature
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 – day of month
f9	field 9 – month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year
fl (and /fl)	flashing text on a line by line basis with flash rates controllable in 0.5 second increments.
fo	Font
jl2	Justification – line – left
jl3	Justification – line – center
jl4	Justification – line – right
jl5	Justification – line – full
jp2	Justification – page – top
jp3	Justification – page – middle
jp4	Justification – page – bottom
Mv	moving text
Nl	new line
Np	new page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page)
Pt	page times controllable in 0.5 second increments.

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

3 **(5) Test Heading**

4 (a) Time Management

5 As defined in NTCIP 1201

6 (b) Timebase Event Schedule

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

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

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

11
12 (c) Report
13 As defined in NTCIP 1201. The following list indicates the modified object
14 requirements for this conformance group.

15 **Table 6: Modified Object Ranges for the Report Conformance Group**

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

16

17

1 (d) PMPP

2 (e) Font Configuration

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

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

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

6
7 *Upon delivery, the first font is a standard 18” font. The second font is a double-
8 stroke 18” font. The third font is a 28” font. The fourth font is empty.

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

- 11 – “A” thru “Z”- All upper case letters,
12 – “0” thru “9”- All decimal digits,
13 – Space (i.e., ASCII code 0x20),
14 – Punctuation marks shown in brackets [, , ! ? - ‘ ’ “ ” / ()],
15 – Special characters shown in brackets [# & * +<>].

16 (f) DMS Configuration

17 As defined in NTCIP 1203.

18 (g) MULTI Configuration

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

21

1
2**Table 8: Modified Object Ranges for the MULTI Configuration Conformance Group**

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

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- (h) Default Message Control
As defined in NTCIP 1203.
- (i) Pixel Service Control
As defined in NTCIP 1203.
- (j) MULTI Error Control
As defined in NTCIP 1203.

U-2524D

ITS-68

Guilford County

1 (k) Illumination/Brightness Control

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

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

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

6

7 (l) Auxiliary I/O8 (m) Scheduling

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

11 **Table 10: Modified Object Ranges for the Scheduling Conformance Group**

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

12

13 (n) Sign Status

14 As defined in NTCIP 1203.

15 (o) Status Error

16 As defined in NTCIP 1203.

17 (p) Pixel Error Status

18 As defined in NTCIP 1203.

19 (q) Fan Error Status

20 As defined in NTCIP 1203.

21 (r) Power Status

22 As defined in NTCIP 1203.

1 (s) Temperature Status

2 As defined in NTCIP 1203.

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

4
5 **Table 11: Some Optional Object Requirements**

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

6
7 **(6) Documentation**

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

- 10
- 11 • The relevant version of each official standard MIB Module referenced by the device functionality,
 - 12 • If the device does not support the full range of any given object within a
13 Standard MIB Module, a manufacturer specific version of the official
14 Standard MIB Module with the supported range indicated in ASN.1 format in
15 the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE
16 macro. Name this file identical to the standard MIB Module, except that it will
17 have the extension ".man",
 - 18 • A MIB Module in ASN.1 format containing any and all manufacturer-specific
19 objects supported by the device with accurate and meaningful DESCRIPTION
20 fields and supported ranges indicated in the SYNTAX field of the OBJECT-
21 TYPE macros,
 - 22 • A MIB containing any other objects supported by the device.

U-2524D

ITS-70

Guilford County

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

4 **(B) NTCIP Acceptance Testing**

5 Test the NTCIP requirements outlined above by a third party testing firm. Submit to the
6 Engineer for approval a portfolio of the selected firm. Include the name, address, and a history
7 of the selected firm in performing NTCIP testing along with references. Also provide a contact
8 person's name and phone number. Submit detailed NTCIP testing plans and procedures,
9 including a list of hardware and software, to the Engineer for review and approval 10 days in
10 advance of a scheduled testing date. Develop test documents based on the NTCIP
11 requirements of these Project Special Provisions. The acceptance test will use the NTCIP
12 Exerciser, and/or other authorized testing tools and will follow the guidelines established in the
13 ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in
14 the presence of the Engineer. Document and certify the results of the test by the firm
15 conducting the test and submit the Engineer for review and approval. In case of failures,
16 remedy the problem and have the firm retest in North Carolina. Continue process until all
17 failures are resolved. The Department reserves the right to enhance these tests as deemed
18 appropriate to ensure device compliance.

19 **13.2. MEASUREMENT AND PAYMENT**

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

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

1 **14. DMS PEDESTAL STRUCTURE**

2 **14.1. DESCRIPTION**

3 This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structures,
4 platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS
5 enclosures to the structures in accordance with the requirements of these Project Special Provisions
6 and the Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type
7 DMS assemblies as shown in the Plans.

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

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

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

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

18 **14.2. MATERIALS**

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

20	Item	Section
21	Structural Steel	Section 1072
22	Overhead Sign Structures	Section 1096
23	Signing Materials	Section 1092
24	Organic-Zinc Repair Paint	Article 1080-9
25	Reinforcing Steel	Section 1070
26	Direct Tension Indicators	Sections 440 and 1072

27 **14.3. CONSTRUCTION METHODS**

28 **(A) General**

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

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

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

1 Erect DMS in accordance with the requirements indicated on the Plans and in these Project
2 Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to
3 the structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt
4 connection such as 1) each truss chord to sign hanger, or 2) each truss chord to platform
5 support. Provide two (2) U-bolts at each U-bolts connection where ends of truss chords are
6 supported. Minimum diameter of all U-bolts is to be ½ inch.

7 Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials. See
8 *Standard Specifications*, Section 1076-6.

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

10 **Shop Drawing**

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

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

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

25 Allow a minimum of 40 working days for shop drawing approval after the Engineer receives
26 them. If revised drawings are necessary, allow appropriate additional time for review and
27 approval of final shop drawings.

28 Approval of shop drawings by the Engineer will not relieve the Contractor of his responsibility
29 for the correctness of drawings, or for the fit of all shop and field connections and anchors.

30 **(B) Design and Fabrication**

31 **(1) Dynamic Message Sign Assembly**

- 32 • Design must be in accordance with the *Standard Specifications for Structural*
33 *Supports for Highway Signs, Luminaires and Traffic Signals*, 5th Edition,
34 2009, and the latest Interim Specifications,
- 35 • The wind pressure map that is developed from the 3-second gust speeds, as
36 provided in Article 3.8 of the *Standard Specifications for Structural Supports*
37 *for Highway Signs, Luminaires and Traffic Signals*, 5th Edition, 2009, and the
38 latest Interim Specifications shall be used,
- 39 • The natural wind gust speed in North Carolina shall be assumed to be 5 meters
40 per second or 11.6 mph for inland areas, and 7 meters per second or 15.7 mph

1 for coastal areas. The coastal area shall be defined as any area within 2 miles
 2 from the waterfront facing the ocean or sound and all area where the design
 3 basic wind speed is above 120 mph, as shown in Figure 3-2,

- 4 • The fatigue importance category used in the design, for each type of structure,
 5 as provided for in Article 11.6, Fatigue Importance Factors, shall be Category
 6 II unless otherwise shown on the contract plans,
- 7 • Wind drag coefficient for Dynamic Message Sign enclosures shall be 1.7.

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

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

13 Case 1 For a single upright post of span type overhead sign structure, the
 14 effective column length factor, “K”, shall be taken as 2.0,

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

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

- 21 • For twin post truss-type upright post, the unbraced length shall be from the
 22 chord to post connection to the top of base plate,
- 23 • For twin post truss-type upright post that is subject to axial compression,
 24 bending moment, shear, and torsion the post shall satisfy Standard
 25 *Specifications for Structural Supports for Highway Signs, Luminaries and*
 26 *Traffic Signals* Equations 5-17, 5-18 and 5-19. To reduce the effects of
 27 secondary bending, in lieu of Equation 5-18, the following equation may be
 28 used:

$$29 \quad \frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6 f_a}{F_e}\right) F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

30 Where:

31 f_a = Computed axial compression stress at base of post

- 32 • The base plate thickness for all uprights and poles shall be a minimum of 2”
 33 but not less than that determined by the following criteria and design,

34 Case 1 Circular or rectangular solid base plates with the upright pole welded to
 35 the top surface of base plate with full penetration butt weld, and where

1 no stiffeners are provided. A base plate with a small center hole, which
2 is less than 1/5 of the upright diameter, and located concentrically with
3 the upright pole, may be considered as a solid base plate.

4 The magnitude of bending moment in the base plate, induced by the
5 anchoring force of each anchor bolt shall be calculated using equation
6 $M = (P \times D1) / 2$,

7 Case 2 Circular or rectangular base plate with the upright pole socketed into and
8 attached to the base plate with two lines of fillet weld, and where no
9 stiffeners are provided, or any base plate with a center hole that is larger
10 in diameter than 1/5 of the upright diameter.

11 The magnitude of bending moment induced by the anchoring force of
12 each anchor bolt shall be calculated using equation $M = P \times D2$,

- 13 - M, bending moment at the critical section of the base plate
14 induced by one anchor bolt,
- 15 - P, anchoring force of each anchor bolt,
- 16 - D1, horizontal distance between the center of the anchor bolt
17 and the outer face of the upright, or the difference between
18 the radius of the bolt circle and the outside radius of the
19 upright,
- 20 - D2, horizontal distance between the face of the upright and the
21 face of the anchor bolt nut,

- 22 • The critical section shall be located at the face of the anchor bolt and
23 perpendicular to the radius of the bolt circle. The overlapped part of two
24 adjacent critical sections shall be considered ineffective,
- 25 • The thickness of base plate of Case 1 shall not be less than that calculated
26 based on formula for Case 2,
- 27 • Uprights, foundations, and trusses shall be designed in accordance with the
28 DMS Foundation Project Special Provision for the effects of torsion. Torsion
29 shall be considered from dead load eccentricity of these attachments, as well
30 as for attachments such as walkway platforms, supporting brackets, etc., that
31 add to the torsion in the assembly. Truss vertical and horizontal truss
32 diagonals in particular and any other assembly members shall be appropriately
33 sized for these loads,
- 34 • Uprights, foundations, and trusses shall be designed for the proposed sign
35 wind area and future wind areas. The design shall consider the effect of
36 torsion induced by the eccentric force location of the center of wind force
37 above (or below) the center of the supporting truss. Truss vertical and
38 horizontal truss diagonals in particular and any other assembly members shall
39 be appropriately sized for these loads.

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

3 Horizontal components of the supporting structures for overhead DMS must be of a truss
4 design to support the DMS. Truss centerline must coincide with centerline of the DMS
5 design area shown on the structure line drawing. Provide permanent camber in addition
6 to dead load camber in accordance with the *Standard Specifications for Structural*
7 *Supports for Highway Signs, Luminaires and Traffic Signals*, 5th Edition, 2009, and the
8 latest Interim Specifications. Indicate on the shop drawings the amount of camber
9 provided and the method employed in the fabrication of the support to obtain the camber.

10 For all U-bolt connections of hanger beams to overhead assembly truss chords, provide
11 all U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts.
12 All double nuts that are on any U-bolt shall be the same thickness and weight. When
13 assembled, the double nuts shall be brought tight against each other by the use of two
14 wrenches.

15 Fabricate attachment assemblies for the mounting DMS in a manner that allows easy
16 removal of the sign.

17 **(2) DMS Maintenance Platform (Walkway)**

18 Provide a maintenance platform (walkway), a minimum of three feet wide with open skid
19 resistant surface and safety railing on the DMS assemblies for access to the DMS
20 inspection door. Provide platforms with fixed safety railings along both sides from the
21 beginning of the platform to the inspection door.

22 Ensure the design, fabrication and installation of the access platforms on new DMS
23 structures complies with the following:

- 24 • The top of the platform grading surface is vertically aligned with the bottom
25 of the DMS door,
- 26 • The DMS door will open 90-degrees from its closed position without any
27 obstruction from the platform or safety handrails,
- 28 • The platform is rigidly and directly connected to the walkway brackets and
29 there is no uneven surface between sections,
- 30 • Install a 4" x 4" safety angle parallel to and along both sides of the platform
31 and extend it the entire length of the platform. Design the safety angle to
32 withstand loading equivalent to the platform,
- 33 • Ensure the platform design allows full access to the DMS enclosure inspection
34 door with no interference or obstructions.

35 **(3) DMS Access Ladder**

36 Provide a fixed ladder, of the same material as the pedestal structures, leading to and
37 ending at the access platform. Equip the ladder with a security cover (ladder guard) and
38 lock to prohibit access by unauthorized persons. Furnish the lock to operate with a
39 Corbin #2 key, and furnish two keys per lock. Design the rungs on 12-inch center to
40 center typical spacing. Start the first ladder rung no more than 18 inches above the

U-2524D

ITS-76

Guilford County

1 landing pad. Attach the security cover approximately 6 feet above the finished ground.
 2 Design the ladder and security cover as a permanent part of the DMS assembly and
 3 include complete design details in the DMS assembly shop drawings. Fabricate the
 4 ladder and cover to meet all OSHA requirements and applicable state and local codes,
 5 including but not limited to providing a ladder cage.

6 Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and
 7 36 inches long to service as a landing pad for accessing the ladder. Design the landing
 8 pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by
 9 the DMS foundation. Provide pre-formed or cast-in place concrete pads.

10 14.4. MEASUREMENT AND PAYMENT

11 *DMS Pedestal Structure* will be measured and paid as the actual number of dynamic message sign
 12 pedestal structure assemblies furnished, installed, and accepted. Payment includes all design,
 13 fabrication, construction, transportation, and attachment of the complete dynamic message sign
 14 assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and
 15 furnishing shop drawings, additional documentation, incidentals, and all other equipment and
 16 features necessary to furnish the system described above.

17 *DMS Access Ladder* will be measured and paid as the actual number of DMS access ladders
 18 furnished, installed and accepted. Payment includes design, fabrication, transportation, attachment
 19 to the DMS assembly as described above, lock with two keys each, and concrete pad.

20 Payment will be made under:

21 Pay Item	Pay Unit
22 DMS Pedestal Structure	Each
23 DMS Access Ladder	Each

1 **15. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES**

2 **15.1. DESCRIPTION**

3 Foundations for metal poles include foundations for signals, cameras, overhead and dynamic
4 message signs (DMS) and high mount and low level light standards supported by metal poles or
5 upright trusses. Foundations consist of footings with pedestals and drilled piers with or without
6 grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with
7 nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of
8 rods embedded in the foundation.

9 Construct concrete foundations with the required resistances and dimensions and install anchor rod
10 assemblies in accordance with the contract and accepted submittals. Construct drilled piers
11 consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide
12 temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a
13 prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation"
14 and "hole" as a drilled pier excavation and "pier" as a drilled pier.

15 This provision does not apply to materials and anchor rod assemblies for standard foundations for
16 low level light standards. See Section 1405 of the *Standard Specifications* and Standard Drawing
17 No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for
18 standard foundations. For construction of standard foundations for low level light standards,
19 standard foundations are considered footings in this provision.

20 This provision does not apply to foundations for signal pedestals; see Section 1743 of the *Standard*
21 *Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

22 **15.2. MATERIALS**

23 Refer to the 2012 *Standard Specifications*.

24	Item	Section
25	Conduit	1091-3
26	Grout, Nonshrink	1003
27	Polymer Slurry	411-2(B)
28	Portland Cement Concrete	1000
29	Reinforcing Steel	1070
30	Rollers and Chairs	411-2(C)
31	Temporary Casings	411-2(A)

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

1 Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals,
2 Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings
3 including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings
4 may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is
5 available from:

6 www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html

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

- 8 ○ Straight anchor rods,
- 9 ○ Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and
- 10 ○ Nuts and either flat plates or washers on the other ends of anchor rods embedded in
11 foundations.

12 Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade
13 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a nominal
14 thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with
15 Article 1076-4 of the *Standard Specifications*. It is not necessary to galvanize nuts, plates and
16 washers embedded in concrete.

17 **15.3. CONSTRUCTION METHODS**

18 Install the required size and number of conduits in foundations in accordance with the plans and
19 accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level
20 and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary
21 Surface finish in accordance with Subarticle 825-6(B) of the *Standard Specifications* for portions of
22 foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or
23 grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a
24 compressive strength of at least 3,000 psi.

25 **(A) Drilled Piers**

26 Before starting drilled pier construction, hold a predrill meeting to discuss the installation,
27 monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier
28 Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor
29 and Drilled Pier Contractor Superintendent will attend this predrill meeting.

30 Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft
31 of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

32 Check for correct drilled pier alignment and location before beginning drilling. Check
33 plumbness of holes frequently during drilling.

34 Construct drilled piers with the minimum required diameters shown in the plans. Install piers
35 with tip elevations no higher than shown in the plans or approved by the Engineer.

36 Excavate holes with equipment of the sizes required to construct drilled piers. Depending on
37 the subsurface conditions encountered, drilling through rock and boulders may be required. Do
38 not use blasting for drilled pier excavations.

- 1 Contain and dispose of drilling spoils and waste concrete as directed and in accordance with
2 Section 802 of the *Standard Specifications*. Drilling spoils consist of all materials and fluids
3 removed from excavations.
- 4 If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with
5 temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it
6 becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert
7 a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry
8 before removing the temporary casing.
- 9 If temporary casings become stuck or the Contractor proposes leaving casings in place,
10 temporary casings should be installed against undisturbed material. Unless otherwise
11 approved, do not leave temporary casings in place for mast arm poles and cantilever signs.
12 The Engineer will determine if casings may remain in place. If the Contractor proposes
13 leaving temporary casings in place, do not begin drilling until a casing installation method is
14 approved.
- 15 Use polymer slurry and additives to stabilize holes in accordance with the slurry
16 manufacturer's recommendations. Provide mixing water and equipment suitable for polymer
17 slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *Standard*
18 *Specifications* except for sand content.
- 19 Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the
20 bottom of holes. Take sample sets from excavations to test polymer slurry immediately after
21 filling holes with slurry, at least every 4 hours thereafter and immediately before placing
22 concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet
23 the required polymer slurry properties. If any slurry test results do not meet the requirements,
24 the Engineer may suspend drilling until both samples from a sample set meet the required
25 slurry properties.
- 26 Remove soft and loose material from bottom of holes using augers to the satisfaction of the
27 Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with
28 Subarticle 411-4(E) of the *Standard Specifications* except for the following:
- 29 ▪ Inspections for tip resistance and bottom cleanliness are not required,
30 ▪ Temporary casings may remain in place if approved, and
31 ▪ Concrete placement may be paused near the top of pier elevations for anchor rod
32 assembly installation and conduit placement, or
33 ▪ If applicable, concrete placement may be stopped at bottom of grade beam or wings
34 elevations for grade beam or wing construction.
- 35 If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete
36 until a concrete placement procedure is approved. If applicable, temporary casings and fluids
37 may be removed when concrete placement is paused or stopped in accordance with the
38 exceptions above provided holes are stable. Remove contaminated concrete from exposed
39 Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove
40 temporary casings until a procedure for placing anchor rod assemblies and conduit or
41 constructing grade beams or wings is approved.

1 Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier
2 concrete sets and round top edges of piers.

3 If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be
4 required in accordance with Article 411-5 of the *Standard Specifications*. A drilled pier will be
5 considered defective in accordance with Subarticle 411-5(D) of the *Standard Specifications*
6 and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *Standard*
7 *Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *Standard*
8 *Specifications*.

9 If a drilled pier is under further investigation, do not grout core holes, backfill around the pier
10 or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is
11 accepted, dewater and grout core holes and backfill around the pier with approved material to
12 finished grade. If the Engineer determines a pier is unacceptable, remediation is required in
13 accordance with Article 411-6 of the *Standard Specifications*. No extension of completion
14 date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

15 Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and
16 number of vertical reinforcing bars and the minimum compressive strength of the concrete mix
17 at 28 days.

18 **(B) Footings, Pedestals, Grade Beams and Wings**

19 Excavate as necessary for footings, grade beams and wings in accordance with the plans,
20 accepted submittals and Section 410 of the *Standard Specifications*. If unstable, caving or
21 sloughing materials are anticipated or encountered, shore foundation excavations as needed
22 with an approved method. Notify the Engineer when foundation excavation is complete. Do
23 not place concrete or reinforcing steel until excavation dimensions and foundation material are
24 approved.

25 Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with
26 the dimensions shown in the plans and in accordance with Section 825 of the *Standard*
27 *Specifications*. Use forms to construct portions of pedestals and grade beams protruding above
28 finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam
29 edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the
30 *Standard Specifications*. Proper compaction around footings and wings is critical for
31 foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do
32 not use forms for standard foundations for low level light standards.

33 **(C) Anchor Rod Assemblies**

34 Size anchor rods for design and the required projection above top of foundations. Determine
35 required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of
36 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness
37 between top of foundations and bottom of leveling nuts.

38 Protect anchor rod threads from damage during storage and installation of anchor rod
39 assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past
40 leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench

- 1 without a cheater bar. Report any thread damage to the Engineer that requires extra effort to
2 turn nuts.
- 3 Arrange anchor rods symmetrically about center of base plate locations as shown in the plans.
4 Set anchor rod elevations based on required projections above top of foundations. Securely
5 brace and hold rods in the correct position, orientation and alignment with a steel template. Do
6 not weld to reinforcing steel, temporary casings or anchor rods.
- 7 Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly
8 in accordance with the following procedure:
- 9 1. Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top
10 of foundation and bottom of leveling nuts. Place washers over anchor rods on top of
11 leveling nuts.
 - 12 2. Determine if nuts are level using a flat rigid template on top of washers. If necessary,
13 lower leveling nuts to level the template in all directions or if applicable, lower nuts to
14 tilt the template so the metal pole or upright truss will lean as shown in the plans. If
15 leveling nuts and washers are not in full contact with the template, replace washers
16 with galvanized beveled washers.
 - 17 3. Verify the distance between the foundation and leveling nuts is no more than one nut
18 thickness.
 - 19 4. Place base plate with metal pole or upright truss over anchor rods on top of washers.
20 High mount luminaires may be attached before erecting metal poles but do not attach
21 cables, mast arms or trusses to metal poles or upright trusses at this time.
 - 22 5. Place washers over anchor rods on top of base plate. Lubricate top nut bearing
23 surfaces and exposed anchor rod threads above washers with beeswax, paraffin or
24 other approved lubricant.
 - 25 6. Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers
26 are not in full contact with the base plate, replace washers with galvanized beveled
27 washers.
 - 28 7. Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench.
29 Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern
30 cycling through each nut at least twice.
 - 31 8. Repeat (7) for leveling nuts.
 - 32 9. Replace washers above and below the base plate with galvanized beveled washers if
33 the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact
34 with the base plate or any nut is not in firm contact with a washer. If any washers are
35 replaced, repeat (7) and (8).
 - 36 10. With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection
37 of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and
38 base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for
39 pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a
40 total of one flat (1/6 revolution) for anchor rod diameters greater than 1 1/2" and 2

U-2524D

ITS-82

Guilford County

- 1 flats (1/3 revolution) for anchor rod diameters 1 1/2" or less. Follow a star pattern
 2 cycling through each top nut at least twice.
- 3 11. Ensure nuts, washers and base plate are in firm contact with each other for each anchor
 4 rod. Cables, mast arms and trusses may now be attached to metal poles and upright
 5 trusses.
- 6 12. Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated
 7 within the last 12 months to check nuts in the presence of the Engineer. Completely
 8 erect mast arm poles and cantilever signs and attach any hardware before checking top
 9 nuts for these structures. Check that top nuts meet the following torque requirements:

10

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

- 11
- 12 If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque
 13 wrench to within ± 10 ft-lb of the required torque. Do not over tighten top nuts.
- 14 13. Do not grout under base plate.

15 **15.4. MEASUREMENT AND PAYMENT**

- 16 Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and
 17 paid for elsewhere in the contract.
- 18 No payment will be made for temporary casings that remain in drilled pier excavations. No payment
 19 will be made for PIT. No payment will be made for further investigation of defective piers. Further
 20 investigation of piers that are not defective will be paid as extra work in accordance with Article
 21 104-7 of the *Standard Specifications*. No payment will be made for remediation of unacceptable
 22 drilled piers or post repair testing.

1 **16. DYNAMIC MESSAGE SIGN FOUNDATIONS**

2 **16.1. DESCRIPTION**

3 Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by
4 metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers
5 with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign
6 foundations in accordance with the contract and accepted submittals. Define “cantilever sign” as an
7 overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard*
8 *Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*, 5th
9 Edition, 2009, including the latest interim specifications.

10 **16.2. MATERIALS**

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

13 **(A) Assumed Subsurface Conditions**

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

- 16 ▪ Unit weight (γ) = 120 lb/cf,
- 17 ▪ Friction angle (ϕ) = 30°F,
- 18 ▪ Cohesion (c) = 0 lb/sf, and
- 19 ▪ Groundwater 7 ft below finished grade.

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

25 **(B) Subsurface Investigations**

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

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

34 **(C) Sign Foundation Designs**

35 Design sign foundations for the wind zone and clearances shown in the plans and the slope of
36 finished grade at each sign location. Use the assumed soil parameters and groundwater
37 elevation above for sign foundation designs unless a subsurface investigation is required. For

1 sign locations requiring a subsurface investigation, design sign foundations for the subsurface
2 conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and
3 wings in accordance with the 5th Edition of the *AASHTO Standard Specifications for*
4 *Structural Supports for Highway Signs, Luminaries and Traffic Signals*, 5th Edition, 2009,
5 including the latest interim specifications. In some instances, conflicts with drainage structures
6 may dictate sign foundation types.

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

10 Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO*
11 *Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25%
12 for uplift. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc.
13 to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1"
14 at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles,
15 use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least
16 2.0 for torsion.

17 For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected
18 with a grade beam having a moment of inertia approximately equal to that of either pier. The
19 Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use
20 a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the
21 *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and*
22 *Traffic Signals*, 5th Edition, 2009, including the latest interim specifications.

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

29 **16.3. CONSTRUCTION METHODS**

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

33 **16.4. MEASUREMENT AND PAYMENT**

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

U-2524D

ITS-85

Guilford County

1 Payment will be made under:

2 **Pay Item**

Pay Unit

3 DMS Foundation..... Cubic Yards

U-2524D

ITS-87

Guilford County

- 1 • RJ45 connectors,
- 2 • Category 5e, unshielded twisted pair cable,
- 3 • Segment Length: 100m,
- 4 • Auto-negotiation support (10/100Mbps),
- 5 • Auto MDIX crossover capability,
- 6 • Full Duplex operation (IEEE 802.3x),
- 7 • TVS (transient voltage suppression) between Line +/-, Line +/-ground, and
- 8 Line -ground to protect the circuitry.

9 Furnish Field Ethernet switches with the following networking requirements:

- 10 ▪ The switch shall support automatic address learning of up to 8192 MAC addresses.
- 11 ▪ The switch shall support the following advanced layer 2 functions:
 - 12 • IEEE 802.1Q VLAN, with support for up to 4096 VLANs,
 - 13 • IEEE 802.1p priority queuing,
 - 14 • IEEE 802.1w rapid spanning tree,
 - 15 • IEEE 802.1s multiple spanning tree,
 - 16 • IEEE802.1AD link aggregation,
 - 17 • IEEE 802.3x flow control,
 - 18 • IGMPv2 with 256 IGMP groups,
 - 19 • Port Rate Limiting,
 - 20 • Configuration via test file which can be modified through standard text editor,
 - 21 • Forwarding/filtering rate shall be 14,880 packets per second (PPS) for
 - 22 10Mps, 148,800 for 100Mps, 1,488,000 for 1000Mps, and
 - 23 • DHCP Option 82.

24 Furnish Field Ethernet switches with the following network management functionality

25 requirements:

- 26 ▪ SNMPv2, SNMPv3,
- 27 ▪ RMON,
- 28 ▪ GVRP,
- 29 ▪ Port Mirroring,
- 30 ▪ 802.1x port security,
- 31 ▪ Radius Server,
- 32 ▪ TACACS+ Server,
- 33 ▪ SSL – Secure Socket Layer,

- 1 ▪ SSH – Secure Shell,
- 2 ▪ TFTP,
- 3 ▪ Network Time Protocol (NTP),
- 4 ▪ Simple Network Time Protocol (SNTP), and
- 5 ▪ Management via web or Telnet.

6 **17.3. CONSTRUCTION METHODS**

7 **(A) General**

8 Furnish media access control (MAC) addresses for all equipment utilized as part of this project.
9 Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment
10 utilized as part of this project. Affix final IP address each device utilized. Use labels that do
11 not smear or fade.

12 In field equipment cabinets, fully integrate new Ethernet switches with the fiber-optic
13 interconnect centers. Integrate all field equipment as call for.

14 Fully integrate LAN to accomplish local device failover and fault tolerance.

15 Fully integrate LAN equipment to provide virus protection, user authentication, and security
16 functions to prevent unauthorized users and data from entering the LAN.

17 **(B) Requirements Definition Document**

18 Prior to commencing work, the Contractor shall develop a Requirements Definition Document
19 (RDD) that will form the basis for the overall network architecture and design that at a
20 minimum includes the following:

- 21 ▪ Complete description of the proposed implementation of the access, distribution
22 and core layers for the network as described in the Plans and these Project Special
23 Provisions,
- 24 ▪ Development of an IP Design Scheme with ranges assigned to each node to be
25 integrated by the Contractor (address ranges, geographic distribution, standards for
26 addresses within each cabinet),
- 27 ▪ Proposed IP subnet definition and addressing including any and all masks,
- 28 ▪ Proposed IP multicast configuration including multicast routing (i.e., PIM sparse or
29 dense) and Rendezvous Point (RP) designation as necessary,
- 30 ▪ Proposed recommendations for failover and redundancy including network device
31 power, supervisor cards, and network ports,
- 32 ▪ Proposed configuration and guidelines for L3 routing (OSPF, VRRP, EIGRP, RIP,
33 etc.),
- 34 ▪ Proposed configuration and guidelines for Virtual LAN assignments including
35 management VLANs, device VLANs and routing VLANs,

- 1 ▪ Proposed configuration and guidelines for L2 broadcast storm prevention, loop
- 2 prevention and fault tolerance mechanisms. (Spanning Tree diagram with
- 3 designated, blocking and forwarding ports indicated. Root bridge and backup root
- 4 bridge must also be specified.) Incorporation of Multiple Spanning Tree Protocol,
- 5 ▪ Proposed configuration and guidelines to mitigate common security threats such as
- 6 denial of service, man in the middle, MAC/IP spoofing and brute force dictionary
- 7 attacks,
- 8 ▪ Proposed configuration and guidelines for 802.1p Class of Service (COS) queue
- 9 assignments, and
- 10 ▪ Proposed configuration and guidelines for specific port assignments on each of the
- 11 L2 and L3 devices.

12 The RDD shall be prepared and signed by a qualified networking professional (minimum
 13 CCNA or a manufacturer-approved equivalent based on the approved hardware vendor) and
 14 will be approved by the Engineer. The Qualified network professional will be present during
 15 the installation and testing of the local area network as well as during system testing.

16 **(C) Field Ethernet Switch**

17 Install and integrate all field Ethernet switches at field locations as depicted in the diagrams
 18 and tables and called for in these Project Special Provisions. Integrate with equipment cabinet
 19 hardware and fiber-optic communications equipment.

20 Provide inline surge protection for all Ethernet connections in field cabinets.

21 **17.4. MEASUREMENT AND PAYMENT**

22 *Field Ethernet switch* will be measured and paid as the actual number of field Ethernet switches
 23 furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators,
 24 configuration, and testing or other labor or materials required to install and integrate the field
 25 Ethernet switch will be considered incidental and will not be paid for separately.

26 *Furnish field Ethernet switch* will be measured and paid as the actual number of field Ethernet
 27 switches furnished and accepted. All SFP modules, optics, cabling, attenuators, configuration,
 28 testing and other materials that are an integral part of the field Ethernet switch will be considered
 29 incidental and will not be paid for separately.

30 Payment for all LAN integration, RDD development, cabling, jumpers, adapters, sockets, LAN patch
 31 panels, and other hardware shall be considered incidental and no separate payment will be made.

32 Payment will be made under:

33 Pay Item	33 Pay Unit
34 Field Ethernet Switch.....	Each
35 Furnish Field Ethernet Switch	Each

U-2524D

ITS-91

Guilford County

- 1 - Cisco-Stack-MIB
- 2 - Cisco-VTP-MIB
- 3 - Cisco-CDP-MIB
- 4 - RMON MIB (RFC 1757)
- 5 - Cisco-PAGP-MIB
- 6 - Cisco-STP-EXTENSIONS-MIB
- 7 - Cisco-VLAN-BRIDGE-MIB
- 8 - Cisco-VLAN-MEMBERSHIP-MIB
- 9 - Entity-MIB (RFC 2037)
- 10 - HC-RMON
- 11 - RFC1213-MIB (MIB-II)
- 12 - SMON-MIB

13 **(C) Rack-Mounted Video Decoder Chassis**

14 Furnish 19” rack-mounted video decoder chassis to accept the central video decoder units
15 furnished under this project. Furnish rack-mounted video decoder chassis that have the
16 following minimum requirements:

- 17 ▪ Accept 12 (minimum) central video decoder units (cards),
- 18 ▪ Redundant power supply,
- 19 ▪ Extended temperature range (-20 degrees C to +70 degrees C),
- 20 ▪ 4 RU (7.0) high),
- 21 ▪ Input voltage 86-254 VAC, 47-60 Hz,
- 22 ▪ Output voltage, 12 volts DC,
- 23 ▪ On/Off power switch,
- 24 ▪ Cover plates for empty card slots.

25 **(D) Central Video Decoder Unit**

26 Furnish central video decoder units to decode the transmission from the built-in digital video
27 Ethernet encoder to analog NTSC video and serial data. Furnish central decoder units that are
28 functionally compatible with the CCTV camera’s built-in digital video Ethernet encoder
29 installed under this project. Furnish central decoder units that are card-based and chassis
30 installed.

31 **(E) Master Distribution Amplifier**

32 Furnish master distribution amplifiers that accept analog video inputs from the output of the
33 central video decoder units, and provide analog video outputs into the existing Pelco video
34 matrix switch at the TRTMC.

35 Furnish master distribution amplifiers that are fully compatible with the existing Pelco
36 CM9760-MDA Master Distribution Amplifiers in the TRTMC and satisfy the following
37 minimum requirements.

38

1 Features:

- 2 ▪ Master time-date titler,
- 3 ▪ Distribution amplifier,
- 4 ▪ Accepts master time-date strings from CM9700 Series Systems,
- 5 ▪ Stand-alone use, with keyboard programming,
- 6 ▪ Provides master time-date and title for up to 63 slave units (64 total units),
- 7 ▪ Accepts text messages (RS-232/RS-422) from third-party systems for insertion onto
- 8 any video channel,
- 9 ▪ 16 ground-isolated video inputs per unit,
- 10 ▪ 4 video outputs per input,
- 11 ▪ Outputs selectable for time-date only, time-date and title, or no character
- 12 generation,
- 13 ▪ Includes video amplification,
- 14 ▪ Line compensation,

15 Electrical:

- 16 ▪ Input voltage 120 VAC, 60 Hz,
- 17 ▪ Power consumption 25 W,
- 18 ▪ Fuse 250 mA,

19 Mechanical:

- 20 ▪ Video input connectors BNC (16),
- 21 ▪ Video output connectors BNC (4 per input; 64 total),
- 22 ▪ Communications In RJ-45,
- 23 ▪ Communications Out RJ-45

24 Video:

- 25 ▪ Video Input(s) 0.5 to 2 Vp-p, 16 inputs per unit
- 26 ▪ Video Output(s) 1 Vp-p, 4 outputs per input
- 27 ▪ Input/Output Impedance 75 ohms, terminated
- 28 ▪ Gain Unity \pm 1 dB
- 29 ▪ Frequency Response \pm 1 dB at 8 MHz
- 30 ▪ Bandwidth \pm 3 dB at 15 MHz
- 31 ▪ Crosstalk -60 dB at 3.58 MHz

32

U-2524D**ITS-93****Guilford County**

1	▪ Gain	+ .88 dB
2		+ .55 dB with 1,500 feet RG59/U
3	▪ Video Coaxial Cable	RG59/U 750 feet (229 m)
4	▪ Requirements	RG6/U 1,000 feet (305 m)
5		RG11/U 1,500 feet (457 m)
6	▪ Video Coaxial Cable	0-1,500 feet (using RG59/U cable)
7	▪ Compensation Range	Selectable ranges:
8	▪ (Inputs Only)	– None
9		– 500 feet (152.4 m)
10		– 1,000 feet (304.8 m)
11		– 1,500 feet (457.2 m)
12	▪ Differential Gain	Less than 1%
13	▪ Differential Phase	Less than 1/2°
14	▪ Maximum Output Level	1.0 Vp-p terminated
15	▪ Signal-to-Noise Ratio	-45 dB
16	▪ Tilt	Less than 1%
17	▪ Inputs	Ground isolated
18	▪ Character Size	7 x 9 TV Lines
19	▪ Brightness	Individually adjustable (digital)
20	▪ Position	Individually adjustable (digital)
21	Communication:	
22	▪ Type	RS-232, RS-422, RS-485
23	▪ Data Rate	Selectable; 1200, 2400, 4800 or 9600 baud
24	▪ Cable Requirements	24-gauge shielded twisted pair
25	RS-232	Maximum 50 feet (15.25 m)
26	RS-422	Maximum 4,000 feet (1,219 m)
27	RS-485	Maximum 4,000 feet (1,219 m)
28	General:	
29	▪ Construction	Aluminum
30	▪ Dimensions	5.25" H x 19.00" W x 12.90" D
31	▪ Mounting Fits	19-inch EIA Standard rack mount (3 RUs)
32	▪ Operating Temperature	32° to 120°F (0° to 49°C)

1 **(C) Rack-Mounted Video Decoder Chassis**

2 Install the rack-mounted video decoder chassis into an new 19” rack (by others) within the
3 TRTMC equipment room in a space as directed by the Engineer. Integrate the central video
4 decoder units with the rack cabinet power supply and UPS (by others).

5 **(D) Central Video Decoder Unit**

6 Install the central video decoder units in the rack-mounted video decoder chassis at the
7 TRTMC as shown in the Plans. Integrate the decoders with the existing core Ethernet switch.
8 Integrate the central video decoder unit video outputs with the inputs on the master distribution
9 amplifier at the TRTMC as directed by the Engineer.

10 **(E) Master Distribution Amplifier**

11 Install the master distribution amplifier within new rack space (by others) in the TRTMC
12 equipment room as directed by the Engineer. Integrate the master distribution amplifier with
13 the proposed rack-mounted video decoder chassis and the existing Pelco video matrix switch.

14 Furnish all necessary interconnecting video and data cables and hardware to properly integrate
15 the master distribution amplifiers into the existing video system.

16 **(F) Central Media Converter**

17 Install one multiple-port central media converter in the existing rack cabinet at the TRTMC.
18 Integrate with the core Ethernet switch and existing DMS server to facilitate communications with
19 the field DMS unit.

20 **18.4. MEASUREMENT AND PAYMENT**

21 *Overhead cable tray* will be measured and paid on a lump sum basis. This item shall include
22 furnishing and installing the overhead cable tray and all associated mounting hardware; as well as
23 furnishing all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to
24 complete the cable tray installation in the TRTMC equipment room.

25 *Ethernet core switch interface module* will be measured and paid as the actual number of units
26 furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and
27 configuration required to install the Ethernet core switch interface module shall be incidental and not
28 be paid for separately.

29 *Rack-mounted video decoder chassis* will be measured and paid as the actual number of units,
30 furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and
31 configuration required to install the rack-mounted video decoder chassis unit shall be incidental and
32 not be paid for separately.

33 *Central video decoder unit* will be measured and paid as the actual number of units, furnished,
34 installed, integrated, and accepted. All cabling and patch cables, integration, and configuration
35 required to install the central video decoder unit shall be incidental and not be paid for separately.

36 *Master distribution amplifier* will be measured and paid as the actual number of units, furnished,
37 installed, integrated, and accepted. All cabling and patch cables, integration, and configuration
38 required to install the master distribution amplifier shall be incidental and not be paid for separately.

U-2524D

ITS-96

Guilford County

1 *Central media converter* will be measured and paid for as the actual number of units furnished,
 2 installed, integrated, and accepted. All cabling and patch cables, integration, and configuration
 3 required to install the media converter shall be incidental and not be paid for separately.

4 Payment will be made under:

5 Pay Item	6 Pay Unit
-------------------	-------------------

7 Overhead Cable Tray	Lump Sum
-----------------------------	----------

8 Ethernet Core Switch Interface Module	Each
---	------

9 Rack-Mounted Video Decoder Chassis	Each
--	------

10 Central Video Decoder Unit	Each
-------------------------------------	------

11 Master Distribution Amplifier	Each
--	------

12 Central Media Converter.....	Each
---------------------------------	------

1 **19. INTEGRATION AND CONFIGURATION**

2 **19.1. DESCRIPTION**

3 Install and fully integrate new central equipment at the TRTMC. Fully configure existing central
4 hardware and software at the TRTMC to establish communications with new CCTV and DMS
5 devices.

6 Coordinate the working hours and building access for all central configuration activities with the
7 Engineer.

8 **19.2. CENTRAL INTEGRATION**

9 Furnish media access control (MAC) addresses for all equipment utilized as part of this project.
10 Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as
11 part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

12 Install rack-mounted video decoder chassis, central video decoder units, and master distribution
13 amplifiers in the existing rack cabinets at the TRTMC as shown on the Network Block Diagram in
14 the Plans.

15 Integrate the existing core Ethernet switch with the existing fiber-optic interconnect center such that
16 the current communications topology is preserved. Configure the core Ethernet switch and ports as
17 required to establish communications to hub Ethernet switches, field Ethernet switches and CCTV
18 cameras.

19 Integrate the central video decoder units with the core Ethernet switch and the new master
20 distribution amplifiers. Configure the video matrix switch to add the new CCTV devices as new
21 inputs to the switch.

22 **As currently configured, there are no available inputs to the video matrix switch. The**
23 **TRTMC staff will disconnect up to four (4) existing inputs into the switch to accommodate the**
24 **four (4) project CCTV cameras.**

25 Configure the existing CCTV server to recognize the new CCTV units and process the video and
26 control data for sharing with the TRTMC.

27 Integrate the serial device servers with the core Ethernet switch and existing DMS server.

28 Configure the existing DMS server to recognize the new DMS units and process control data for
29 sharing with the TRTMC.

30 **19.3. CENTRAL CONFIGURATION**

31 The existing DMS central software that controls the DMS units at the TRTMC is Daktronics
32 Vanguard. Modify the existing DMS central software configuration at the TRTMC to display and
33 map the new DMS units in the software GUI. Ensure that the software also allows for full
34 communications and control of the DMS unit.

35 The existing CCTV central software that controls the existing video matrix switch at the TRTMC is
36 Protronix's VideoPro. This software includes on-screen pan-tilt-zoom controls of each camera in the
37 system. Modify the Protronix CCTV central software configuration at the TRTMC to display and

U-2524D

ITS-98

Guilford County

1 map the new CCTV devices so that the CCTV video can be displayed on the existing monitors and
2 display devices at the TRTMC.

3 Integrate the new CCTV units with NCDOT’s regional video sharing and distribution system to
4 allow for remote users to view and control the new CCTV units that terminate on the NCDOT
5 analog video matrix switch through the Ethernet network connection between the remote user and
6 the NCDOT VideoPro server at the TRTMC.

7 **19.4. MEASUREMENT AND PAYMENT**

8 *Integration and configuration* will be measured and paid as a lump sum price. This item shall
9 include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and
10 incidentals necessary to complete the integration and configuration of CCTV and DMS devices with
11 the existing systems at the TRTMC.

12 All cabling, labeling, sockets, or other accessories required to configure, integrate, and interconnect
13 computer equipment shall be considered incidental and shall not be paid for separately.

14 All central equipment installed for communications to new CCTV and DMS units will be measured
15 and paid for under the applicable Section of these Project Special Provisions.

16 Payment will be made under:

17 Pay Item	Pay Unit
18 Integration and Configuration.....	Lump Sum

1 been made, the Department may accept the prototype DMS and controller as the physical and
2 functional standard for the system furnished under this contract. You may use the prototype
3 units on this project if, after inspection and rework (if necessary), they meet all physical and
4 functional specifications. In the case of standard product line equipment, if the Contractor can
5 provide test results certified by an independent testing facility as evidence of prior completion
6 of successful design approval tests, then the Engineer may choose to waive these tests.

7 In each Design Approval Test, successfully perform the Functional Tests described below.
8 Apply the extreme conditions to all associated equipment unless stated otherwise in these
9 Project Special Provisions.

10 **(B) CCTV System**

11 No design approval test is required.

12 **(C) Fiber-optic Communications**

13 No design approval test is required.

14 **(D) Central Hardware**

15 No design approval test is required.

16 **20.3. COMPATIBILITY TESTS**

17 **(A) DMS System**

18 No compatibility test is required.

19 **(B) CCTV System**

20 Compatibility Tests are applicable to CCTV cameras and video encoders/decoders that the
21 Contractor wishes to furnish but are of a different manufacturer or model series than the
22 existing units in the field or existing units installed at the TRTMC. If required, the
23 Compatibility Test shall be completed and accepted by the Engineer prior to approval of the
24 material submittal.

25 The Compatibility Test shall be performed in a laboratory environment at a facility chosen by
26 the Engineer based on the type of unit being tested. Provide notice to the Engineer with the
27 material submitted that a Compatibility Test is requested. The notice shall include a detailed
28 test plan that will show compatibility with existing equipment. The notice shall be given a
29 minimum of 15 calendar days prior to the beginning of the Compatibility Test.

30 The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The
31 Department will provide access to existing equipment to facilitate these testing procedures.
32 The Contractor is responsible for configuring proposed equipment at the TRTMC and proving
33 compatibility. The Engineer will determine if the Compatibility Test was acceptable for each
34 proposed device.

35 **(C) Fiber-optic Communications**

36 No compatibility test is required.

1 **(D) Central Hardware**

2 Compatibility Tests are applicable to field Ethernet switches that the Contractor wishes to
3 furnish but are of a different manufacturer or model series than the existing units in the field or
4 existing units installed at the TRTMC. If required, the Compatibility Test shall be completed
5 and accepted by the Engineer prior to approval of the material submittal.

6 The Compatibility Test shall be performed in a laboratory environment at a facility chosen by
7 the Engineer based on the type of unit being tested. Provide notice to the Engineer with the
8 material submitted that a Compatibility Test is requested. The notice shall include a detailed
9 test plan that will show compatibility with existing equipment. The notice shall be given a
10 minimum of 15 calendar days prior to the beginning of the Compatibility Test.

11 The Contractor shall provide, install, and integrate a fully-functioning unit to be tested. The
12 Department will provide access to existing equipment to facilitate these testing procedures.
13 The Contractor is responsible for configuring proposed equipment at the TRTMC and proving
14 compatibility. The Engineer will determine if the Compatibility Test was acceptable for each
15 proposed device.

16 **20.4. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)**

17 **(A) DMS System**

18 Conduct an Operational Field Test of the DMS system installed on the project to exercise the
19 normal operational functions of the equipment. The Operational Field Test will consist of the
20 following tests as a minimum:

21 **(1) Physical Examination**

22 Examine each piece of equipment to verify that the materials, design, construction,
23 markings, and workmanship comply with the mechanical, dimensional, and assembly
24 requirements of these Project Special Provisions.

25 Perform the following tests as a minimum:

- 26 • Verify that all surfaces are free of dents, scratches, weld burns, or abrasions.
27 Round sharp edges and corners,
- 28 • Verify bend radius of cables is not excessive or could potentially cause
29 damage,
- 30 • Verify all modules, lamps, and components are properly secured, and
- 31 • Verify that there are no exposed live terminals.

32 **(2) Continuity Tests**

33 Check the wiring to assure it conforms to the requirements of these Project Special
34 Provisions.

35 **(3) Functional Tests**

36 Perform the following functional tests:

- 37 • Start-up and operate the DMS locally using a laptop computer,

U-2524D

ITS-102

Guilford County

- 1 • Use automatic (photo-electric sensor controlled) DMS Control Software to
- 2 switch between “dim”, “normal”, and “bright” light levels,
- 3 • Operate the DMS with all display elements flashing continuously for 10
- 4 minutes at the maximum flash rate,
- 5 • Exercise the DMS by displaying static messages, flashing messages, and
- 6 alternating static and flashing message sequences,
- 7 • Automatic poll the DMS by the Control Software at various intervals and
- 8 verify the data received by Control Software from DMS,
- 9 • Download and edit messages using Control Software,
- 10 • Execute status request on the DMS controller,
- 11 • Observe normal operations during uploading and downloading messages,
- 12 • Input and select messages from the sign controller’s local user interface,
- 13 • Test sequence activation at chosen intervals,
- 14 • Display and verify all stored messages,
- 15 • Verify resumption of standard operation upon interruption of electrical power,
- 16 • Demonstrate detected failures and response functions,
- 17 • Demonstrate proper operation of the Failure Log,
- 18 • Set controller clock using the Control Software,
- 19 • Execute system shutdown using the Control Software and local user interface,
- 20 and
- 21 • Verify detection of a power failure in the DMS enclosure and the report
- 22 feature of the failure to the Control Software,
- 23 • Display IP address and web settings,
 - 24 – Verify that the IP address is not publically accessible. Placing a display on a
 - 25 private network or VPN helps mitigate the lack of security,
 - 26 – Disable the telnet, Web Interface, Web LCD, and ICMP (PING) interfaces,
 - 27 – Change the default password,
- 28 • Set the controller to enable a controller log file.

29 Approval of Operational Field Test results does not relieve the Contractor to conform to
 30 the requirements in these Project Special Provisions. If the DMS system does not pass
 31 these tests, document a correction or substitute a new unit as approved by the Engineer.
 32 Re-test the system until it passes all requirements.

33 (B) CCTV System

34 Perform the following local operational field tests at the camera assembly field site in
 35 accordance with the test plans. A laptop computer shall provide camera control and

1 positioning. After installing the camera assembly, including the camera hardware, field
2 Ethernet switch, power supply, and connecting cables:

- 3 ▪ Furnish all equipment, appliances, and labor necessary to test the installed cable and
4 to perform the following tests before any connections are made,
- 5 ▪ Verify that physical construction has been completed,
- 6 ▪ Inspect the quality and tightness of ground and surge protector connections,
- 7 ▪ Check the power supply voltages and outputs,
- 8 ▪ Connect devices to the power sources,
- 9 ▪ Verify installation of specified cables and connections between the camera, PTZ,
10 field Ethernet switch, and control cabinet,
- 11 ▪ Perform the CCTV assembly manufacturer's initial power-on test in accordance
12 with the manufacturer's recommendation,
- 13 ▪ Set the VLAN, IP address, default gateway and subnet mask for the camera and
14 field Ethernet switch,
- 15 ▪ Verify the presence and quality of the video image with a portable NTSC-approved
16 monitor,
- 17 ▪ Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections,
18 and the operation, preset positioning, and power on/off functions,
- 19 ▪ Demonstrate the pan and tilt speeds and extent of movement to meet all applicable
20 standards, specifications, and requirements,
- 21 ▪ Verify proper voltage of all power supplies,
- 22 ▪ Interconnect the communication interface device with the communication
23 network's assigned fiber-optic trunk cable and verify that there is a transmission
24 LED illuminated, and
- 25 ▪ Verify that the CCTV camera's built-in digital video Ethernet encoder is properly
26 encoding its video signal.

27 Approval of Operational Field Test results does not relieve the Contractor to conform to the
28 requirements in these Project Special Provisions. If the CCTV system does not pass these
29 tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the
30 system until it passes all requirements.

31 **(C) Fiber-optic Communications**

32 Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the
33 cable is installed and terminated. Provide written notification a minimum of ten days before
34 beginning fiber-optic cable testing.

35 After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused
36 fibers, to ensure the following:

- 37 ▪ Fusion splice loss does not exceed 0.05 dB,

- 1 ▪ Terminations and connections have a loss of 0.5 dB or less, and
2 ▪ Reflection loss is 40 dB or greater for each connector.
- 3 Install a 1,000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be
4 tested.
- 5 If exceeded, remake splices until the loss falls below 0.05 dB. The Department will record each
6 attempt for purposes of acceptance.
- 7 Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each
8 fiber including engineering calculations demonstrating that OTDR test results meet or exceed
9 the attenuation requirements and that optical properties of the cable have not been impaired.
10 Include digital photographs that clearly show the workmanship for each splice. Label all test
11 results (plots and discs) with the manufacturer and model number of the OTDR testing
12 equipment.
- 13 Provide a tabular summary or spreadsheet detailing and comparing the loss budget and actual
14 loss calculations per link. Provide test results for fiber-optic cable that demonstrates the loss
15 budget where the fiber originates and the point where the fiber meets an electronic device.
- 16 If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the
17 cable have been impaired, take approved corrective action including replacement of complete
18 segments of fiber-optic cable if required. Corrective action will be at no additional cost to the
19 Department.

20 **(D) Central Hardware**

- 21 The Contractor shall perform a Network System Test (NST) on the local area network. During
22 the NST, the Contractor must demonstrate successful local operation of field equipment
23 operating from the field Ethernet switches as well as successful control of the equipment from
24 the TRTMC.
- 25 In the event of a failed NST, the Contractor, at his expense, must perform all necessary
26 activities required to provide proper operation of the LAN, which can include full replacement
27 of field equipment or cabling.
- 28 The Engineer or his representative will witness all NSTs. Documentation of all testing
29 procedures and activities must be provided to the Engineer prior to full acceptance of the
30 system ring.

31 **20.5. 30-DAY OBSERVATION PERIOD**

- 32 The 30-Day Observation Period shall not be considered part of work to be completed by the project
33 completion date.
- 34 Upon successful completion of all project work, the component tests, the System Test, and the
35 correction of all deficiencies, including minor construction items, the 30-day Observation Period
36 may commence. This observation consists of a 30-day period of normal, day-to-day operations of
37 the new field equipment in operation with the new central equipment without any failures. The
38 purpose of this period is to ensure that all components of the system function in accordance with the
39 Plans and these Project Special Provisions.

U-2524D

ITS-105

Guilford County

1 Respond to system or component failures (or reported failures) that occur during the 30-day
2 Observation Period within twenty-four (24) hours. Correct said failures within forty-eight (48)
3 hours. Any failure that affects a major system component as defined below for more than forty-eight
4 (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the
5 failure occurred. After the cause of such failures has been corrected, timing of the 30-day
6 Observation Period will resume. System or component failures that necessitate a redesign of any
7 component or failure in any of the major system components exceeding a total of three (3)
8 occurrences will terminate the 30-day Observation Period and cause the 30-day Observation Period
9 to be restarted from day zero when the redesigned components have been installed and/or the
10 failures corrected. The major system components are:

- 11 ○ DMS Field Controller and Display Module,
- 12 ○ CCTV Camera, PTZ, and built-in digital video Ethernet encoder,
- 13 ○ Fiber-optic Communications Cables and Splices, and
- 14 ○ Local Area Network including Ethernet switches

15 20.6. FINAL ACCEPTANCE

16 Final system acceptance is defined as the time when all work and materials described in the Plans
17 and these Project Special Provisions have been furnished and completely installed by the Contractor;
18 all parts of the work have been approved and accepted by the Engineer; and the 30-day observation
19 period has been successfully completed.

20 The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in
21 this Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the
22 submittal of all project documentation.

23 20.7. MEASUREMENT AND PAYMENT

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

25 Payment for this work will be covered in the applicable sections of these Project Special Provisions
26 at the contract unit price for other items furnished on this Project.

ST-1

Project U-2524D

Guilford County

Project Special Provisions Structures, Culverts, Walls

Table of Contents

<u>SP #</u>		<u>Page #</u>
1	Maintenance and Protection of Traffic Beneath Proposed Structure at Sta. 495+22.00 -LREV- (8-13-04)	----- ST-2
2	Temporary Bents (9-30-11)	----- ST-3
3	Placing Load on Structure Members (11-27-12)	----- ST-4
4	Steel Reinforced Elastomeric Bearings (6-22-16)	----- ST-4
5	Disc Bearings (2-3-14)	----- ST-4
6	Thermal Sprayed Coatings (Metallization) (9-30-11)	----- ST-9
7	Elastomeric Concrete (9-27-12)	----- ST-13
8	Foam Joint Seals (9-27-12)	----- ST-15
9	Expansion Joint Seals (9-30-11)	----- ST-19
10	Sound Barrier Wall (SPECIAL)	----- ST-23
11	Falsework and Formwork (4-5-12)	----- ST-26
12	Submittal of Working Drawings (6-19-15)	----- ST-32
13	Crane Safety (8-15-05)	----- ST-38
14	Grout for Structures (9-30-11)	----- ST-39
15	Embedded Clips for Prestressed Concrete Girders (6-22-16)	----- ST-41
16	Vinyl Coated Chain Link Fence, 79" Fabric (SPECIAL)	----- ST-41
17	Concrete Barrier Rail with Moment Slab (1-17-12)	----- ST-42

For Piles and Walls, see Geotechnical special provisions.

7/14/2016



DocuSigned by:

A. Keith Paschal

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Except for SP # 10

7/14/2016



DocuSigned by:

J. M. Bailey

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Except for SP# 1, 2, 5, 9, 16, and 17

ST-2

PROJECT SPECIAL PROVISIONS **STRUCTURE, CULVERTS, WALLS**

PROJECT U-2524D

GUILFORD COUNTY

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH **PROPOSED STRUCTURE AT STATION 495+22.00 –LREV-**

(8-13-04)

1.0 GENERAL

Maintain traffic on SR 2303 (Lawndale Dr.) as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 17'-0" at all times during construction.

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

2.0 PROTECTION OF TRAFFIC

Protect traffic from any operation that affords the opportunity for construction materials, equipment, tools, etc. to be dropped into the path of traffic beneath the structure. Based on Contractor means and methods determine and clearly define all dead and live loads for this system, which, at a minimum, shall be installed between beams or girders over any travelway or shoulder area where traffic is maintained. Install the protective system before beginning any construction operations over traffic. In addition, for these same areas, keep the overhang falsework in place until after the rails have been poured.

3.0 BRACING GIRDERS

Brace girders to resist wind forces, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the member during all stages of erection and construction. Before casting of intermediate diaphragms, decks, or connecting steel diaphragms do not allow the horizontal movement of girders to exceed ½ inch.

4.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

TEMPORARY BENTS

(9-30-11)

When girder erection requires the use of temporary bents, design, construct, maintain and afterwards remove the temporary bents in accordance with the Standard Specifications and this Special Provision. For the purpose of this Special Provision, the term “temporary bents” includes girder erection temporary bents, vertical shoring and proprietary shoring systems.

Temporary bents for structures over railroads shall maintain a minimum horizontal clearance of 25' from center of track.

Design temporary bents in accordance with the 1995 AASHTO Guide Design Specification for Bridge Temporary Works (including the 2008 Interim Revisions) and the Project Special Provision entitled “Falsework and Formwork”. The design calculations and detailed drawings of the structural components shall be signed and sealed by a North Carolina Registered Professional Engineer.

Submit design calculations and detailed drawings of temporary bents to the Engineer for review and approval. The detailed drawings shall show the position of the temporary bents in relationship to the existing travel way, the location of the temporary bents with respect to the ends of the girders, the top of support elevations for setting girders in the cambered position, and a girder erection procedure. For stream crossings, determine the bent stability assuming a scour depth equal to 250% of the pile diameter or width below the existing bed elevation. The Engineer may require a more detailed analysis of scour depth for temporary bents containing more than a single row of piles.

Include all material specifications for new and used materials in the detail drawings. In addition, show the location of the used materials indicating condition of the material, the location and geometry of existing but unused holes, attachments left over from previous use and any other irregularities in the material. Account for the condition of all used materials in the design calculations.

For all manufactured components, provide engineering data supplied by the manufacturer. For proprietary shoring systems, evaluate differential leg loading.

Provide access to all new and used materials for inspection prior to assembly.

Before the temporary bent is loaded, the contractor shall inspect the bent in the presence of the Engineer, and submit a written statement certifying that the erected bent complies with the approved detailed drawings. Any condition or material that does not comply with the accepted drawings, or any other condition deemed unsatisfactory by the Engineer, is cause for rejection until corrections are made.

Remove temporary bents in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. During removal do not disturb or otherwise damage the finished work.

ST-4

U-2524D

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Unless otherwise specified, temporary bents will not be directly measured. Payment will be full compensation at the contract unit prices for the various pay items requiring temporary bents.

PLACING LOAD ON STRUCTURE MEMBERS

(11-27-12)

The 2012 Standard Specifications shall be revised as follows:

In **Section 420-20 – Placing Load on Structure Members** replace the first sentence of the fifth paragraph with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 7 curing days.

STEEL REINFORCED ELASTOMERIC BEARINGS

(6-22-16)

The 2012 Standard Specifications shall be revised as follows:

In **Section 1079-2(A) – Elastomeric Bearings** add the following after the second paragraph:

Internal holding pins are required for all shim plates when the contract plans indicate the structure contains the necessary corrosion protection for a corrosive site.

Repair laminated (reinforced) bearing pads utilizing external holding pins via vulcanization. Submit product data for repair material and a detailed application procedure to the Materials and Tests Unit for approval before use and annually thereafter.

DISC BEARINGS

(2-3-14)

1.0 GENERAL

This item consists of furnishing, fabrication and installation of disc bearings in accordance with AASHTO LRFD Bridge Design Specifications, the Standard Specifications, the recommendations of the manufacturer, the details shown on the plans and as specified herein. Disc Bearings consist of a polyether urethane structural element (elastomeric disc) confined by upper and lower steel bearing plates. Equip disc bearings with a shear restriction mechanism (shear pin) to prevent movement of the disc. Supply disc bearings as fixed bearings and guided expansion bearings as designated by the Contract Documents.

Fixed disc bearings allow rotation but no longitudinal or transverse movement in the bearing plane. Fixed bearings consist of a steel sole plate, an elastomeric disc, a shear pin,

ST-5

U-2524D

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a steel upper bearing plate, a steel lower bearing plate, a steel masonry plate, a preformed bearing pad, anchor bolts, nuts and washers.

Guided expansion disc bearings allow rotation and only longitudinal movement in the bearing plane. Guided expansion disc bearings consist of a steel sole plate, a polished stainless steel sheet welded to the bottom of the sole plate within the sliding region, a steel upper bearing plate, a layer of virgin polytetrafluoroethylene (PTFE) material bonded to the top and sides of the upper plate within the sliding regions, guide bars welded to the bottom of the sole plate surrounding the sliding region to restrict transverse movement, polished stainless steel sheets welded to the sides of the guide bars within the sliding regions, an elastomeric disc, a shear pin, a steel lower bearing plate, a steel masonry plate, a preformed bearing pad, anchor bolts, nuts, washers, pipe sleeves, a closure plate, grout and various sizes of standard pipe, and any other necessary material as detailed on the plans. Align the stainless steel sheet on the bottom of the sole plate with the PTFE material on the top of the upper bearing plate. Align the PTFE material on the sides of the upper bearing plate with the stainless steel sheets on the sides of the guide bars.

2.0 MATERIALS

Use disc bearings produced by the same manufacturer.

Use AASHTO M270 Grade 50W (345W) or Grade 50 (345) for all steel plates except the stainless steel sheets in the disc bearings. Clean, coat, and seal the plates in the disc bearing assemblies except for the areas with special facings and the areas that come in contact with the elastomer disc, in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". The surfaces shall be coated to a thickness of 8 mils minimum on all external parts. Repair surfaces that are abraded or damaged after the application of metallizing in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)".

Provide anchor bolts and nuts in accordance with the Standard Specifications.

When the maximum plan dimension of the sheet is 12" or less, provide a stainless steel sheet in expansion disc bearings that is at least 16 gage or 1/16". When the maximum plan dimension is greater than 12", provide a stainless steel sheet that is at least 11 gage or 1/8". Ensure that all stainless steel sheets are in conformance with ASTM A240/A167 Type 304 and polished to a minimum #8 mirror surface finish.

Blast clean the surfaces of the steel sole plate and the steel guide bars that will be attached to the stainless steel sheets to a near white condition in accordance with the Standard Specifications. Position and clamp the back of the stainless steel sheets in contact with the steel sole plate and the steel guide bars. Apply the stainless steel sheets to the blast cleaned surfaces of the steel sole plate and the steel guide bars as soon as possible after blasting and before any visible oxidation of the blast cleaned surfaces occurs. Weld the stainless steel sheets continuously around the perimeter using a tungsten inert gas, wire-fed welder.

ST-6

U-2524D

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For the PTFE sheets bonded to the top and side sliding surfaces of the steel upper bearing plate, used as mating surfaces for the stainless steel sheets attached to the steel sole plate and the guide bars, provide an unfilled virgin PTFE sheet (recessed) or a glass-fiber filled PTFE sheet, resulting from skiving billets formed under hydraulic pressure and heat. Provide resin that conforms to the requirements of ASTM D4894 or D4895.

To bond the PTFE sheets and the steel upper bearing plate, use heat cured high temperature epoxy capable of withstanding temperature of -320°F to 500°F .

Weld the guide bars in expansion bearings to the bottom of the sole plate. Alternatively, integrate the guide bars and sole plate from the same piece of steel, ensuring that the required dimensions are provided. Provide 1/16" clearances between the stainless steel sheets attached to the side sliding surfaces of the guide bars and the PTFE sheet attached to the side sliding surface of the steel upper bearing plate.

Mold the polyether urethane structural element (elastomeric disc) from a polyether urethane compound. The top and bottom surfaces of the disc shall be roughened. Ensure that the physical properties of the polyether urethane conform to the following requirements:

Physical Property	ASTM Test Method	Requirements	
		Min.	Max.
Hardness, Type D Durometer	D2240	60	64
Tensile Stress psi At 100% elongation At 200% elongation	D412	2000 3700	-----
Tensile Strength psi	D412	5000	-----
Ultimate Elongation %	D412	220	-----
Compression Set % 22 hrs. at 158°F	D395	-----	40

3.0 DESIGN

Design the disc bearings for the loads and movements shown on the contract plans. However, use the anchor bolt size, length, spacing and masonry plate thickness as shown on the contract plans and provide an overall bearing height within $\frac{1}{2}$ inch of the bearing assembly height shown on the contract plans. Either combine and cast the sole plate and upper bearing plate (for fixed bearings), the sole plate and guide bars (for expansion bearings), and the lower bearing plate and masonry plate (for fixed and expansion bearings) as a single unit or weld together prior to the installation of the disc.

Ensure access and removal of anchor bolt nut is not in conflict with the upper bearing plate, guide bars or sole plate.

When designing the bearings, use the following allowable bearing stresses:

- On polyether urethane structural element: 5000 psi
- On PTFE Sliding Surface, filled or unfilled PTFE (recessed): 3500 psi

Submit eight sets of shop drawings and one set of design calculations for review, comments and acceptance. Have a North Carolina Registered Professional Engineer check and seal the shop drawings and design calculations.

After the Engineer reviews the drawings and, if necessary, corrections are made, submit one 22" x 34" reproducible set of the working drawings.

4.0 SAMPLING AND TESTING

A. Sampling

The manufacturer is responsible for randomly selecting and testing sample bearings from completed lots of bearings. The manufacturer is also responsible for certifying that the completed bearings and their components have been tested and are in compliance with the requirements of this Special Provision. The manufacturer shall furnish the results of the tests to the Materials and Tests Engineer.

B. Testing

1. Proof Load Test

Load a test bearing to 150% of the bearing's rated design capacity and simultaneously subject it to a rotational range of 0.02 radians (1.146°) for a period of 1 hour.

Have the bearing visually examined both during the test and upon disassembly after the test. Any resultant visual defects, such as extruded or deformed elastomer or PTFE, damaged seals or rings, or cracked steel is cause for rejection.

Keep continuous and uniform contact between the polyether urethane element and the bearing plates and between the stainless steel sheets and the PTFE sheets (for expansion bearings) for the duration of the test. Any observed lift-off or separation is cause for rejection.

2. Sliding Coefficient of Friction

For all guided expansion bearings, measure the sliding coefficient of friction at the bearing's design capacity in accordance with the test method described below, and on the fifth and fiftieth cycles, at a sliding speed of 1 in/min.

ST-8

U-2524D

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Calculate the sliding coefficient of friction as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's vertical design capacity.

The test results are evaluated as follows:

- A maximum measured sliding coefficient of friction of 3%.
- A visual examination both during and after the test. Any resultant visual defects, such as bond failure, physical destruction, cold flow of PTFE to the point of debonding, or damaged components is cause for rejection of the lot.

Using undamaged test bearings in the work is permitted.

3. Test Method

The test method and equipment shall meet the following requirements:

- a. Arrange the test to determine the coefficient of friction on the first movement of the manufactured bearing.
- b. Clean the bearing surface prior to testing.
- c. Conduct the test at maximum working stress for the PTFE surface with the test load applied continuously for 12 hours prior to measuring friction.
- d. Determine the first movement static and dynamic coefficient of friction of the test bearing at a sliding speed of less than 1 in/min, not to exceed:

0.04	unfilled	PTFE
0.08	filled PTFE	

- e. Subject the bearing specimen to 100 movements of at least 1 inch of relative movement and, if the test facility permits, the full design movement at a speed of less than 1 ft/min. Following this test determine the static and kinetic coefficient of friction again. The specimen is considered a failure if it exceeds the values measured in (d) above or if it shows any signs of bond failure or other defects.

Bearings represented by test specimens passing the above requirements are approved for use in the structure subject to on-site inspection for visible defects.

5.0 INSTALLATION

Store disc bearings delivered to the bridge site upright and under cover on a platform above the ground surface. Protect the bearings from injury at all times and, before placing the bearings, dry and clean all dirt, oil, grease or other foreign substances from the bearing. Do not disassemble the bearings during installation, except at the manufacturer's direction.

Lift bearing assemblies by their bottom surfaces only, unless lifting brackets that have been designed and approved by the manufacturer are used. Ensure that the polyether urethane disc is not exposed to direct flame or sparks. Place the bearings in accordance with the recommendations of the manufacturer, Contract Drawings, and as directed by the Engineer. If there is any discrepancy between the recommendations of the manufacturer, Special Provisions, and Contract Drawings, the Engineer is the sole judge in reconciling any such discrepancy.

Provide preformed bearing pads under the masonry plates in accordance with Article 1079-1 of the Standard Specifications.

Do not install any bearing before the Engineer approves it.

6.0 BASIS OF PAYMENT

Payment for all disc bearings will be at the lump sum contract price bid for “Disc Bearings” which includes full compensation for furnishing all disc bearings, labor, materials, tools, equipment, testing and incidentals required to complete the work in accordance with the Standard Specifications, this Special Provision, the manufacturer’s requirements and as directed by the Engineer.

THERMAL SPRAYED COATINGS (METALLIZATION)

(9-30-11)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces as specified herein when called for on the plans or by other Special Provisions, or when otherwise approved by the Engineer in accordance with the SSPC-CS 23.00/AWS C2.23/NACE No. 12 Specification. Only Arc Sprayed application methods are used to apply TSC coatings, the Engineer must approve other methods of application.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the following requirements:

1. The capability of blast cleaning steel surfaces to SSPC SP-5 and SP-10 Finishes.
2. Employ Spray Operator(s) qualified in accordance with AWS C.16/C2.16M2002 and Quality Control Inspector(s) who have documented training in the applicable test procedures of ASTM D-3276 and SSPC-CS 23.00.

A summary of the contractor’s related work experience and the documents verifying each Spray Operator’s and Quality Control Inspector’s qualifications are submitted to the Engineer before any work is performed.

ST-10

U-2524D

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3.0 MATERIALS

Provide wire in accordance with the metallizing equipment manufacturer's recommendations. Use the wire alloy specified on the plans which meets the requirements in Annex C of the SSPC-CS 23.00 Specification. Have the contractor provide a certified analysis (NCDOT Type 2 Certification) for each lot of wire material.

Apply an approved sealer to all metallized surfaces in accordance with Section 9 of SSPC-CS 23. The sealer must either meet SSPC Paint 27 or is an alternate approved by the Engineer.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Grind flame cut edges to remove the carbonized surface prior to blasting. Bevel all flame cut edges in accordance with Article 442-10(D) regardless of included angle. Blast clean surfaces to be metallized with grit or mineral abrasive in accordance with Steel Structures Painting Council SSPC SP-5/10(as specified) to impart an angular surface profile of 2.5 - 4.0 mils. Surface preparation hold times are in accordance with Section 7.32 of SSPC-CS 23. If flash rusting occurs prior to metallizing, blast clean the metal surface again. Apply the thermal sprayed coating only when the surface temperature of the steel is at least 5°F above the dew point.

At the beginning of each work period or shift, conduct bend tests in accordance with Section 6.5 of SSPC-CS 23.00. Any disbonding or delamination of the coating that exposes the substrate requires corrective action, additional testing, and the Engineer's approval before resuming the metallizing process.

Apply TSC with the alloy to the thickness specified on the plans or as provided in the table below. All spot results (the average of 3 to 5 readings) must meet the minimum requirement. No additional tolerance (as allowed by SSPC PA-2) is permitted. (For Steel Beams: For pieces with less than 200 ft² measure 2 spots/surface per piece and for pieces greater than 200 ft² add 1 additional spots/surface for each 500 ft²).

Application	Thickness	Alloy	Seal Coat
Pot Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Armored Joint Angles	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Modular Joints	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Expansion Joint Seals	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Optional Disc Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil

When noted on the plans or as specified in the above chart, apply the sealer to all metallized surfaces in accordance with the manufacturer's recommendations and these provisions. Apply the seal coat only when the air temperature is above 40°F and the surface temperature of the steel is at least 5°F above the dew point. If the sealer is not

ST-11

U-2524D

Guilford Co.

applied within eight hours after the final application of TSC, the applicator verifies acceptable TSC surfaces and obtains approval from the Engineer before applying the sealer.

5.0 INSPECTION FREQUENCY

The TSC Contractor must conduct the following tests at the specified frequency and the results documented in a format approved by the Engineer.

Test/Standard	Location	Frequency	Specification
Ambient Conditions	Site	Each Process	5°F above the dew point
Abrasive Properties	Site	Each Day	Size, angularity, cleanliness
Surface Cleanliness SSPC Vis 1	All Surfaces	Visual All Surfaces	SSPC-SP-10 Atmospheric Service SSPC-SP - 5 Immersion Service
Surface Profile ASTM D-4417 Method C	Random Surfaces	3 per 500 ft ²	2.5 - 4.0 mils
Bend Test SSPC-CS 23.00	Site	5 per shift	Pass Visual
Thickness SSPC PA-2R SSPC-CS 23.00	Each Surface	Use the method in PA-2 Appendix 3 for Girders and Appendix 4 for frames and miscellaneous steel. See Note 1.	Zn - 8 mils minimum Al - 8 mils minimum Zn Al - 8 mils minimum Areas with more than twice the minimum thickness are inspected for compliance to the adhesion and cut testing requirements of this specification.
Adhesion ASTM 4541	Random Surfaces Splice Areas	1 set of 3 per 500 ft ²	Zn > 500 psi Al > 1000 psi Zn Al > 750 psi
Cut Test - SSPC-CS 23.00	Random Surfaces	3 sets of 3 per 500 ft ²	No peeling or delamination
Job Reference Std. SSPC-CS 23.00	Site	1 per job	Meets all the above requirements

6.0 REPAIRS

All Repairs are to be performed in accordance with the procedures below, depending on whether the repair surface is hidden or exposed. As an exception to the following, field

ST-12

U-2524D

Guilford Co.

welded splices on joint angles and field welding bearing plates to girders may be repaired in accordance with the procedures for hidden surfaces.

For hidden surfaces (including but not limited to interior girders, interior faces of exterior girders, and below-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallizing at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.
2. Minor areas less than or equal to 0.1 ft² exposing the substrate are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."
3. Large areas greater than 0.1 ft² exposing the substrate are metallized in accordance with SSPC CS 23.00.
4. Damaged (burnished) areas not exposing the substrate with less than the specified coating thickness are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."
5. Damaged (burnished) areas not exposing the substrate with more than the specified coating thickness are not repaired.
6. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

For Exposed Surfaces (including but not limited to exterior faces of exterior girders and above-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallization at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.
2. All areas exposing the substrate are metallized in accordance with SSPC CS 23.00
3. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

ST-13

U-2524D

Guilford Co.

7.0 TWELVE MONTH OBSERVATION PERIOD

The contractor maintains responsibility for the coating system for a twelve (12) month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the engineer. The contractor must guarantee the coating system under the payment and performance bond (refer to Article 109-10). To successfully complete the observation period, the coating system must meet the following requirements after twelve(12) months service:

- No visible rust, contamination or application defect is observed in any coated area.
- Painted surfaces have a uniform color and gloss.
- Surfaces have an adhesion of no less than 500 psi when tested in accordance with ASTM D-4541.

8.0 BASIS OF PAYMENT

The contract price bid for the bridge component to which the coating is applied will be full compensation for the thermal sprayed coating.

ELASTOMERIC CONCRETE

(9-27-12)

1.0 DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate. Provide an elastomeric concrete and binder system that is preapproved. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

2.0 MATERIALS

Provide materials that comply with the following minimum requirements at 14 days (or at the end of the specified curing time).

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi	ASTM D695	2000
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength, psi	ASTM D3967	625
Bond Strength to Concrete, psi	ASTM D882 (D882M)	450
Durometer Hardness	ASTM D2240	50

ST-14

U-2524D

Guilford Co.

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D638	1000
Ultimate Elongation	ASTM D638	150%
Tear Resistance, lb/in	ASTM D624	200

In addition to the requirements above, the elastomeric concrete must be resistant to water, chemical, UV and ozone exposure and withstand temperature extremes. Elastomeric concrete systems requiring preheated aggregates are not allowed.

3.0 PREQUALIFICATION

Manufacturers of elastomeric concrete materials shall submit samples (including aggregate, primer and binder materials) and a Type 3 certification in accordance with Article 106-3 of the Standard Specifications for prequalification to:

North Carolina Department of Transportation
Materials and Tests Unit
1801 Blue Ridge Road
Raleigh, NC 27607

Prequalification will be determined for the system. Individual components will not be evaluated, nor will individual components of previously evaluated systems be deemed prequalified for use.

The submitted binder (a minimum volume of 1 gallon) and corresponding aggregate samples will be evaluated for compliance with the Materials requirements specified above. Systems satisfying all of the Materials requirements will be prequalified for a one year period. Before the end of this period new product samples shall be resubmitted for prequalification evaluation.

If, at any time, any formulation or component modifications are made to a prequalified system that system will no longer be approved for use.

4.0 INSTALLATION

The elastomeric concrete shall not be placed until the reinforced concrete deck slab has cured for seven full days and reached a minimum strength of 3000 psi.

Provide a manufacturer's representative at the bridge site during the installation of the elastomeric concrete to ensure that all steps being performed comply with all manufacturer installation requirements including, but not limited to weather conditions (ambient temperature, relative humidity, precipitation, wind, etc), concrete deck surface preparation, binder and aggregate mixing, primer application, elastomeric concrete placement, curing

ST-15

U-2524D

Guilford Co.

conditions and minimum curing time before joint exposure to traffic. Do not place elastomeric concrete if the ambient air or surface temperature is below 45°F.

Prepare the concrete surface within 48 hours prior to placing the elastomeric concrete. Before placing the elastomeric concrete, all concrete surfaces shall be thoroughly cleaned and dry. Sandblast the concrete surface in the blockout and clear the surface of all loose debris. Do not place the elastomeric concrete until the surface preparation is completed and approved.

Prepare and apply a primer, as per manufacturer's recommendations, to all concrete faces to be in contact with elastomeric concrete, and to areas specified by the manufacturer.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within 2 hours after applying the primer. Trowel the elastomeric concrete to a smooth finish.

The joint opening in the elastomeric concrete shall match the formed opening in the concrete deck prior to sawing the joint.

5.0 FIELD SAMPLING

Provide additional production material to allow freshly mixed elastomeric concrete to be sampled for acceptance. A minimum of six 2 inch cube molds and three 3x6 inch cylinders will be taken by the Department for each day's production. Compression, splitting tensile, and durometer hardness testing will be performed by the Department to determine acceptance. Materials failing to meet the requirements listed above are subject to removal and replacement at no cost to the Department.

6.0 BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Foam Joint Seals" will be full compensation for furnishing and placing the Elastomeric Concrete.

FOAM JOINT SEALS

(9-27-12)

1.0 SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable, foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

ST-16

U-2524D

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Use seals manufactured with grooves $1/8'' \pm$ wide by $1/8'' \pm$ deep and spaced between $1/4''$ and $1/2''$ apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than $1/4''$. Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D3575-08, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	$< 0.03 \text{ lb/ft}^2$
Elongation at Break	ASTM D3575	180% - 210%
Tear Strength	ASTM D624 (D3575-08, Suffix G)	14 – 20 pli
Density	ASTM D3575-08, Suffix W, Method A	$1.8 - 2.2 \text{ lb/ft}^3$
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint seals upon receipt to ensure that the marks are clearly visible before installation.

2.0 BONDING ADHESIVE

Use a two component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3000 psi (min.)
Compressive strength	ASTM D695	7000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

3.0 SAWING THE JOINT

The joint opening shall be initially formed to the width shown on the plans including the blockout for the elastomeric concrete.

The elastomeric concrete shall have sufficient time to cure such that no damage can occur to the elastomeric concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus 1/4" above the top of the seal plus approximately 1" below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

4.0 PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete shall cure a minimum of 24 hours prior to seal installation.

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

ST-18

U-2524D

Guilford Co.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

5.0 SEAL INSTALLATION

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

Before installing the joint seal, check the uninstalled seal length to insure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a teflon heating iron of 425-475°F for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. After opening both cans of the bonding agent, stir each can using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the elastomeric concrete as well as both sides of the joint seal, making certain to completely fill the grooves with epoxy. With gloved hands, compress the joint seal and with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately 1/4" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval. Do not place pavement markings on top of foam joint seals.

6.0 BASIS OF PAYMENT

Payment for all foam joint seals will be at the lump sum contract price bid for “Foam Joint Seals”. Prices and payment will be full compensation for furnishing all material, including elastomeric concrete, labor, tools and equipment necessary for installing these units in place and accepted.

EXPANSION JOINT SEALS

(9-30-11)

1.0 General

The work covered by this Special Provision consists of furnishing and installing the expansion joint seals as shown on the contract drawings. All materials, labor, equipment and incidentals necessary for the proper installation of the expansion joint seals are included.

2.0 Material

Provide expansion joint seals capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans.

Provide an elastomeric component for each expansion joint seal that is a continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. The minimum length of an elastomeric component before shop splicing is 20 feet. However, one piece shorter than 20 feet is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Make sure the convolution of the gland does not project above the top of the hold-down plates when the joint opening is in the most compressed condition. Use either elastic polychloroprene (neoprene) or ethyl propylene diene monomer (EPDM) for the elastomer that meets the following minimum properties:

ST-20

U-2524D

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	ASTM TEST METHOD	REQUIREMENTS
Hardness, Durometer - Shore A	D2240	<p>60 ± 5, Neoprene (upward corrugated shape - fabric reinforced)</p> <p>75 ± 5, EPDM and Neoprene (upward non-corrugated shape)</p> <p>80 ± 5, EPDM (upward corrugated shape-fabric reinforced)</p>
Tensile Strength	D412	2000 psi (min.)
Elongation at Break	D412	250% (min.)
Width of Gland in Relaxed Condition	N/A	10" ± 0.25"

Thickness of Upturned portion of gland	N/A	0.25" non-corrugated shape, -0.032" to +0.032"
Thickness of Upturned portion of gland	N/A	0.1875" corrugated shape, -0.032" to +0.032"
Thickness of Flat portion of gland	N/A	0.1563", -0.032" to +0.032"

For fabric reinforced glands, submit one unreinforced sample per lot number, up to 500 feet of Expansion Joint Seal, to the Engineer for testing.

Only field splice hold-down plates at crown points, at abrupt changes in the deck slab cross slope, and on lane lines. Splicing within travel lanes is not permitted and splicing on edge lines is not required. Field splice hold-down plates between the edge line and gutter upturn and where necessary for proper installation and alignment is permitted. Show all splice locations on the working drawings for approval. For the location of lane markings at the expansion joint seal, see the Structure plans. At the splice locations, locate the hold-down bolts 3 inches from the end of the hold-down plate. At splice locations where changes in

deck slab cross slope occur, cut the ends of hold-down plates parallel to the bridge centerline for skews less than 80° and greater than 100°.

Do not use welded shop splices in hold-down plates.

3.0 Shop Drawings

Submit nine sets of working drawings to the Engineer for review, comments and acceptance. Show complete details drawn to scale and include:

The proposed template details including the makeup of the template

The proposed method of holding the base angle assembly in place while concrete is cast around it

The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening

The proposed chronology of installation including the sequence and direction of the concrete casting

The details of cross connectors between base angles, such as steel bars with slots bolted to angles, to maintain evenness between the adjacent base angles while accommodating movement that occurs when concrete is cast. Indicate when bolts are loosened to allow movement.

The proposed method for removing the hold-down plate

A section detail through the joint showing horizontal offset dimensions of the base angles from the centerline joint. This detail is required when the vertical face of the joint opening is not perpendicular to the roadway surface (e.g. when the roadway grade is significant).

Have someone other than the one who prepares the drawing check all detailed drawings and include the signatures of both the drafter and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor. Provide all completed drawings well in advance of the scheduled installation time for the expansion joint seal.

4.0 Installation

Provide supports for the base angle assembly at a maximum spacing of 9 feet. Place supports near field splices of base angles to ensure that field splices are straight and even. Provide base angles with ½" diameter weep holes at 12 inch centers to allow bleeding of trapped air and/or water. Do not obstruct the weep holes with falsework. Make the bottom of the trough parallel to grade and the sides parallel to the sides of the expansion joint seal.

For damaged areas, depressions, spalls, cracks, or irregularities of curbs or decks adjacent to the expansion joint, submit a proposed method of repair and repair material specifications for approval.

If the Engineer deems any aspects of the expansion joint seals unacceptable, make necessary corrections.

5.0 Inspection

When concrete is cast, use a non-aluminum, 10 foot, true to line straight edge to check and grade the top of the slab on each side of the joint to ensure smooth transition between spans.

Watertight Integrity Test

Upon completion of an expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalks, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.

Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not a sign of leakage.

If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no extra cost to the Department.

6.0 Basis of Payment

Basis of payment for all expansion joint seals will be at the lump sum contract price for "Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including any steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the expansion joint seal in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

U-2524D

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SOUND BARRIER WALL

(SPECIAL)

1.0 DESCRIPTION

This work consists of furnishing precast panels, structural steel, concrete, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, pile excavation, backfilling, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision.

The Standard Plans allow a pile spacing of 10, 15 or 20 feet. Pile spacing greater than 15 feet will not be allowed for standard precast concrete panels. Provide consistent pile spacing the entire length of the wall. Use odd pile spacing, if necessary, only at the ends of the wall and at turning points as approved by the Engineer.

A maximum one foot drop or rise in elevation between wall sections is permitted. Elevation changes greater than one foot, if necessary, will be allowed only at the end of the wall. Top of wall elevation changes that result in a jagged appearance will not be allowed.

2.0 ALTERNATE PILE SPACING FOR STANDARD PRECAST PANELS

As an alternate, the Contractor may submit plans for pile spacing greater than 10 feet and less than 15 feet for review and approval. The excavated diameter, excavation depth and reinforcing steel shall be equal to the amount shown on the existing plans for the 15 feet pile spacing. A variance in the reinforcing steel will be allowed for the length of horizontal and number of vertical reinforcement bars in the precast panel for the alternate pile spacing.

Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of required reinforcement necessary to fabricate the precast panels. Have a North Carolina Registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

3.0 ALTERNATE WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for substitution to the detailed Standard Sound Barrier Wall only when noted on the plans. Alternate wall types, piles and pile spacing must meet the design and construction requirements of the project. Pile spacing greater than 20 feet will not be permitted. Alternate pile and wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications.

Prior to submittal of Working Drawings, as described herein, submit a copy of the signed NCDOT Product Status Notification Letter and two sets of preliminary plans for review and approval. Include material specifications for all components. Once preliminary plans are approved, submit Working Drawings in accordance with all applicable portions of the

requirements herein, including details necessary to fabricate and construct the proposed alternate.

Have a North Carolina Registered Professional Engineer check, seal and date the plans and, when requested, calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

4.0 MATERIALS AND FABRICATION OF STANDARD PRECAST PANELS

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures.

Provide precast panels that are 4 inches \pm 1/4 inch thick with an exposed aggregate finish on one face. The panel face with the aggregate finish shall be installed facing the roadway. The depth of the exposure is required to range from 0 to 1/4 inch. Furnish three 12" x 12" samples for approval which establish the acceptable variations in color, texture, and uniformity. After the color, texture, and uniformity of the furnished samples are approved, produce a full scale panel unit meeting design requirements. This mock-up and the furnished samples establish the standard quality for determining acceptance of the panels. When producing the final installed panels, use fine and coarse aggregate, retarder, and cement from the same source as those used in the approved sample panels.

5.0 CONSTRUCTION METHODS

Complete the final survey of existing ground profile after clearing the wall area but prior to submitting any working drawings. Submit the final groundline survey with the working drawings.

If the Department is responsible for the survey, the Engineer field verifies the existing ground profile along the sound barrier wall. Contact the Engineer to obtain the survey information. Otherwise, complete the existing ground survey prior to submittal of working drawings.

Excavate holes with the diameters shown on the plans. Perform pile excavation to the depths shown on the plans and install piles as shown on the plans or in the accepted submittals with a tolerance of 1/2 inch per foot from vertical. Backfill excavations with concrete after placing piles.

A. Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance the excavation. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the Standard Specifications and as directed by the

Engineer. Drilling spoils consist of all excavated material including water removed from the excavation either by pumping or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize excavations with either slurry or steel casing. When using slurry, submit slurry details including product information, manufacturer's recommendations for use, slurry equipment information and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casing, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of 1/4 inch.

B. Concrete Placement

Before placing concrete, center and support the pile in the excavation and check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6 inches per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6 inches per half hour, propose a concrete placement procedure to the Engineer. The Engineer shall approve the concrete placement procedure before placing concrete.

Fill the excavation with Class A concrete in accordance with Section 1000 of the Standard Specifications except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner and remove all casings.

6.0 WORKING DRAWINGS

Submit casting drawings for the precast face panels for approval in accordance with Article 1077-2 of the Standard Specifications prior to casting. Show the inserts, method of handling, and support details used for transportation on casting drawings. Submit metalwork fabrication drawings for approval prior to fabrication of steel wall components. Submit an erection plan and concrete face panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of metalwork. Submit five sets of detail drawings.

7.0 METHOD OF MEASUREMENT

The quantity of sound barrier wall to be paid will be the actual square feet of completed and accepted wall. In any individual section of sound barrier wall or in comparably dimensioned sections, the wall height is from the bottom of the bottom panel to the top of the top panel and the width is the distance between the centerline of the piles at the ends of the section. Include the full width of the piles at the ends of the wall.

8.0 BASIS OF PAYMENT

The quantity of sound barrier wall, measured as provided above, will be paid for at the contract unit price bid per square foot for “Sound Barrier Wall No._____”.

The unit price bid per square foot will be full compensation for all work covered by this Special Provision including, but not limited to, furnishing precast panels, steel or concrete piles, miscellaneous structural steel, concrete, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, backfilling, pile excavation including any casing or slurry, and erecting and installing the sound barrier wall members.

Payment will be made under:

Sound Barrier Wall No._____ Square Foot

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. Screenshot 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.

ST-28

U-2524D

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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

ST-30

U-2524D

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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)
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

(6-19-15)

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 Engineer. Either the Structures Management 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 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 Engineer, Structures Management 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 Structures Management Unit, use the following addresses:

Via US mail:

Mr. T. K. Koch, 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. T. K. Koch, 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)

mrorie@ncdot.gov (Madonna Rorie)

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:

ST-34

U-2524D

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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 Structures Management Unit can be viewed from the Unit's web site, via the "Drawing Submittal Status" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: Paul Lambert (919) 707 – 6407
(919) 250 – 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts: James Gaither (919) 707 – 6409
Madonna Rorie (919) 707 – 6508

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
ewilliams3@ncdot.gov

3.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers "Geotechnical Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

ST-35

U-2524D

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Unless otherwise required, submit one set of supporting calculations to either the Structures Management 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 Structures Management 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

ST-36

U-2524D

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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
Disc Bearings ⁴	8	0	“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
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”

ST-37

U-2524D

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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 Structures Management 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 Structures Management 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)

ST-38

U-2524D

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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 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:
https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx
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. **Crane 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.

ST-40

U-2524D

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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.

ST-41

U-2524D

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EMBEDDED CLIPS FOR PRESTRESSED CONCRETE GIRDERS

(6-22-16)

The 2012 Standard Specifications shall be revised as follows:

Replace Section **420-3(D) – Forms for Concrete Bridge Decks**, Subsection **(2) – Fabricated Metal Stay-In-Place Forms**, criterion **(j)** with the following:

Weld metal stay-in-place forms for prestressed concrete girders to embedded clips in the girder flanges. The embedded clips shall be at least 2" x 3" and 2" long. The clips shall be galvanized, 10-gauge ASTM A653 steel and have a 3/4" or 1" diameter hole in the 2" leg. The spacing of the clips shall be 12". All submitted metal stay-in-place form designs shall be able to use the standard size and spacing of the clip described above.

VINYL COATED CHAIN LINK FENCE, 79" FABRIC

(SPECIAL)

1.0 GENERAL

Furnish and erect chain link fence in accordance with the details and locations shown in the contract plans, this Special Provision, and the Standard Specifications.

2.0 MATERIALS

All fence materials shall be black vinyl coated and meet the requirements of Section 1050 of the Standard Specifications. Any damage to the vinyl coated surfaces of the fencing materials shall be repaired according to the manufacturer's instructions at the direction of the Engineer and at the Contractor's expense.

3.0 MEASUREMENT AND PAYMENT

The quantity of chain link fence will be measured and paid as the actual number of linear feet of chain link fence, measured from end post to end post, that has been completed and accepted. All posts used for the chain link fence are included in the price of the fence and will not be paid for separately. No separate payment will be made for installing adhesive anchors in the concrete parapet as such work is considered incidental.

The unit bid per linear foot will be full compensation for all items required to furnish and erect chain link fence including, but not limited to, chain link fabric, tie wires, stretcher bars, stretcher bar bands, tie rods, turnbuckles, brace rails, posts, post caps, brackets, adhesive anchors, fittings and any other materials, painting, tools, labor, equipment and incidentals necessary to complete this item.

Payment will be made under:

Vinyl Coated Chain Link Fence, 79" FabricLinear Foot

ST-42

U-2524D

Guilford Co.

CONCRETE BARRIER RAIL WITH MOMENT SLAB

(1-17-12)

1.0 GENERAL

Construct concrete barrier rail connected to moment slabs to resist traffic impact above retaining walls. Construct concrete barrier rail with moment slab in accordance with the contract and accepted submittals.

2.0 MATERIALS

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Barrier Delineators	1088-2
Portland Cement Concrete	1000
Reinforcing Steel	1070

Use Class AA concrete for concrete barrier rail and Class A concrete for moment slabs. Provide epoxy coated reinforcing steel that meets Article 1070-7 of the *Standard Specifications* for concrete barrier rail.

3.0 CONSTRUCTION METHODS

Construct concrete barrier rail with moment slab in accordance with the plans and accepted submittals. Construct cast-in-place reinforced concrete moment slabs in accordance with Section 420 of the *Standard Specifications* and concrete barrier rail in accordance with Subarticle 460-3(C) of the *Standard Specifications*. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi.

4.0 MEASUREMENT AND PAYMENT

Concrete Barrier Rail with Moment Slab will be measured and paid in linear feet. Concrete barrier rail with moment slab will be measured as the length of concrete barrier rail above retaining walls. The contract unit price for *Concrete Barrier Rail with Moment Slab* will be full compensation for submittals, labor, tools, equipment and concrete barrier rail with moment slab materials, excavating, backfilling, hauling and removing excavated materials and supplying any incidentals necessary to construct concrete barrier rail with moment slab.

Payment will be made under:

Pay Item	Pay Unit
Concrete Barrier Rail with Moment Slab	Linear Foot

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-13)

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.

<u>PERMIT</u>	<u>AUTHORITY GRANTING THE PERMIT</u>
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, NCDEQ 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.

NOTE: This permit approval only applies to work Sites 1 – 10.



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

July 15, 2016

Regulatory Division/1200A

Action ID No. SAW-2001-21125

COPY

Mr. Philip S. Harris III, P.E., C.P.M.
Natural Environment Section Head
North Carolina Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Reference the Department of the Army (DA) permit issued on August 1, 2013, to Mr. Gregory J. Thorpe, of the North Carolina Department of Transportation (NCDOT) for impacts associated with the new location project identified as U-2524CD. The project is a 4.8 mile, six-lane divided facility on new location extending from north of SR 2176 (Bryan Boulevard) to SR 2303 (Lawndale Drive) in Greensboro, Guilford County, North Carolina. Section C of this project begins immediately north of SR 2176 (Bryan Boulevard) and terminates immediately east of US220 (Battleground Avenue) and Section D begins immediately east of Battleground Avenue and ends at SR 2303 (Lawndale Drive). The site contains a portion of Horsepen Creek, fifteen (15) unnamed tributaries to Horsepen Creek, a portion of Richland Creek, five (5) unnamed tributaries to Richland Creek, and fifteen (15) adjacent wetland areas in the Cape Fear River Basin (8-Digit Cataloging Unit 03030002).

Total impacts authorized by the permit, as well as subsequent permit modifications dated March 25, 2014, June 6, 2014, June 19, 2015, and October 7, 2015 include: 1) the permanent placement of fill material into 7,717 linear feet of jurisdictional stream channel and 6.16 acres of adjacent riparian wetlands and 2) the temporary placement of fill material into 518 linear feet of jurisdictional stream channel and 0.63 acre of adjacent riparian wetlands. Compensatory mitigation was implemented for the unavoidable impacts by payment into the North Carolina Ecosystem Enhancement Program, now known as the North Carolina Division of Mitigation Services.

Also reference your permit modification request letter dated May 12, 2016 (received May 31, 2016), and "Modification to Request for Modification" letter submitted by e-mail and dated July 11, 2016, proposing the following:

- 1) Release of Section D of TIP U-2524 for construction per Special Condition 20 of the DA permit issued on August 1, 2013;
- 2) Authorization of permanent discharge of fill material into 5,258 linear feet of stream channel related to:
 - a. Placing 5,116 linear feet of stream channel in culverts and other fills resulting in permanent loss of waters, and;
 - b. Adding rip rap bank stabilization to 142 linear feet of stream channel;
- 3) Authorization of temporary discharge of fill material in 264 linear feet (0.06 acre) of stream channel related to:
 - a. Disturbing 174 linear feet (0.04 acre) of stream channel for temporary construction access and dewatering, and;
 - b. Disturbing 90 linear feet (0.02 acre) of stream channel associated with the installation of an 8" and 12" sanitary sewer line;
- 4) Authorization of indirect impacts to 780 linear feet of stream channel, resulting in reduced aquatic function from "isolating" a 780 linear foot reach of stream channel between two long culvert segments.

Note that your modification request letter, dated May 12, 2016, was advertised to the public as well as relevant Federal and State agencies on June 1, 2016, for a 30-day Public Notice period. Following evaluation of the information submitted in your modification request, comments made during the agency Public Notice period, and the revised modification request provided via e-mail on July 11, 2016, the U.S. Army Corps of Engineers, Wilmington District has determined that it is appropriate and reasonable and not contrary to the public interest. Therefore, the permit is modified to release the D section of U-2524 for construction, including the requested additional stream impacts. This work must be constructed as follows:

- 1) for U-2524D Permit Sites 1, 2, 3, 3A, 4, 5, 6, 7, 8 and 9, as shown on the Wetland & Stream Impacts drawings for U-2524D (Permit Drawings Sheets 1-17) submitted in the "Request for Modification Letter..." dated May 12, 2016;
- 2) for U-2524D Permit Sites 9 and 10, as shown on Permit Drawings Sheets 18, 19, and 25 (Revised 7/11/2016) submitted in the "Modification to Request for Modification" letter dated July 11, 2016, and;
- 3) for U-2524D utility Sites 1, 2, 3, 4, 5, and 6 as shown on the Utility Sheets 1-4 for U-2524D, included in the "Request for Modification Letter..." dated May 12, 2016.

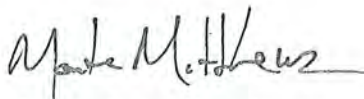
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In addition, the following special condition regarding additional compensatory mitigation has been incorporated:

x) 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.

All other conditions of the permit, including the permit expiration date of December 31, 2018, remain in effect as written. The U-2524CD project now totals permanent impacts to 8,371 linear feet of jurisdictional stream channel and 6.16 acres of adjacent riparian wetlands, 2) the temporary placement of fill material into 702 linear feet of jurisdictional stream channel and 0.63 acre of adjacent riparian wetlands, and 3) indirect impacts to 780 linear feet of stream channel. Should you have questions, contact Mr. David E. Bailey, Raleigh Regulatory Field Office at telephone (919) 554-4884, Extension 30.

Sincerely,



 Kevin P. Landers Sr.
Colonel, U.S. Army
District Commander

Enclosures

Copies Furnished with enclosures:

Mr. Brian Wrenn
Transportation Permitting Unit
Division of Water Resources
North Carolina Department of Environment and Natural Resources
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Ms. Erin Cheely
North Carolina Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Mr. Jerry Parker
Division Environmental Supervisor, Division 7
North Carolina Department of Transportation
Post Office Box 14996
Greensboro, North Carolina 27415

Copies Furnished without enclosures:

Mr. Rodger Rochelle, P.E.
Technical Services Administrator
North Carolina Department of Transportation
1516 Mail Service Center
Raleigh, North Carolina 27699-1516

Mr. Pete Benjamin
U.S. Fish and Wildlife Services
Fish and Wildlife Enhancement
Post Office Box 33726
Raleigh, North Carolina 28516

Ms. Cynthia Van Der Wiele
U.S. Environmental Protection Agency
Region 4 NEPA Program Office
C/o USEPA-RTP
109 T.W. Alexander Drive
Mail Code: E143-08
Research Triangle Park, North Carolina 27709

Mr. Travis Wilson
North Carolina Wildlife Resources Commission
1718 Hwy 56 West
Creedmoor, North Carolina 27522



July 14, 2016

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the proposed Greensboro Western Loop from north of SR 2176 (Bryan Boulevard) to SR 2303 (Lawndale Drive) in Guilford County, Division 7; Federal Aid Project No. STP-NHF-124(1), WBS Element 34820.1.2, TIP Project No. U-2524 C and D. NCDWR Project No. 20130223 v.6

Dear Mr. Harris:

Attached hereto is a modification of Certification No. 3965 issued to The North Carolina Department of Transportation (NCDOT) dated July 2, 2013 and subsequent modifications dated April 15, 2014, June 25, 2015, October 12, 2015, and July 8, 2016.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

ra S. Jay Zimmerman, Director
Division of Water Resources

Attachments

Electronic copy only distribution:

- David Bailey, US Army Corps of Engineers, Raleigh Field Office
- Jerry Parker, Division 7 Environmental Officer
- Rodger Rochelle, NC Department of Transportation
- Erin Cheely, NC Department of Transportation
- Dr. Cynthia Van Der Wiele, US Environmental Protection Agency
- Gary Jordan, US Fish and Wildlife Service
- Travis Wilson, NC Wildlife Resources Commission
- Beth Harmon, Division of Mitigation Services
- File Copy

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act
with
ADDITIONAL CONDITIONS**

THIS CERTIFICATION 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 Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact an additional 838 linear feet of jurisdictional streams in Guilford County. The project shall be constructed pursuant to the application dated received July 11, 2016. The authorized impacts are as described below:

Table 1. Site Number Key

Site Number	Original Application (July 2, 2013)	Modification Application (May 12, 2016)
1	--	1
2	1	2
3A	--	3A
3	2	3
4	3	4
5	4	5
6	5	6
7	6	7
8	--	8
9	7	9
10	--	10

Table 2. Stream Impacts in the Cape Fear River Basin

Site Number	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	15	15	--	--	30	--
Original approved impacts at Site 1*	--	--	393	10	403	393
New additional impacts at Site 2	--	--	21	--	21	21
Total Impacts with this approval at Site 2	--	--	414	10	424	414
Original approved impacts at Site 2*	--	--	919	10	929	919
New additional impacts at Site 3	158	--	-57	--	101	-57
Total Impacts with this approval at Site 3	158	--	862	10	1,030	862
3A	96	--	--	--	96	--
Original approved impacts at Site 3*	--	--	1,488	10	1,498	1,488
New additional impacts at Site 4	--	--	93	2	95	93
Total Impacts with this approval at Site 4	--	--	1,581	12	1,593	1,581
Original approved impacts at Site 4*†	--	--	1,253	20	1,273	1,253

Site Number	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
New additional impacts at Site 5			-61	23	-38	-61
Total Impacts with this approval at Site 5	--	--	1,192	43	1,235	1,192
Original approved impacts at Site 5*	141	10	--	--	151	--
New additional impacts at Site 6	17	6	--	--	23	--
Total Impacts with this approval at Site 6	158	16	--	--	174	--
Original approved impacts at Site 6*	--	--	311	10	321	311
New additional impacts at Site 7	--	--	3	--	3	3
Total Impacts with this approval at Site 7	--	--	314	10	324	314
8	--	--	46	18	64	--
Original approved impacts at Site 7*	--	--	99	10	109	99
New additional impacts at Site 9			289	10	299	289
Total Impacts with this approval at Site 9	--	--	388	20	408	388
10	--	--	34	20	54	--
Total Original Impacts	141	10	4,463	70	4,684	4,463
Total Additional Impacts	286	21	368	73	748	288
Total Impacts	427	31	4,831	143	5,432	4,751

Total Stream Impact for R-2524D: 5,755 linear feet.

Notes: * See Table 1 for explanation of site numbers.

† Impacts reflect the sum of impacts at site 4 in the original certification.

Table 3. Utility Impacts to Streams in the Cape Fear River Basin

Site	Permanent Impacts (linear Feet)	Temporary Impacts (linear feet)	Impacts Requiring Mitigation (linear feet)
U1	--	15	--
U2	--	15	--
U3	--	15	--
U4	--	15	--
U5	--	15	--
U6	--	15	--
Total Impacts	--	90	--

Total Utility Impacts for Modification: 90 linear feet.

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received May 12, 2016 and additional information dated received June 16, 2016. Should your project change, you are required to 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. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

Project Specific Conditions

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions of certification associated with the original Water Quality Certification dated July 2, 2013 and subsequent modifications dated April 15, 2014, June 25, 2015, October 12, 2015, and July 8, 2016 still apply except where superseded by this certification.
2. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand the potential issues with stream and pipe alignment at the permitted site. NCDWR staff shall be invited to the pre-construction meeting. [15A NCAC 02H.0506(b)(2) and (b)(3)]
- * 3. Two copies of the final construction drawings shall be furnished to the NCDWR Central Office prior to the pre-construction meeting. The permittee shall provide written verification that the final construction drawings comply with the permit drawings contained in the application dated May 12, 2016 and additional information dated received June 16, 2016. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Resources.
4. Channel relocations shall be completed and stabilized, and approved on site by NCDWR staff, prior to diverting water into the new channel. Stream banks shall be matted with coir-fiber matting. Vegetation used for bank stabilization shall be limited to native riparian vegetation, and should include establishment of a vegetated buffer on both sides of the relocated channel to the maximum extent practical. Also, rip-rap may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. Once the stream has been turned into the new channel, it may be necessary to relocate stranded fish to the new channel to prevent fish kills. [15A NCAC 02H .0506(b)(3)]
5. No drill slurry or water that has been in contact with uncured concrete shall be allowed to enter surface waters. This water shall be captured, treated, and disposed of properly. [15A NCAC 02H .0506(b)(3)]
6. 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. [15A NCAC 02H.0506(b)(2)]
7. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage. [15A NCAC 02H.0506(b)(2)]
8. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed. [15A NCAC 02H.0506(b)(2)]

9. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species. [15A NCAC 02H.0506(b)(2)]
- * 10. Compensatory mitigation for 4,751 linear feet of impact to streams at a 1:1 ratio is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Division of Mitigation Service (DMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in a letter dated May 9, 2016 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the DMS Mitigation Banking Instrument signed June 14, 2016.
11. In accordance with commitments made in your application, all clearing of vegetation for purpose of relocating overhead power lines within jurisdictional wetlands shall be performed without the use of mechanized equipment. [15A NCAC 02H.0506(b)(3)]
12. The permittee shall use *Design Standards in Sensitive Watersheds* [15A NCAC 4B.0124(b)-(e)] through the entire project. However, due to the size of the project, the NCDOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres.
13. The NCDOT shall design, construct, and operate and maintain hazardous spill catch basins (HSCBs) for crossings in the Lake Brandt Critical Area watershed. The HSCBs shall be located at Station numbers – RPDY4- STA. 1+70 to STA. 5+00 LT and –L- STA. 443+75 to STA. 446+00 LT.

General Conditions

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 NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02B.0200]
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. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02H.0506(b)(2)]
- * 6. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]
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 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. [15A NCAC 02H.0506(b)(3) and (c)(3)]
8. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream. [15A NCAC 02H.0506(b)(3)]

P-11

9. 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. [15A NCAC 02H.0506(b)(3)]
10. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification. [15A NCAC 02H.0506(b)(3)]
11. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]
12. 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. [15A NCAC 02B.0200]
13. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification. [15A NCAC 02H.0506(b)(2)]
14. 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. [15A NCAC 02H .0507(c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]
15. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization, including all non-commercial borrow and waste sites associated with the project, shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification. [15A NCAC 02H.0501 and .0502]
16. 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.
17. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery. [15A NCAC 02B.0506(b)(2)]
- * 18. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer 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. [15A NCAC 02H.0502(f)]
19. Native riparian vegetation 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. [15A NCAC 02B.0506(b)(2)]
20. 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. [15A NCAC 02H.0506(b)(3) and (c)(3)]
21. 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 in order to protect surface waters standards [15A NCAC 02H.0506(b)(3) and (c)(3)]:
 - a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
 - b. The 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.
 - c. 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*.

P-12

- d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.
22. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification. [15A NCAC 02H.0506(b)(3) and (c)(3)]
23. Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

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 DEQ as follows:

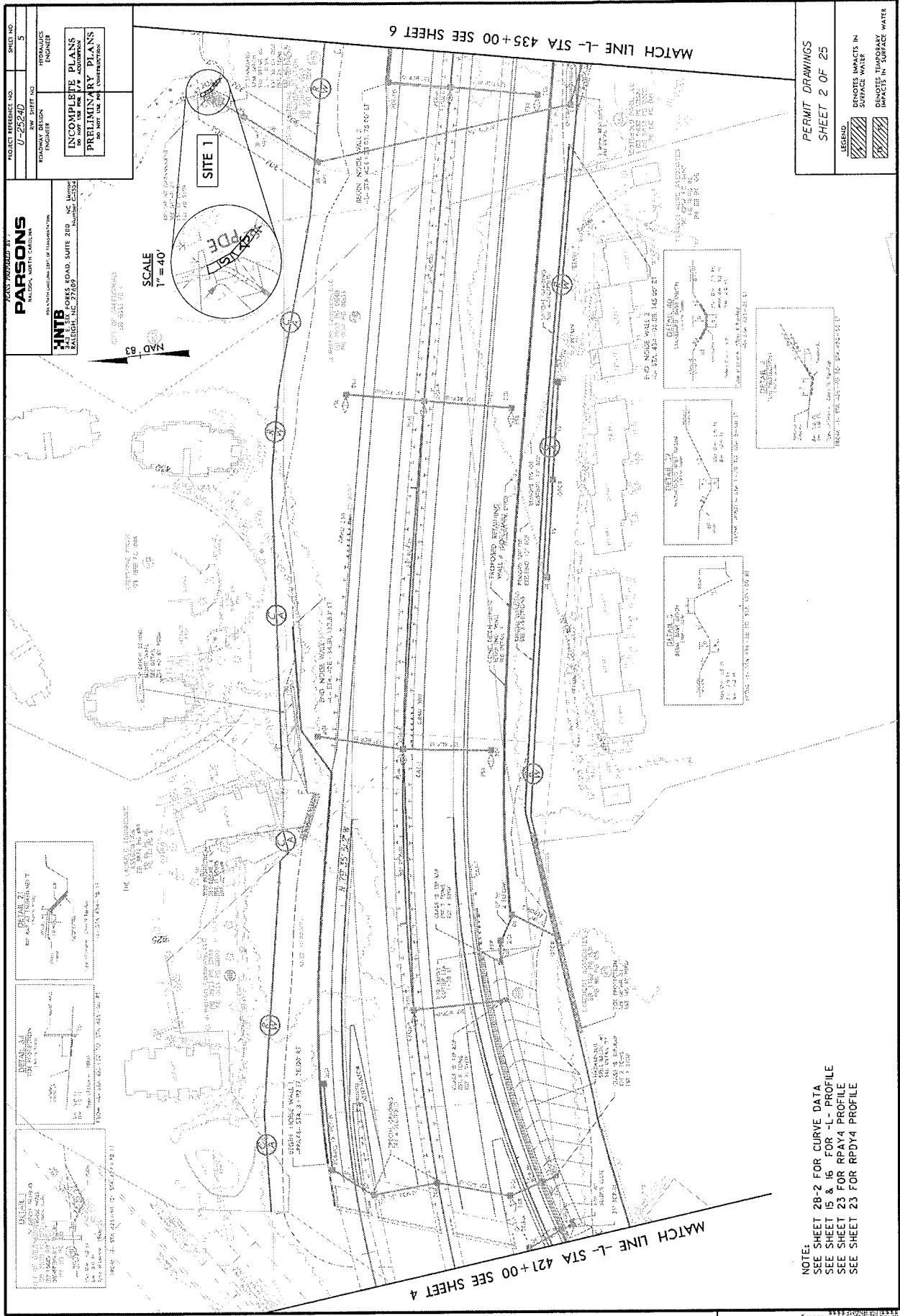
Mr. Sam M. Hayes, General Counsel
Department of Environmental Quality
1601 Mail Service Center

This the 14th day of July 2016

DIVISION OF WATER RESOURCES



 S. Jay Zimmerman, Director



PROJECT REFERENCE NO. **U-2824D** SHEET NO. **5**

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DESIGNED BY **PARSONS**
PARSONS BRINCKERHOFF COMPANY
RALEIGH, NORTH CAROLINA

DESIGNED BY **HNTB**
HNTB CORPORATION
RALEIGH, NORTH CAROLINA

SCALE **1"=40'**

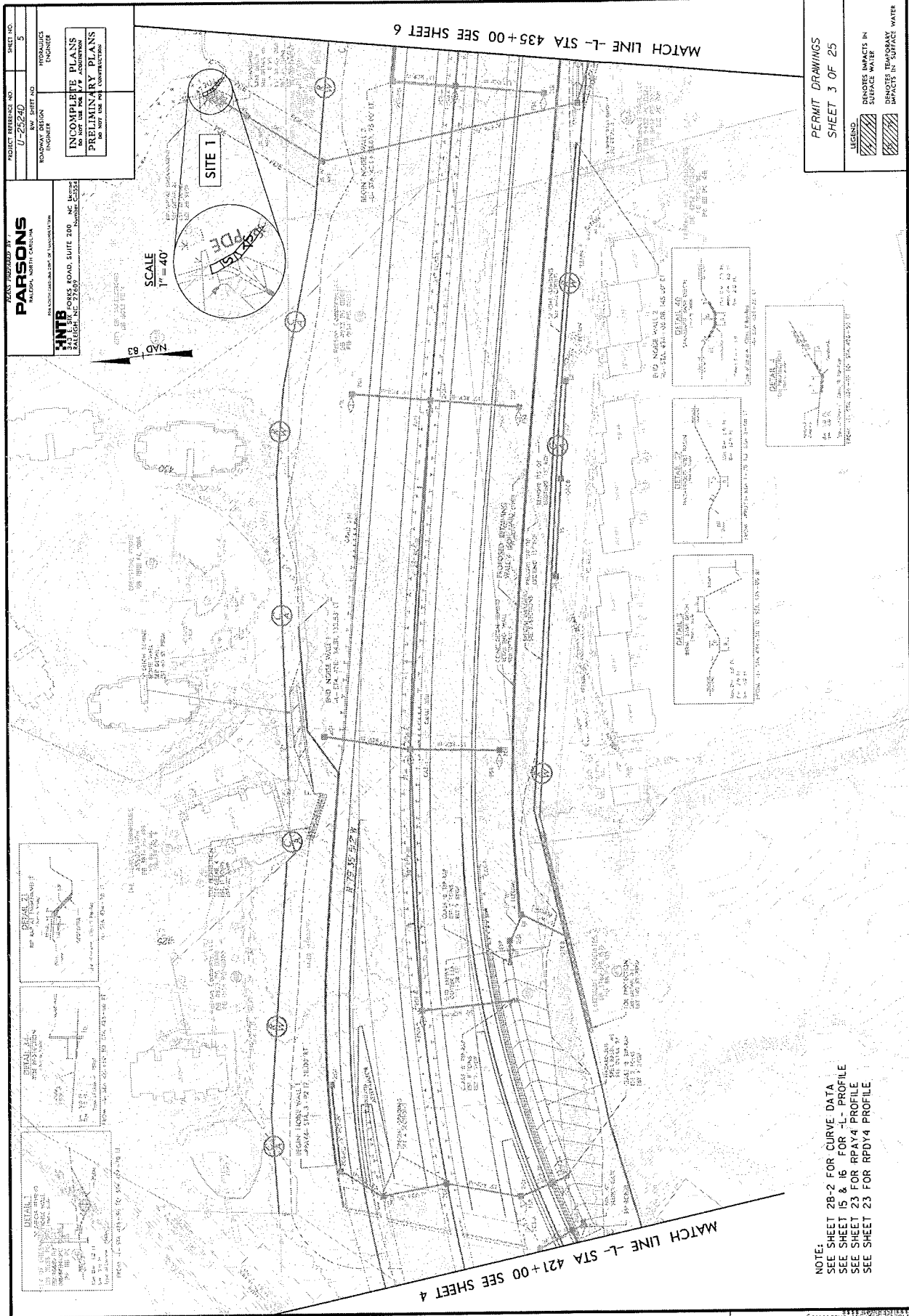
740 83

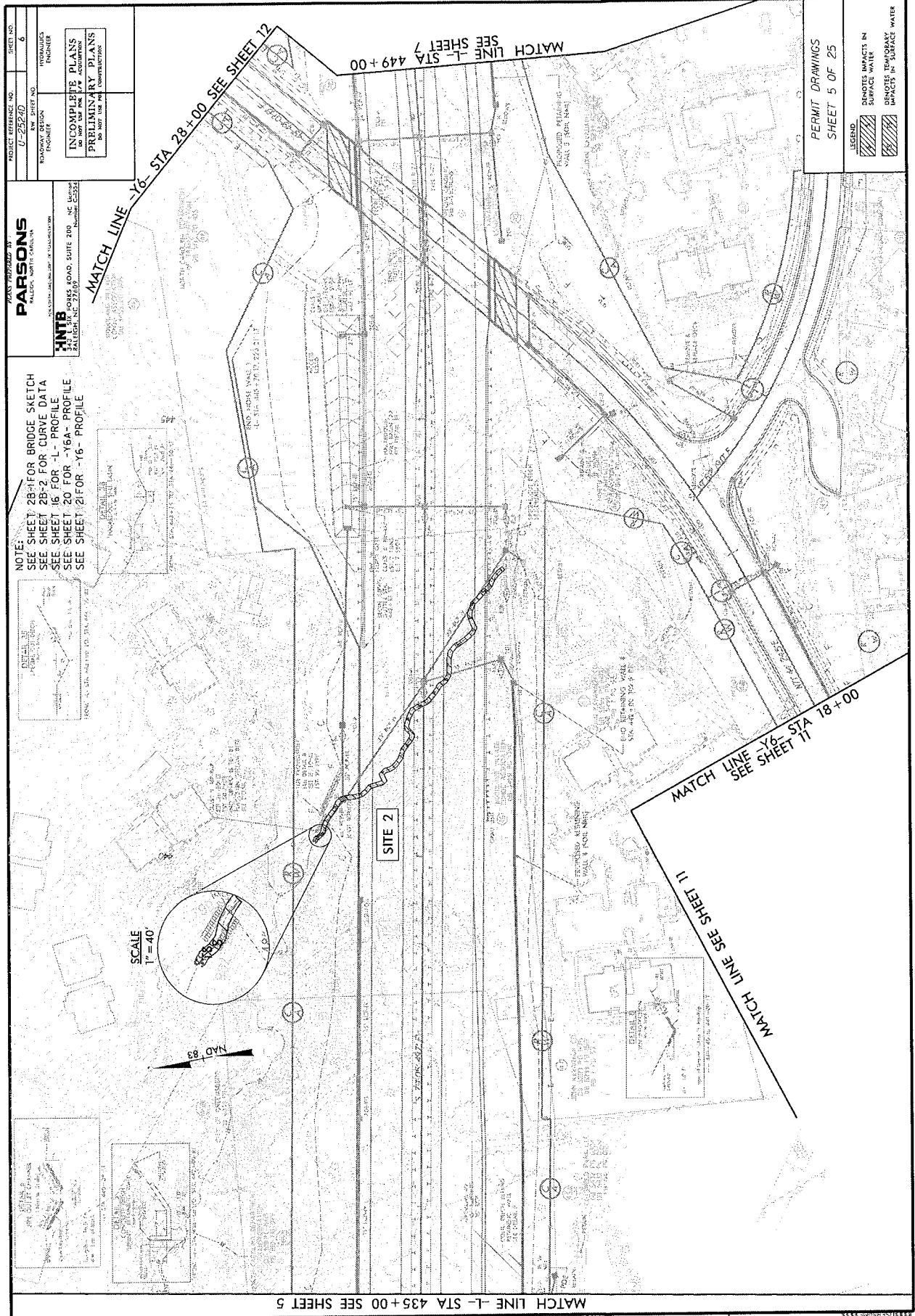
PERMIT DRAWINGS
SHEET 2 OF 25

LEGEND

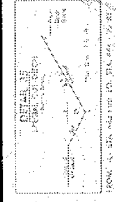
- Denotes Impacts in Surface Water
- Denotes Temporary Impacts in Surface Water

NOTE:
SEE SHEET 28-2 FOR CURVE DATA
SEE SHEET 15 & 16 FOR -L- PROFILE
SEE SHEET 23 FOR RPA4 PROFILE
SEE SHEET 23 FOR RPD4 PROFILE





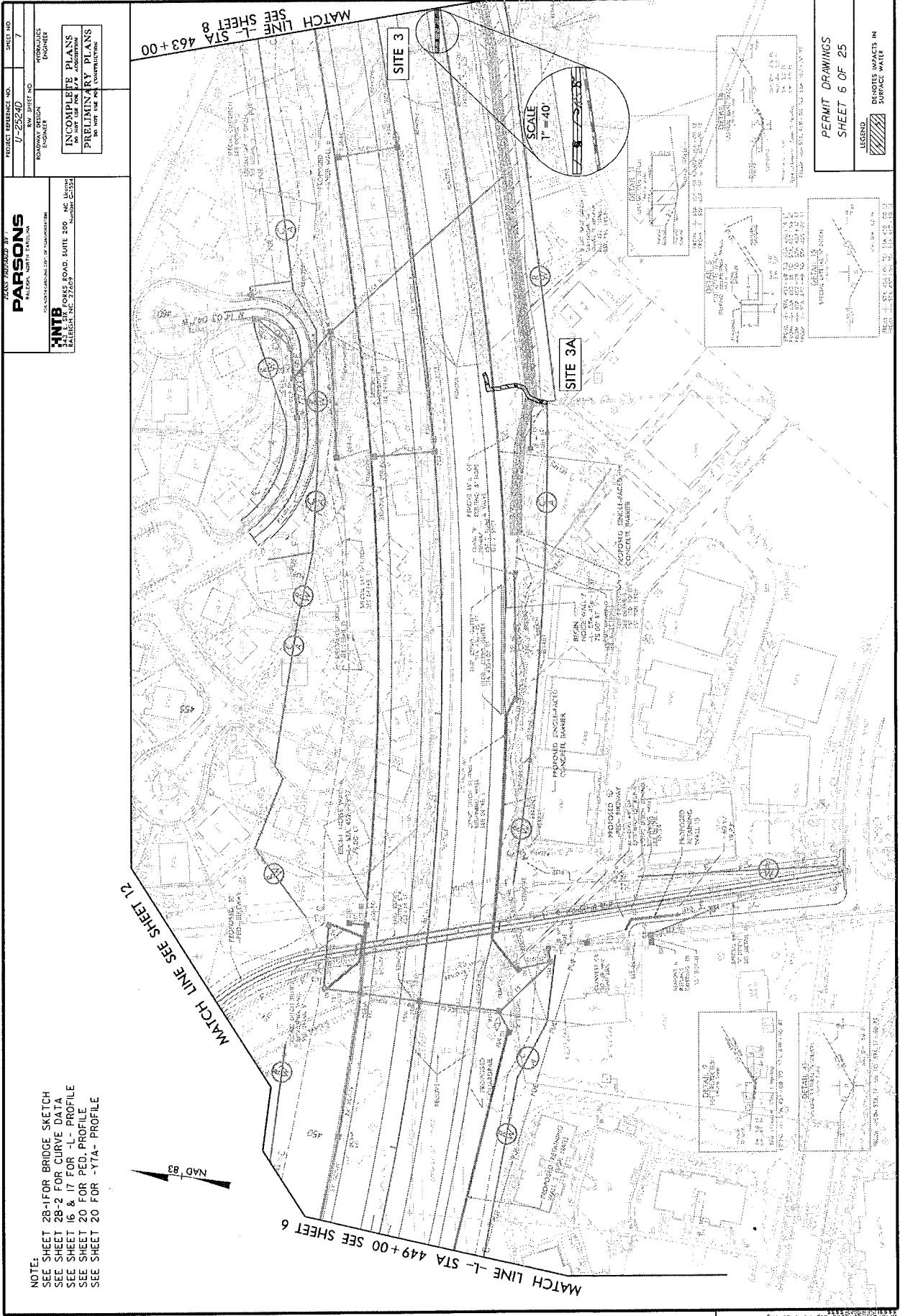
NOTE:
 SEE SHEET 28-1 FOR BRIDGE SKETCH
 SEE SHEET 28-2 FOR CURVE DATA
 SEE SHEET 16 FOR -L- PROFILE
 SEE SHEET 20 FOR -16A- PROFILE
 SEE SHEET 21 FOR -16- PROFILE



9/17/98

1025-14 M
 9/17/98 2541.05 (rd) p

ENVISIONS



PROJECT REFERENCE NO. U-25240
 SHEET NO. 7
 ROADWAY DESIGN ENGINEER
 HYDRAULICS ENGINEER
 INCOMPLETE PLANS
 FOR THE PURPOSE OF PERMITS
 PRELIMINARY PLANS
 NOT TO BE USED FOR CONSTRUCTION

DESIGNED BY: PARSONS
 RALEIGH, NORTH CAROLINA
 CONSULTING ENGINEERS OF CONSTRUCTION
 10000 FOREST HILLS ROAD, SUITE 200, NC BRIDGE
 RALEIGH, NC 27619
 NUMBER 0358

NOTE:
 SEE SHEET 28-1 FOR BRIDGE SKETCH
 SEE SHEET 28-2 FOR CURVE DATA
 SEE SHEET 16 & 17 FOR -L- PROFILE
 SEE SHEET 20 FOR PED. PROFILE
 SEE SHEET 20 FOR -YTA- PROFILE

MATCH LINE -L- SEE SHEET 12

NAD 83

MATCH LINE -L- STA 449+00 SEE SHEET 6

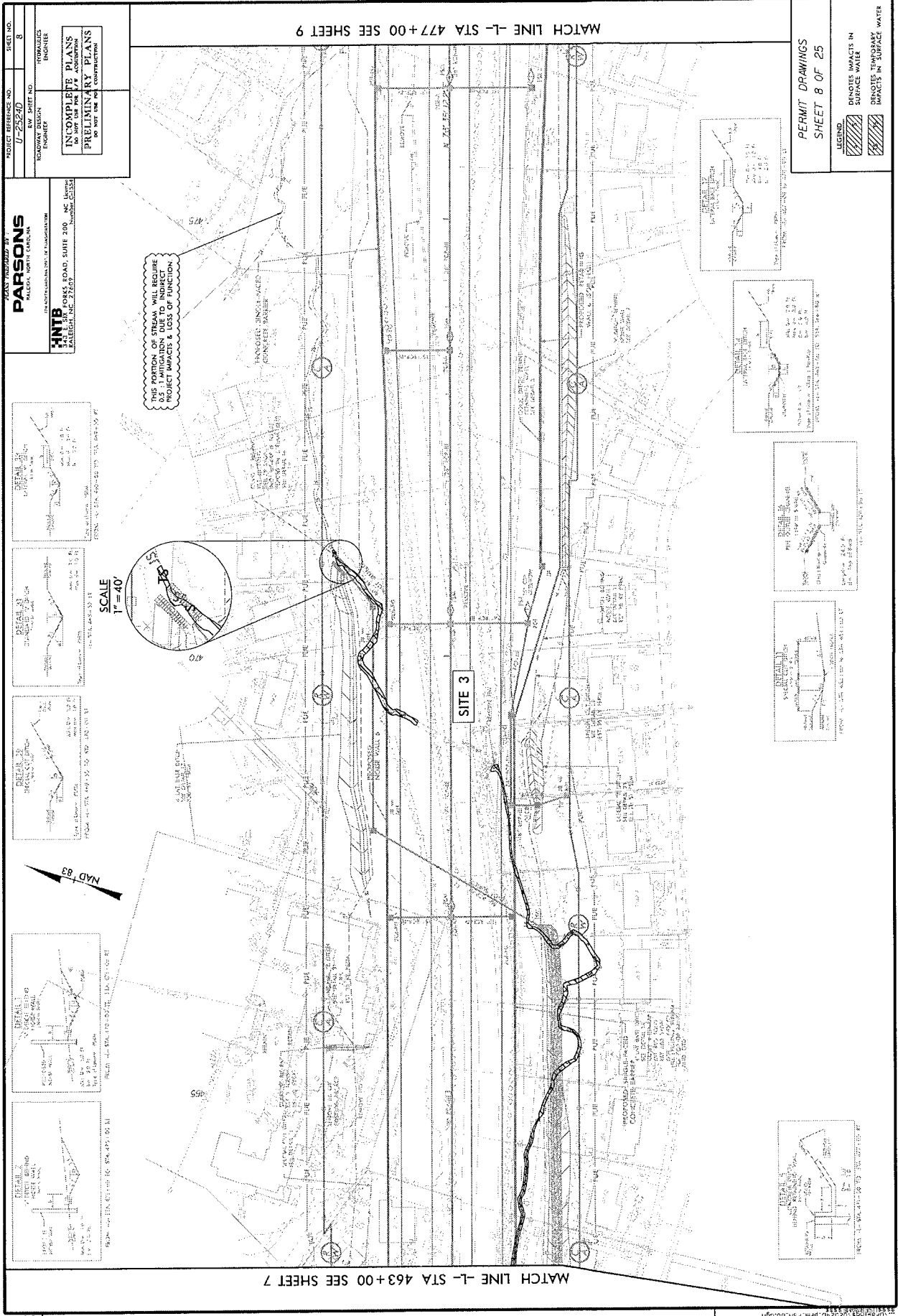
SITE 3

SITE 3A

SCALE
 1" = 40'

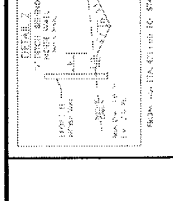
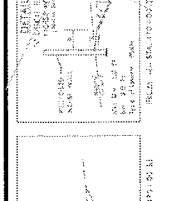
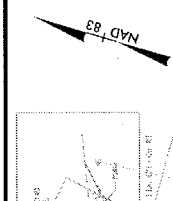
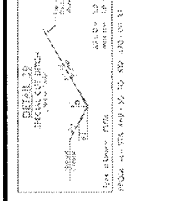
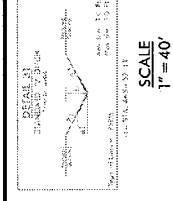
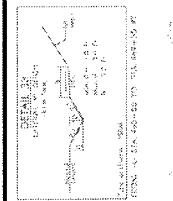
PERMIT DRAWINGS
 SHEET 6 OF 25

LEGEND
 REINFORCED CONCRETE
 SURFACE WATER

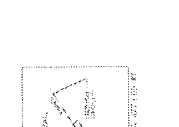
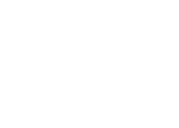
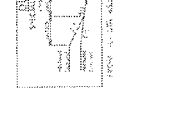
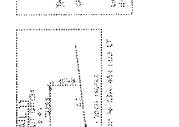
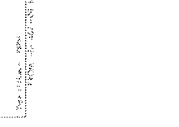


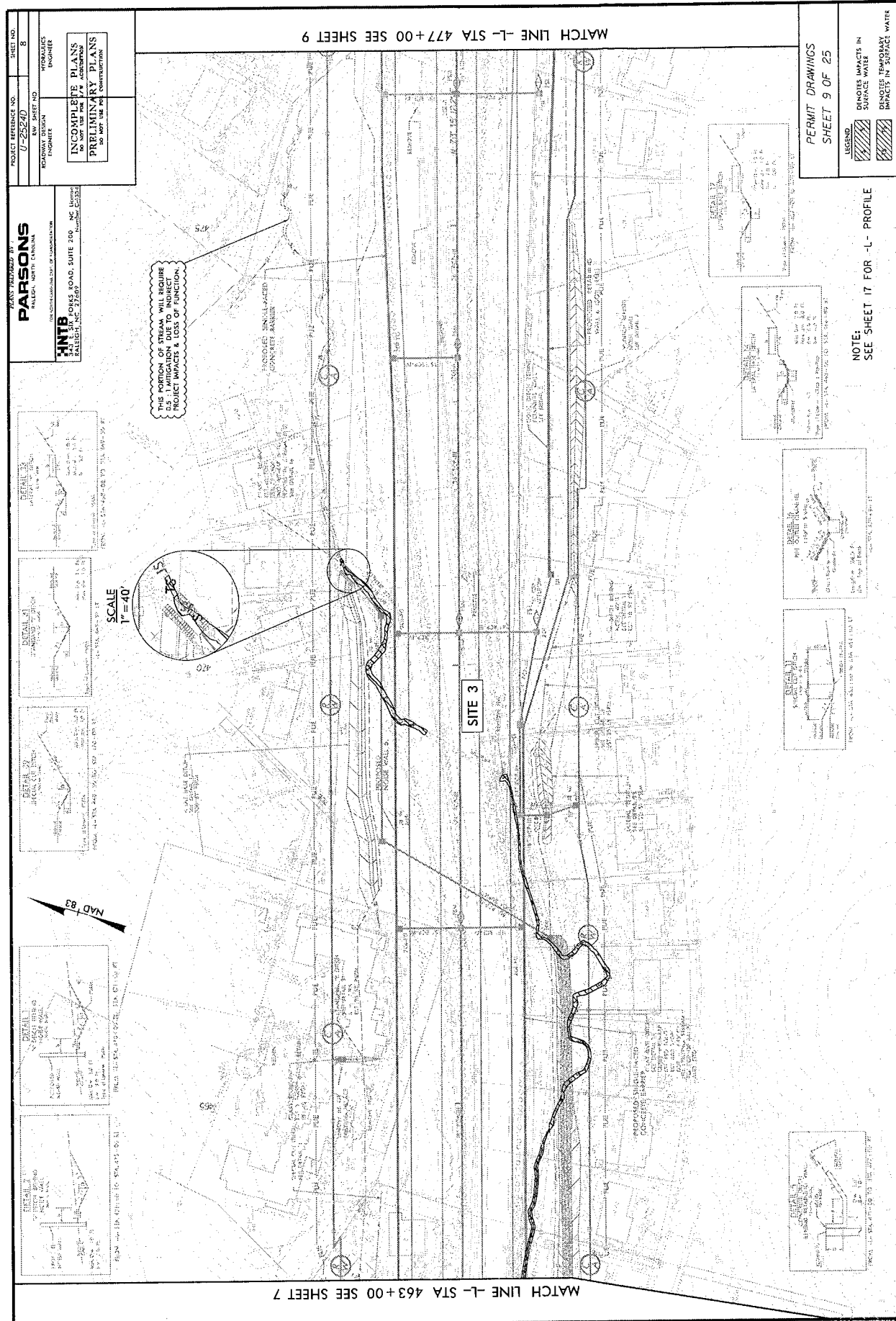
PROJECT REFERENCE NO. 11-2524D
 SHEET NO. 8
 ROADWAY DESIGN ENGINEER
 CIVIL ENGINEER
 INSTRUCTIONS: THESE PLANS DO NOT CONSTITUTE A CONTRACT. PRELIMINARY PLANS DO NOT FOR OR FOR CONSTRUCTION.

DESIGN PREPARED BY
PARSONS
 CONSULTANTS, INC.
 1100 BANKERS BUILDING
 FAYETTEVILLE, NORTH CAROLINA 28404
 HNTB
 1100 BANKERS ROAD, SUITE 200
 FAYETTEVILLE, NORTH CAROLINA 28404
 PROJECT NUMBER: 11-2524D



PERMIT DRAWINGS
 SHEET 8 OF 25
 LEGEND
 PROPOSED IMPACTS IN SURFACE WATER
 PROPOSED REMEDIATION IMPACTS IN SURFACE WATER

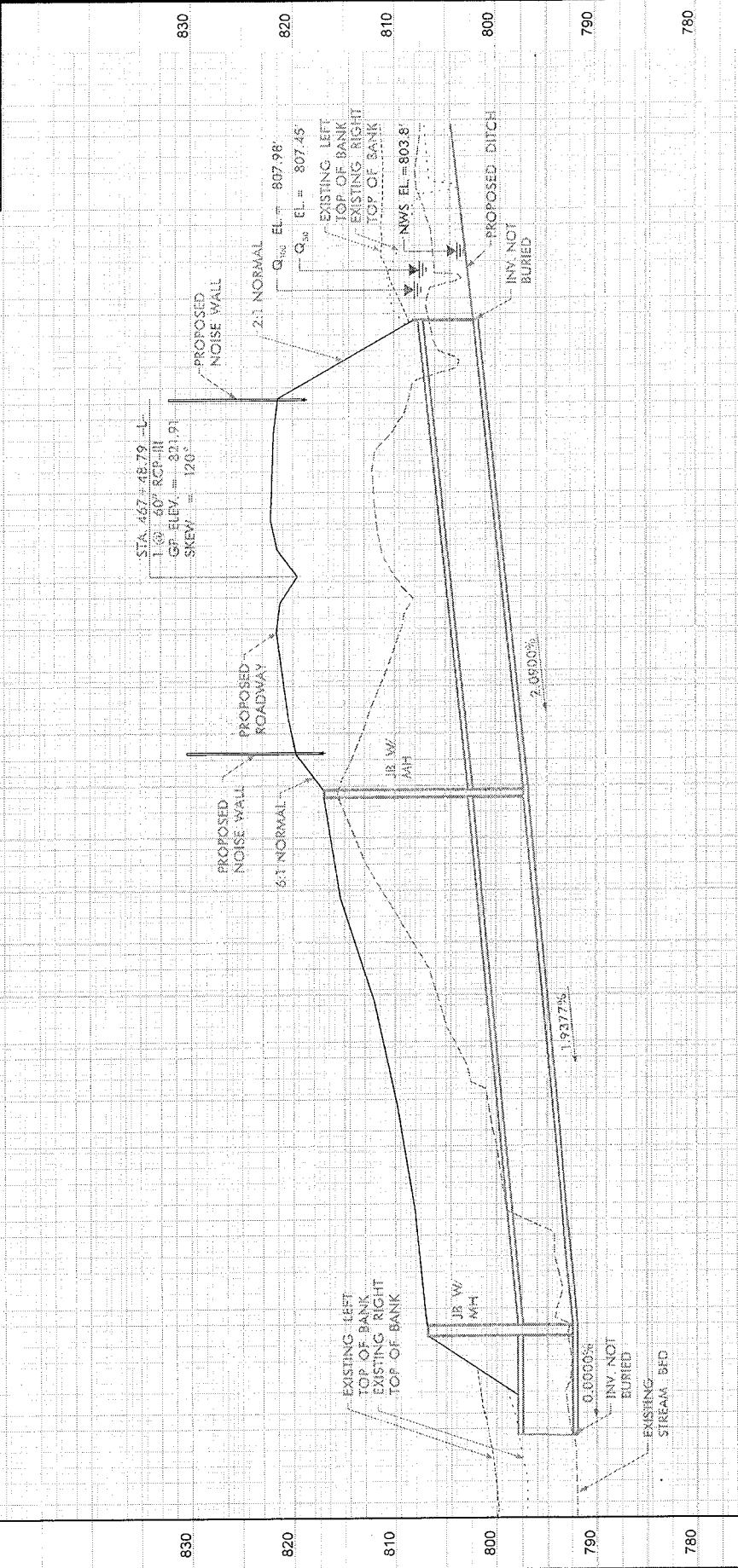




PROJECT REFERENCE NO. U-25240	SHEET NO. 8
DESIGN NO. U-25240	REV. SHEET NO.
PROJECT NAME INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION	PROJECT NAME INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION
PROJECT LOCATION 10000 FORKS ROAD, SUITE 200 NC USMC RALEIGH, NC 27617	PROJECT LOCATION 10000 FORKS ROAD, SUITE 200 NC USMC RALEIGH, NC 27617

REVISIONS

PROJECT REFERENCE NO. U-2524D	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS <small>DO NOT USE FOR CONSTRUCTION</small>	

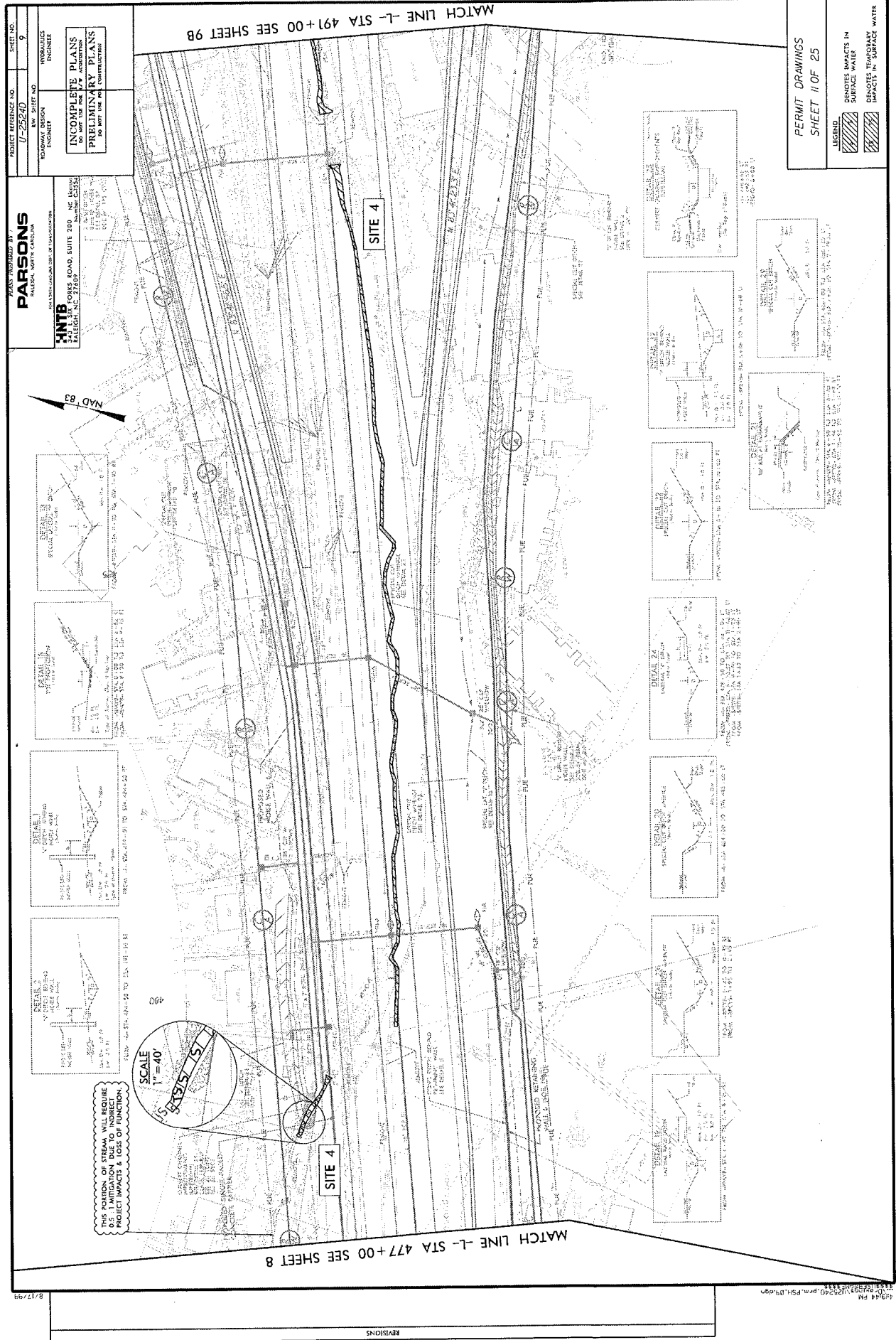


PROFILE ALONG STRUCTURE

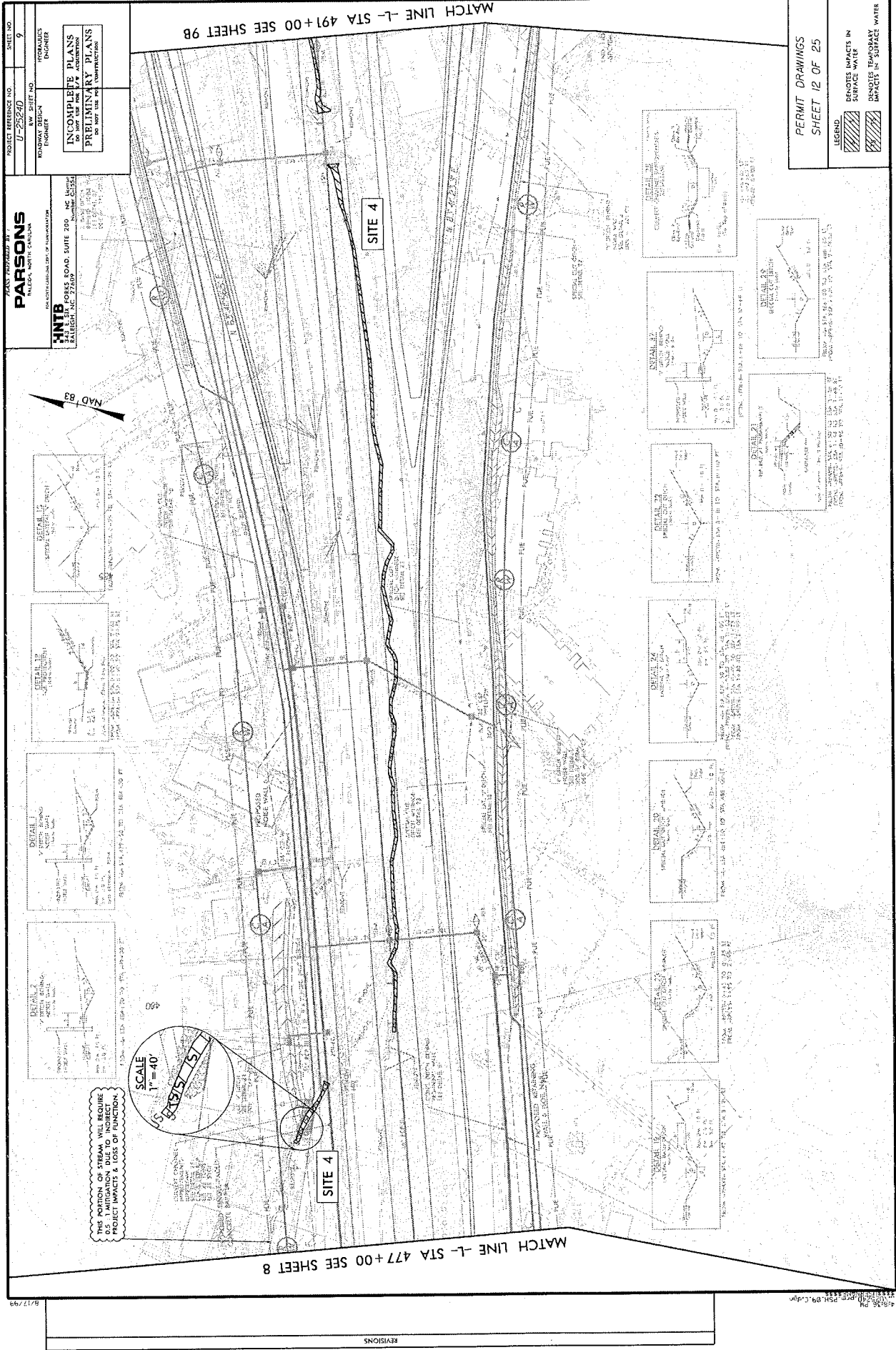
SITE 3

SCALE
 1"=50' HORIZONTAL
 1"=10' VERTICAL

GUILFORD COUNTY
 PROJECT: U-2524D
 GREENSBORO - WESTERN LOOP
 FROM EAST OF BATTLEGROUND AVENUE
 TO EAST OF LAWNDALE DRIVE
 SHEET 10 OF 25 11/13/15



8/17/94
 REVISIONS
 11:34 PM 8/22/90 J.W.P.S.H./D.B.dgn



PROJECT REFERENCE NO. U-25240
 SHEET NO. 9
 HYDRAULICS ENGINEER
 ROADWAY DESIGN
 INCOMPLETE PLANS
 DO NOT USE FOR CONSTRUCTION
 PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

PARSONS
 RALEIGH, NORTH CAROLINA
 WINTER FORKS ROAD, SUITE 200, NC 27159
 NUMBER: 25240

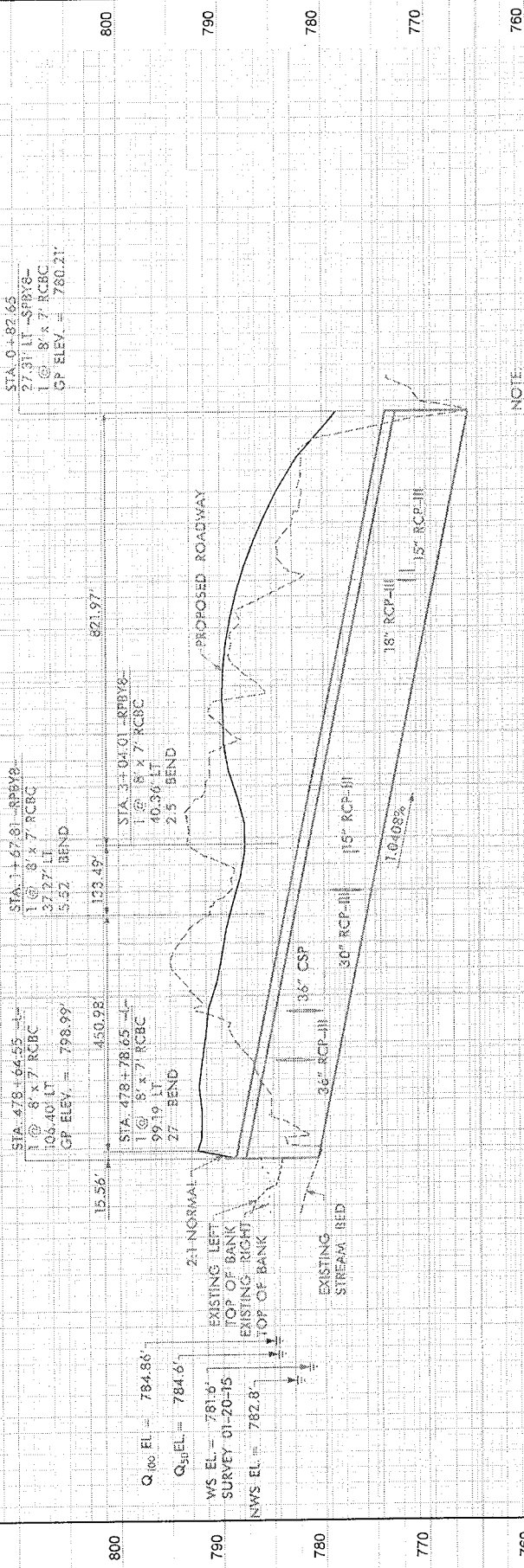
PERMIT DRAWINGS
 SHEET 12 OF 25
 LEGEND
 IMPACTS IN SURFACE WATER
 IMPACTS IN STREAM CHANNEL

8/17/99

REVISIONS

11/15/01 10:58 AM 254.09 C:\p...

PROJECT REFERENCE NO. U-2524D
 ROADWAY DESIGN ENGINEER
 SHEET NO. HYDRAULICS ENGINEER
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION



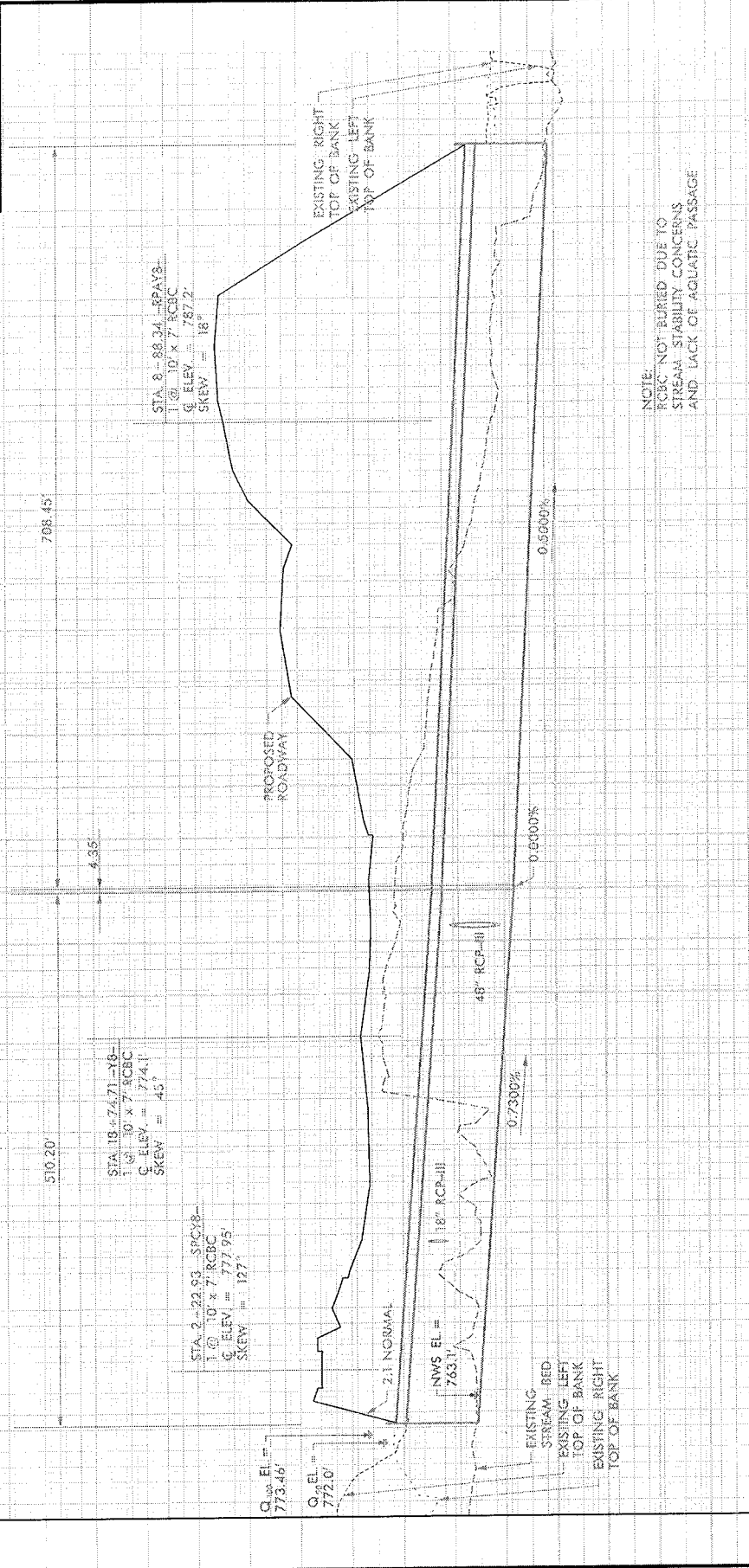
NOTE:
 RCBC NOT BURED DUE TO
 STREAM STABILITY CONCERNS
 AND LACK OF AQUATIC PASSAGE

PROFILE ALONG STRUCTURE
 SITE 4

SCALE
 1"=200' HORIZONTAL
 1"=10' VERTICAL

GUILFORD COUNTY
 PROJECT: U-2524D
 GREENSBORO - WESTERN LOOP
 FROM EAST OF BATTLEGROUND AVENUE
 TO EAST OF LAWNDALE DRIVE
 SHEET 13 OF 25 11/13/15

PROJECT REFERENCE NO. U-2524D
 HYDRAULIC ENGINEER
 ROADWAY DESIGN ENGINEER
 PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION



NOTE:
 RCBC NOT BURED DUE TO
 STREAM STABILITY CONCERNS
 AND LACK OF AQLIATIC PASSAGE

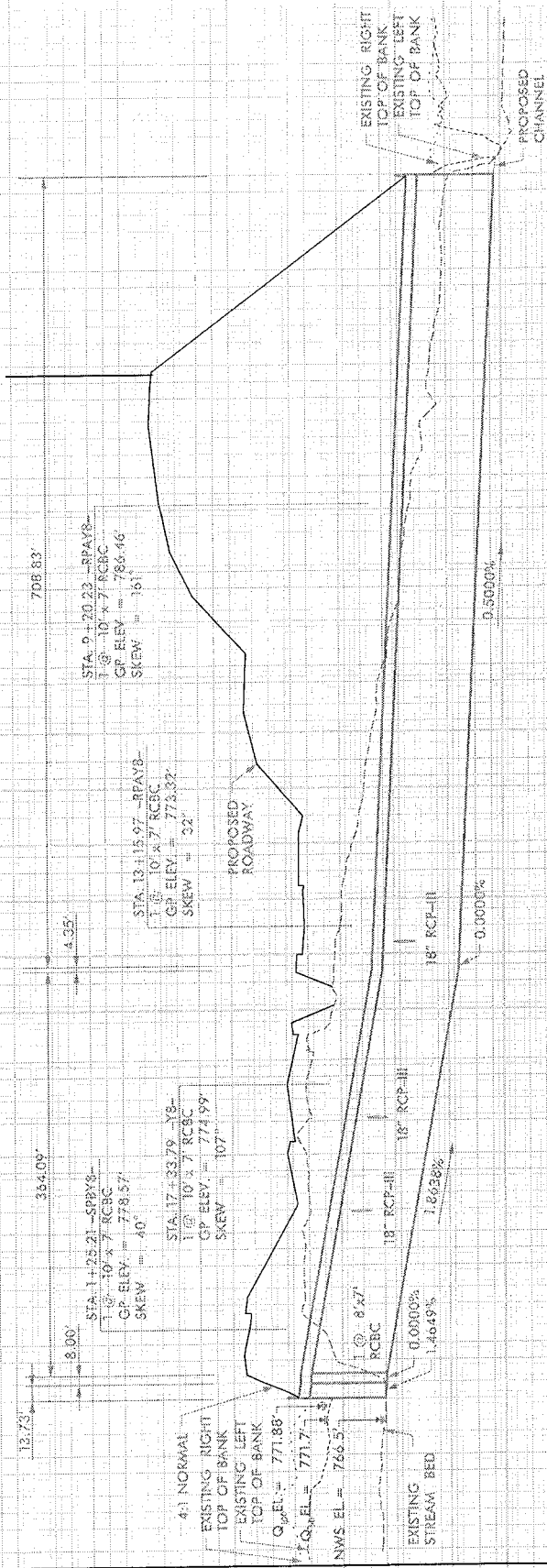
PROFILE ALONG STRUCTURE

SITE 5

SCALE
 1"=100' HORIZONTAL
 1"=10' VERTICAL

GUILFORD COUNTY
 PROJECT: U-2524D
 GREENSBORO - WESTERN LOOP
 FROM EAST OF BATTLEGROUND AVENUE
 TO EAST OF LAWNDALE DRIVE
 SHEET 16 OF 25 11/13/15

PROJECT REFERENCE NO. U-2524D
 DESIGN ENGINEER
 PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

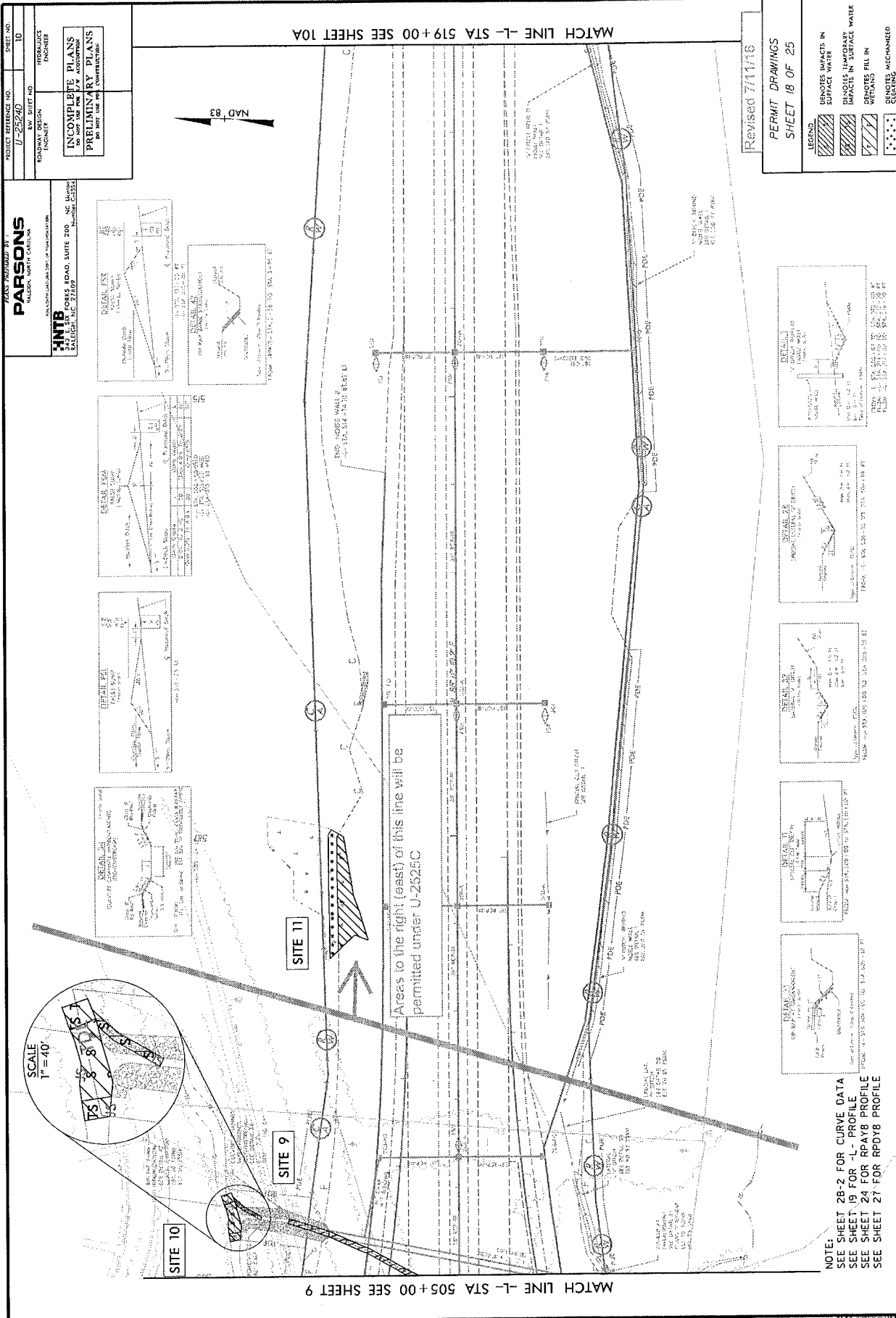


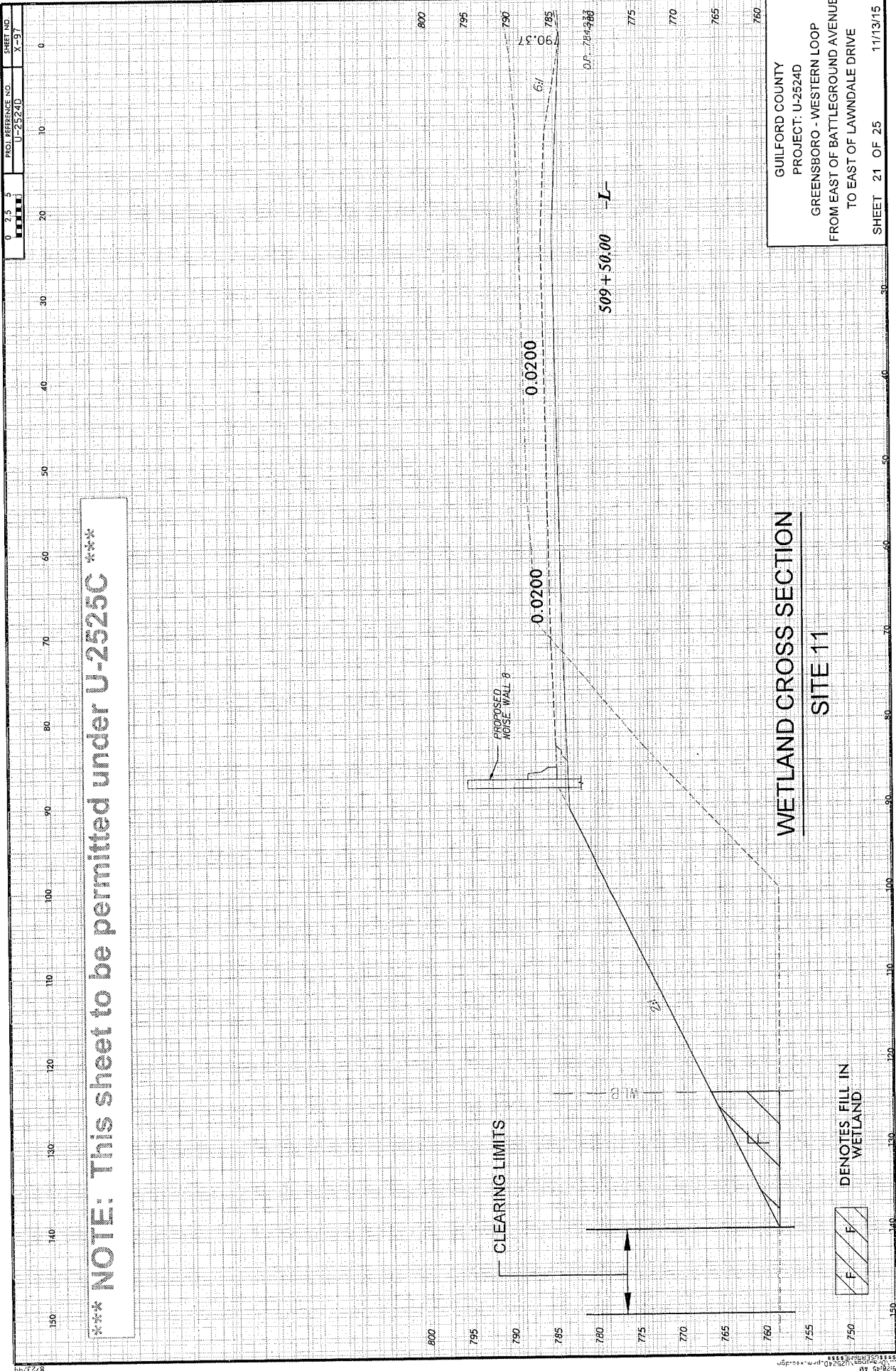
NOTE:
 RCBC NOT BURNED DUE TO
 STREAM STABILITY CONCERNS
 AND LACK OF AQUATIC PASSAGE

GUILFORD COUNTY
 PROJECT: U-2524D
 GREENSBORO - WESTERN LOOP
 FROM EAST OF BATTLEGROUND AVENUE
 TO EAST OF LAWNDALE DRIVE
 SHEET 17 OF 25
 11/13/15

PROFILE ALONG STRUCTURE
 SITE 5 & 6

SCALE
 1"=100' HORIZONTAL
 1"=10' VERTICAL





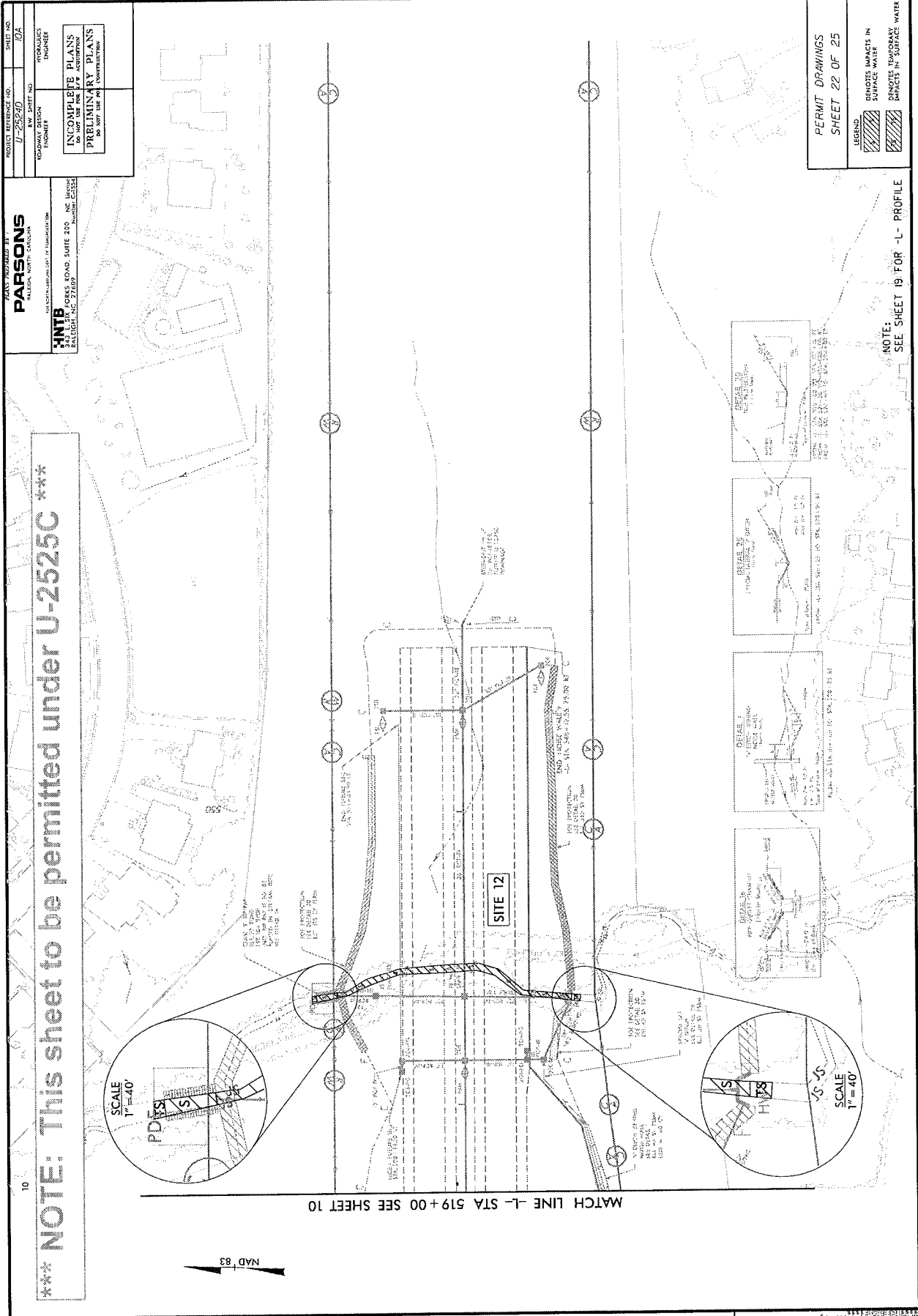
*** NOTE: This sheet to be permitted under U-2525C ***

WETLAND CROSS SECTION
SITE 11

DENOTES FILL IN
WETLAND

GUILFORD COUNTY
PROJECT: U-2524D
GREENSBORO - WESTERN LOOP
FROM EAST OF BATTLEGROUND AVENUE
TO EAST OF LAWDALE DRIVE
SHEET 21 OF 25 11/13/15

0 2.5 5
PROJ. REFERENCE NO. U-2524D
SHEET NO. X-37



*** NOTE: This sheet to be permitted under U-2525C ***

PROJECT REFERENCE NO. U-252-AD
 SHEET NO. 10A
 PERMITS DESIGN DIVISION
 INCOMPLETE PLANS
 DO NOT USE FOR CONSTRUCTION
 PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

DESIGNED BY
PARSONS
 1000 NORTH WILSON ROAD, SUITE 200, NE
 RALEIGH, NC 27609
 DRAWN BY
WNTB
 1000 NORTH WILSON ROAD, SUITE 200, NE
 RALEIGH, NC 27609

PERMIT DRAWINGS
 SHEET 22 OF 25
 LEGEND
 BRACKET IMPACTS IN SURFACE WATER
 BRACKET TEMPORARY IMPACTS IN SURFACE WATER

NOTE: SEE SHEET 19 FOR -L- PROFILE

10/20/20

10/20/20

REVISIONS

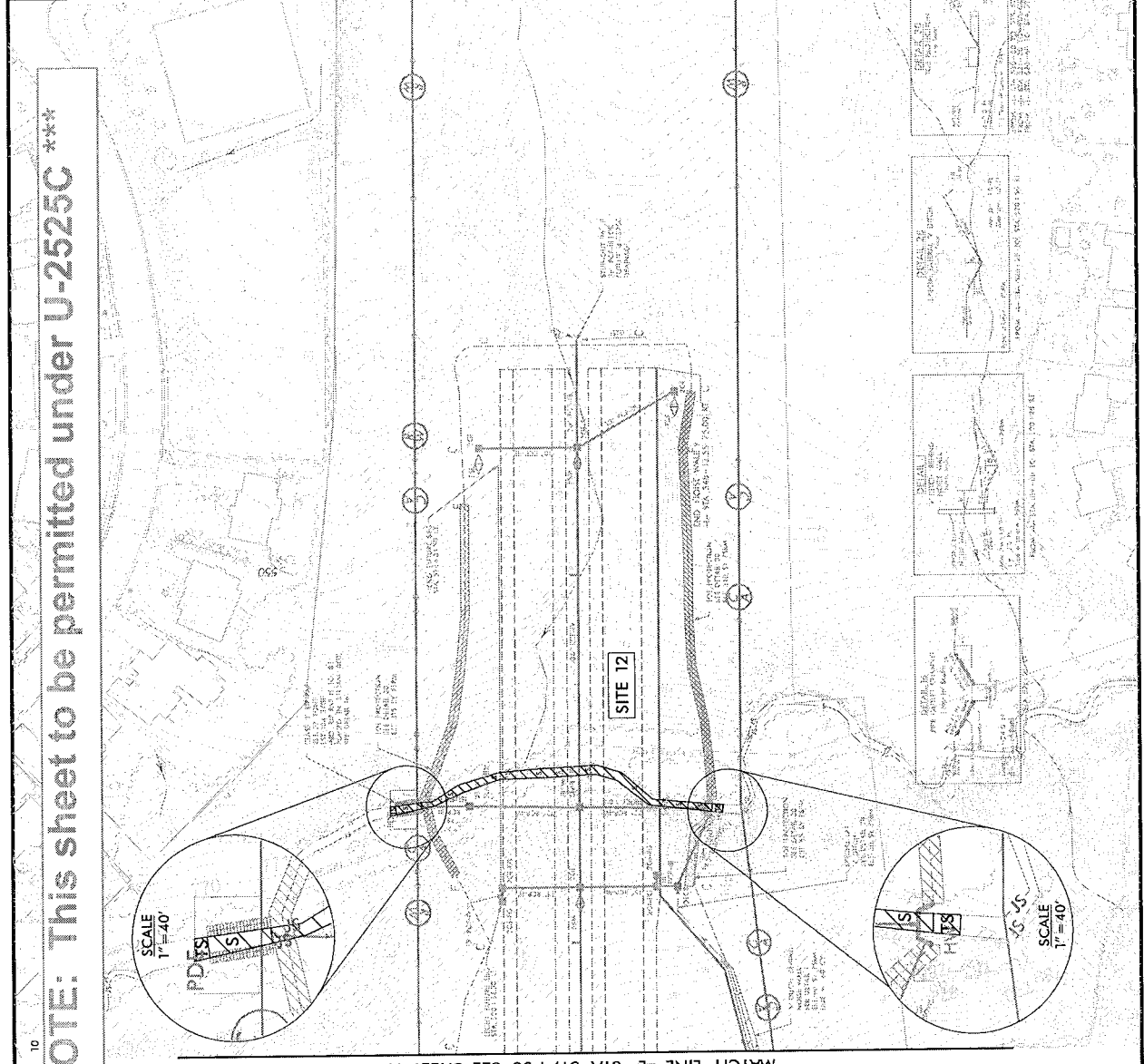
PROJECT REFERENCE NO. U-25240	SHEET NO. 10A
DESIGNED BY ENGINEER	CHECKED BY ENGINEER
INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

DESIGNED BY
PARSONS
RALEIGH, NORTH CAROLINA

FOR THE UNIVERSITY OF CAROLINA

340 SOUTH MAIN STREET, SUITE 200, NC BLDG. 001
CHAPEL HILL, NC 27514

***** NOTE: This sheet to be permitted under U-2525C *****



10

REVISIONS

PERMIT DRAWINGS
SHEET 23 OF 25

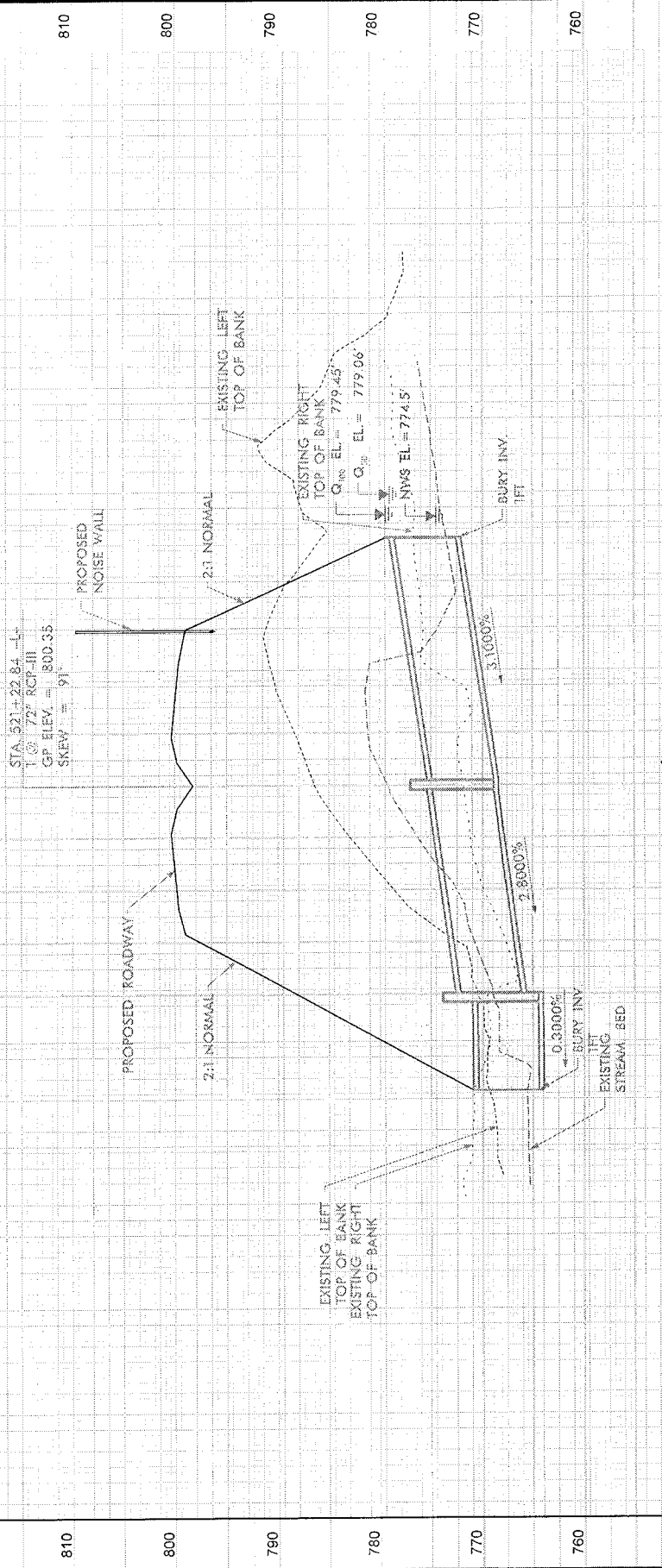
LEGEND

- DEMOTES IMPACTS IN SURFACE WATER
- DEMOTES TEMPORARY IMPACTS IN SURFACE WATER

NOTE:
SEE SHEET 19 FOR -L- PROFILE

*** NOTE: This sheet to be permitted under U-2525C ***

PROJECT REFERENCE NO. U-2524D	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS FOR THE STATE OF MASSACHUSETTS	



PROFILE ALONG STRUCTURE

SITE 12

SCALE
1"=50' HORIZONTAL
1"=10' VERTICAL

GUILFORD COUNTY
PROJECT: U-2524D
GREENSBORO - WESTERN LOOP
FROM EAST OF BATTLEGROUND AVENUE
TO EAST OF LAWDALE DRIVE
SHEET 24 OF 25 11/13/15

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-13)

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.

<u>PERMIT</u>	<u>AUTHORITY GRANTING THE PERMIT</u>
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, NCDEQ 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.

NOTE: This permit modification only applies to work Sites 11 – 12.

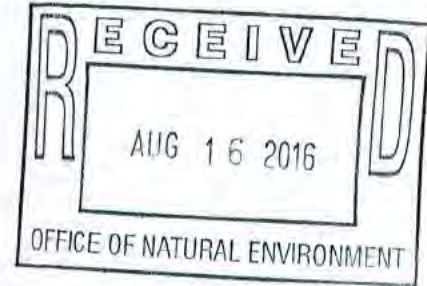


DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

August 11, 2016

Regulatory Division/1200A

Action ID: SAW-2005-21386



Mr. Philip S. Harris III, P.E., C.P.M.
Natural Environment Section Head
North Carolina Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Reference the Department of the Army (DA) permit issued on April 15, 2014, to Ms. Deborah Barbour of the North Carolina Department of Transportation, for impacts associated with the project identified as U-2525BC. The project is a 9.7 mile, four-lane/six-lane divided facility on new location extending from the US 70 relocation to SR 2303 (Lawndale Drive) in Greensboro, Guilford County, North Carolina. Section B of this project begins at the US 70 relocation and terminates at US 29, and Section C begins at US 29 and ends at SR 2303 (Lawndale Drive). Coordinates (in decimal degrees) for the site are: 36.089772° North, -79.697302° West for the eastern terminus and 36.141773° North, -79.825120° West for the western terminus. The site contains portions of four (4) unnamed tributaries to South Buffalo Creek, twenty (20) unnamed tributaries to North Buffalo Creek, five (5) unnamed tributaries to an unnamed tributary at Camp Herman, fourteen (14) unnamed tributaries to Reedy Fork, a portion of Richland Creek, and ten (10) unnamed tributaries to Richland Creek, as well as 50 (50) adjacent wetland areas and five (5) open water ponds in the Cape Fear River Basin (8-Digit Cataloging Unit 03030002).

Impacts authorized by the permit as well as subsequent permit modifications dated June 18, 2014, October 31, 2014, December 4, 2014, March 12, 2015, July 24, 2015, and March, 18, 2016 include: 1) The permanent placement of fill material into 23,467 linear feet of jurisdictional stream channel, 9.95 acres of adjacent riparian wetlands, and 2.32 acres of jurisdictional open waters and, 2) the temporary placement of fill material into 785 linear feet of jurisdictional stream channel and 0.31 acre of adjacent riparian wetlands associated with construction access and the relocation of utility lines. Compensatory mitigation was implemented for the unavoidable impacts by payment into the North Carolina Ecosystem Enhancement Program, now known as the North Carolina Division of Mitigation Services (NCDMS), as well as permittee responsible mitigation referenced in the permit special conditions.

Also reference your "Request for Modification..." letter dated August 8, 2016 (received August 10, 2016), proposing the following:

- 1) Release of Permit Sites 11 and 12 of TIP U-2525C for construction per Special Condition 2 of the DA permit issued on April 15, 2014;
- 2) Authorization of a permanent discharge of fill material into 308 linear feet of stream channel related to:
 - a. Placing 284 linear feet of stream channel in culverts and other fills resulting in permanent loss of waters, and;
 - b. Adding rip rap bank stabilization to 24 linear feet of stream channel;
- 3) Authorization of a temporary discharge of fill material into 15 linear feet (0.01 acre) of stream channel related to temporary construction access and dewatering;
- 4) Authorization of a permanent discharge of fill material into 0.08 acre of riparian, non-riverine wetlands related to:
 - a. Placing fill for road slopes into 0.05 acre of wetlands resulting in permanent loss of waters, and;
 - b. Mechanized clearing in 0.03 acre of wetlands for installation and maintenance of sediment and erosion control devices.

Following evaluation of the information submitted in your modification request, the U.S. Army Corps of Engineers, Wilmington District has determined that it is appropriate and reasonable, is not contrary to the public interest, and no public notice is required for this modification. Therefore, the permit is modified to release Permit Sites 11 and 12 of TIP U-2525C for construction, as described in the Wetland & Stream Impacts drawings for U-2525C (Permit Drawings Sheets 2-8) submitted in the "Request for Modification ..." letter dated August 8, 2016.

In addition, the following special condition regarding additional compensatory mitigation has been incorporated:

x) PHASED PERMIT: This permit modification only authorizes work on Permit Sites 11 and 12 of Section C of TIP U-2525. Construction on the remaining Permit Sites of Sections C of TIP U-2525 shall not commence until final design has been completed for these Sites, the permittee has minimized impacts to waters and wetlands to the maximum extent practicable, any modifications to the plans, and a compensatory mitigation plan, have been approved by the US Army Corps of Engineers. Preliminary plans for U-2525C were provided with the August 28, 2013 application (sheets 1-89) however, these plans are not to be used for construction purposes.

Since impacts to waters of the US for U-2525C were originally permitted as a conceptual sum, refinement of impacts to Sites 11 and 12 cannot be used to further update the total impact amount for the entire U-2525BC project. Rather, upon evaluation of a future modification request to release the remainder of U-2525C for construction, the impacts authorized by this modification will be added to the total proposed impacts for the entirety of the C section and compared with the originally permitted conceptual impact sum. Similarly, the original permit required compensatory mitigation for all of U-2525BC, including the use of the conceptual sum of stream and wetland impacts. This modification, concerning only Permit Sites 11 and 12, takes into account a compensatory mitigation requirement for losses of waters of the US, including 284 linear feet of stream and 0.08 acre of wetlands, via purchase of appropriate stream and wetland credits from NCDMS at a 2:1 mitigation to impact ratio. Since the above compensatory mitigation requirement falls below the amount of compensatory mitigation required in the original permit, any future change in the compensatory mitigation requirement will be based on the wetland and stream impacts proposed in the future modification request to release the remainder of U-2525C for construction.

All other conditions of the permit and subsequent modifications, including the permit expiration date of December 31, 2019, remain in effect as written. Should you have questions, contact Mr. David E. Bailey, Raleigh Regulatory Field Office at telephone (919) 554-4884, Extension 30 or David.E.Bailey2@usace.army.mil.

Sincerely,



for Kevin P. Landers
Colonel, U.S. Army
District Commander

Copies Furnished with Attachment:

Mr. Brian Wrenn
Transportation Permitting Unit
Division of Water Resources
North Carolina Department of
Environment and Natural Resources
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Ms. Erin Cheely
North Carolina Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Mr. Jerry Parker
Division Environmental Supervisor, Division 7
North Carolina Department of Transportation
Post Office Box 14996
Greensboro, North Carolina 27415

Copies Furnished without Attachment:

Mr. Rodger Rochelle, P.E.
Technical Services Administrator
North Carolina Department of Transportation
1516 Mail Service Center
Raleigh, North Carolina 27699-1516

U.S. Fish and Wildlife Services
Fish and Wildlife Enhancement
Post Office Box 33726
Raleigh, North Carolina 28516

Ms. Cynthia Van Der Wiele
U.S. Environmental Protection Agency
Region 4 NEPA Program Office
c/o USEPA-RTP
109 T.W. Alexander Drive
Mail Code: E143-08
Research Triangle Park, North Carolina 27709

Mr. Travis Wilson
North Carolina Wildlife Resources Commission
1718 Hwy 56 West
Creedmoor, North Carolina 27522



PAT MCCRORY

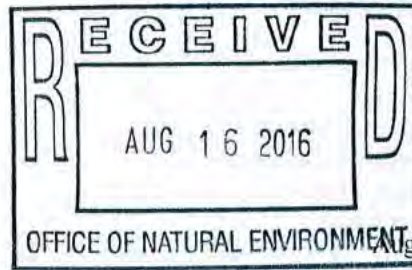
Governor

DONALD R. VAN DER VAART

Secretary

S. JAY ZIMMERMAN

Director



August 12, 2016

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the proposed Greensboro Eastern Loop from US 70 Relocation to SR 2303 (Lawndale Drive) in Guilford County, Division 7; WBS Element 34821.1.1, TIP Project Nos. U-2525 B and C.
NCDWR Project No. 20130918 v.8

Dear Mr. Harris:

Attached hereto is a modification of Certification No. 3978 issued to The North Carolina Department of Transportation (NCDOT) dated February 6, 2014 and subsequent modifications dated June 24, 2014, October 15, 2014, December 11, 2014, March 18, 2015, July 21, 2015, and March 18, 2016.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

S. Jay Zimmerman, Director
Division of Water Resources

Attachments

Electronic copy only distribution:

- David Bailey, US Army Corps of Engineers, Raleigh Field Office
- Jerry Parker, Division 7 Environmental Officer
- Rodger Rochelle, NC Department of Transportation
- Erin Cheely, NC Department of Transportation
- Dr. Cynthia Van Der Wiele, US Environmental Protection Agency
- Gary Jordan, US Fish and Wildlife Service
- Travis Wilson, NC Wildlife Resources Commission
- Beth Harmon, Division of Mitigation Services
- File Copy

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act
with
ADDITIONAL CONDITIONS**

THIS CERTIFICATION 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 Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact an additional 0.08 acres of jurisdictional wetlands and 323 linear feet of jurisdictional streams in Guilford County. The project shall be constructed pursuant to the application dated received August 8, 2016. The authorized impacts are as described below:

Table 1. Stream Impacts in the Cape Fear River Basin

Site Number	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
12	--	--	308	15	323	308
Total Original Impacts	--	--	12,646	--	--	12,646
Total Additional Impacts	--	--	308	15	323	308
Total Impacts	--	--	12,954	15	12,969	12,954

Total Stream Impact for U-2525C: 12,969 linear feet.

Table 2. Riverine Wetland Impacts in the Cape Fear River Basin

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
11	0.05	--	--	0.03	--	--	0.08
Total Original Impacts	2.4	--	--	--	--	--	2.4
Total Additional Impacts	0.05	--	--	0.03	--	--	0.08
Total Impacts	2.45	--	--	0.03	--	--	2.48

Total Wetland Impact for U-2525C: 2.48 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received August 8, 2016. Should your project change, you are required to 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. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

Project Specific Conditions

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions of certification associated with the original Water Quality Certification dated February 6, 2014 and subsequent modifications dated June 24, 2014, October 15, 2014, December 11, 2014, March 18, 2015, July 21, 2015, and March 18, 2016 still apply except where superseded by this certification.
2. When final design plans are completed for U-2525C, a modification to the 401 Water Quality Certification shall be submitted with five copies and fees to the NC Division of Water Resources. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters, and buffers. No construction activities that impact any wetlands, streams, surface waters, or buffers located in U-2525C shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification from the NC Division of Water Resources.

General Conditions

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 NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02B.0200]
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. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02H.0506(b)(2)]
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. [15A NCAC 02H.0506(b)(2)]
6. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]
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 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. [15A NCAC 02H.0506(b)(3) and (c)(3)]
8. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream. [15A NCAC 02H.0506(b)(3)]
9. 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. [15A NCAC 02H.0506(b)(3)]
10. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification. [15A NCAC 02H.0506(b)(3)]
11. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]
12. 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. [15A NCAC 02B.0200]

13. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification. [15A NCAC 02H.0506(b)(2)]
14. 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. [15A NCAC 02H.0507(c) and 15A NCAC 02H.0506(b)(2) and (c)(2)]
15. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization, including all non-commercial borrow and waste sites associated with the project, shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification. [15A NCAC 02H.0501 and .0502]
16. 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.
17. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery. [15A NCAC 02B.0506(b)(2)]
18. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer 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. [15A NCAC 02H.0502(f)]
19. Native riparian vegetation 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. [15A NCAC 02B.0506(b)(2)]
20. 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. [15A NCAC 02H.0506(b)(3) and (c)(3)]
21. 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 in order to protect surface waters standards [15A NCAC 02H.0506(b)(3) and (c)(3)]:
 - a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
 - b. The 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.
 - c. 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*.
 - d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.
22. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification. [15A NCAC 02H.0506(b)(3) and (c)(3)]
23. Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

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

P-47

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:

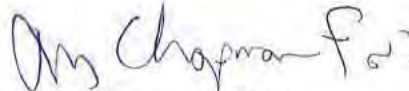
Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919) 431-3000, Facsimile: (919) 431-3100

A copy of the petition must also be served on DEQ as follows:

Mr. Sam M. Hayes, General Counsel
Department of Environmental Quality
1601 Mail Service Center

This the 12th day of August 2016

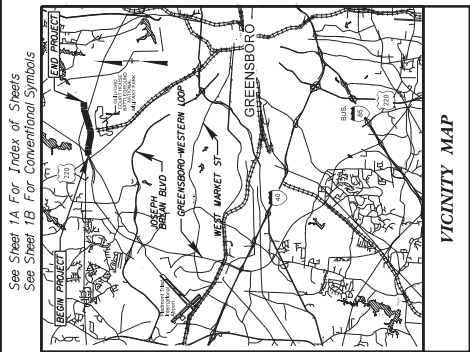
DIVISION OF WATER RESOURCES



S. Jay Zimmerman, Director

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY



See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

TIP PROJECT:

TYPE OF WORK: GRADING, PAVING, CULVERTS, DRAINAGE,
STRUCTURES AND ITS

WETLAND & STREAM IMPACTS

U-2525C Modification Drawings
Greensboro Eastern Loop from US 29 north of
Greensboro to SR 2303 (Lawndale Drive)
34821.1.1

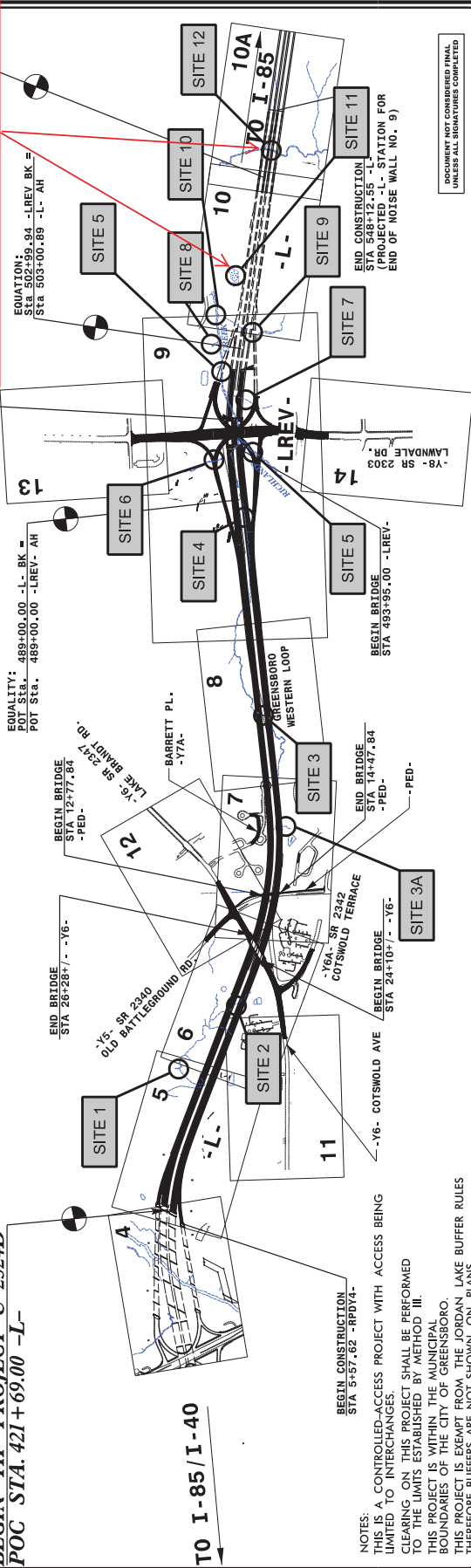
PERMIT DRAWINGS
SHEET 1 OF 8

END TIP PROJECT U-2524D
POT STA 520+34.53 -L- BK.
N 871507.2766 E 1756411.5108

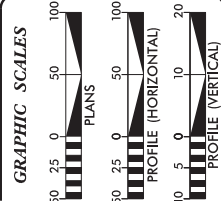
END TIP PROJECT U-2525C
POT STA 552+99.67 -L- AH.
N 871505.0126 E 1756411.6682

U-2525C includes sites 11 and 12

BEGIN TIP PROJECT U-2524D
POC STA. 421+69.00 -L-



CONTRACT:



DESIGN DATA

ADT 2016	=	65756
ADT 2036	=	98793
K	=	10 %
D	=	60 %
T	=	14 % *
V	=	70 MPH
* TTST = 8% DUAL 6%		
FUNC CLASS = FREEWAY		
INTERSTATE TIER		

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT	
LENGTH STRUCTURES TIP PROJECT	
TOTAL LENGTH OF TIP PROJECT	

NCDOT CONTACT: **PAWSONS ENGINEERING**
REC'D CONTACT: **REKHA PATEL, P.E.**

RIGHT OF WAY DATE: **TIM D. GOINS, P.E.**
PROJECT ENGINEER

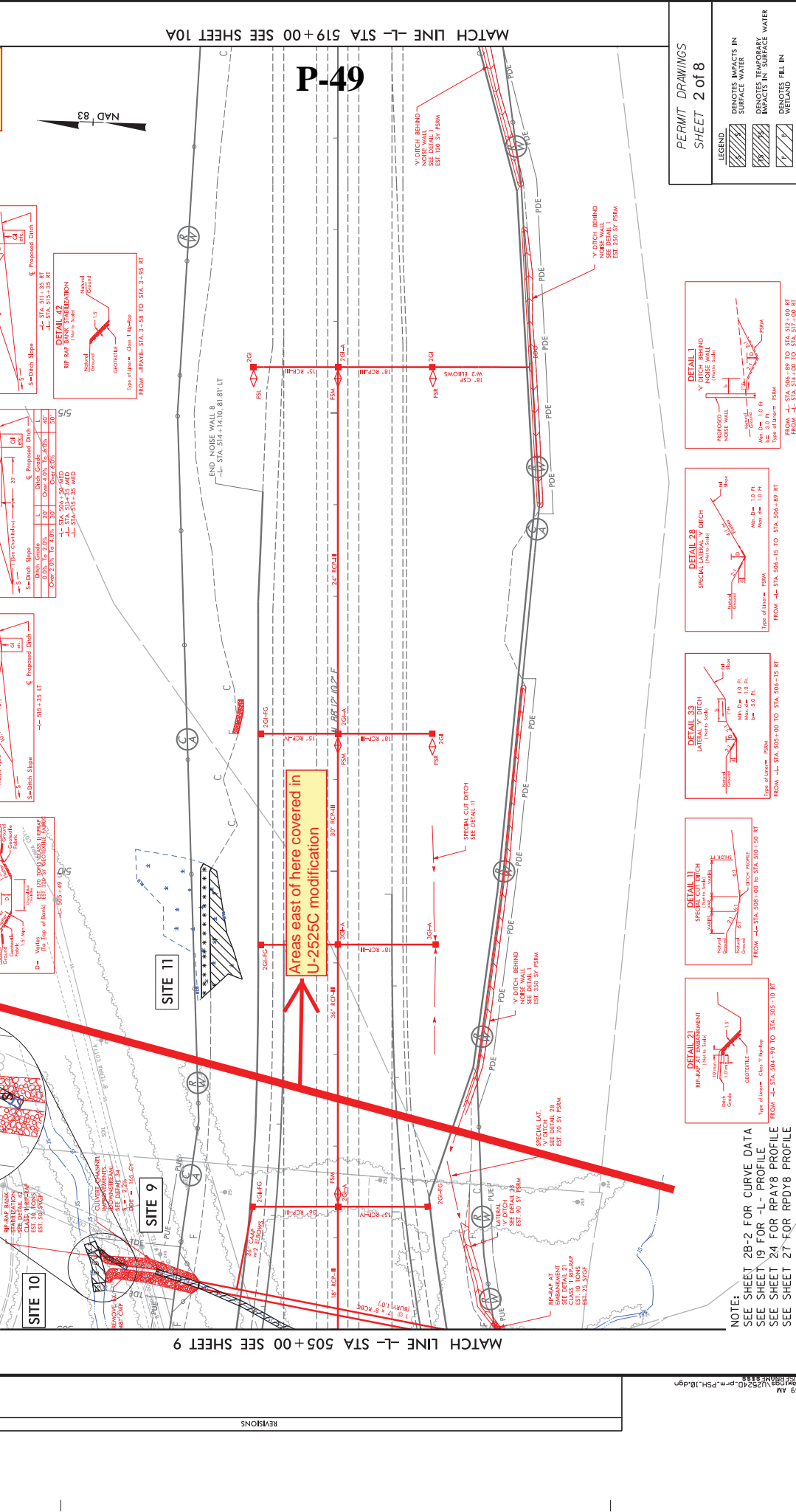
LETTING DATE: **DAVID GARRETT**
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ROADWAY DESIGN ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE HIGHWAY DESIGN ENGINEER



PERMIT DRAWINGS
SHEET 2 of 8

LEGEND

- Denotes Impacts in Surface Water
- Denotes Temporary Impacts in Surface Water
- Denotes Fill in Wetland
- Denotes Mechanized Clearing

DETAIL 21
 BR-AP AT EMBANKMENT
 (North Side)

FROM STA 504+50 TO STA 505+10 FT

DETAIL 22
 SPECIAL CUT DITCH
 (North Side)

FROM STA 508+00 TO STA 510+50 FT

DETAIL 23
 SPECIAL LATERAL V-DITCH
 (North Side)

FROM STA 508+15 TO STA 508+49 FT

DETAIL 33
 LATERAL V-DITCH
 (North Side)

FROM STA 505+00 TO STA 508+15 FT

DETAIL 38
 V-DITCH BEHIND NOISE WALL
 EST 100 SY PSMA

DETAIL 39
 V-DITCH BEHIND NOISE WALL
 EST 250 SY PSMA

DETAIL 40
 V-DITCH BEHIND NOISE WALL
 EST 250 SY PSMA

DETAIL 41
 V-DITCH BEHIND NOISE WALL
 EST 250 SY PSMA

REVISIONS

9:50:39 AM 1/25/24 dpm-PSH.18.dgn

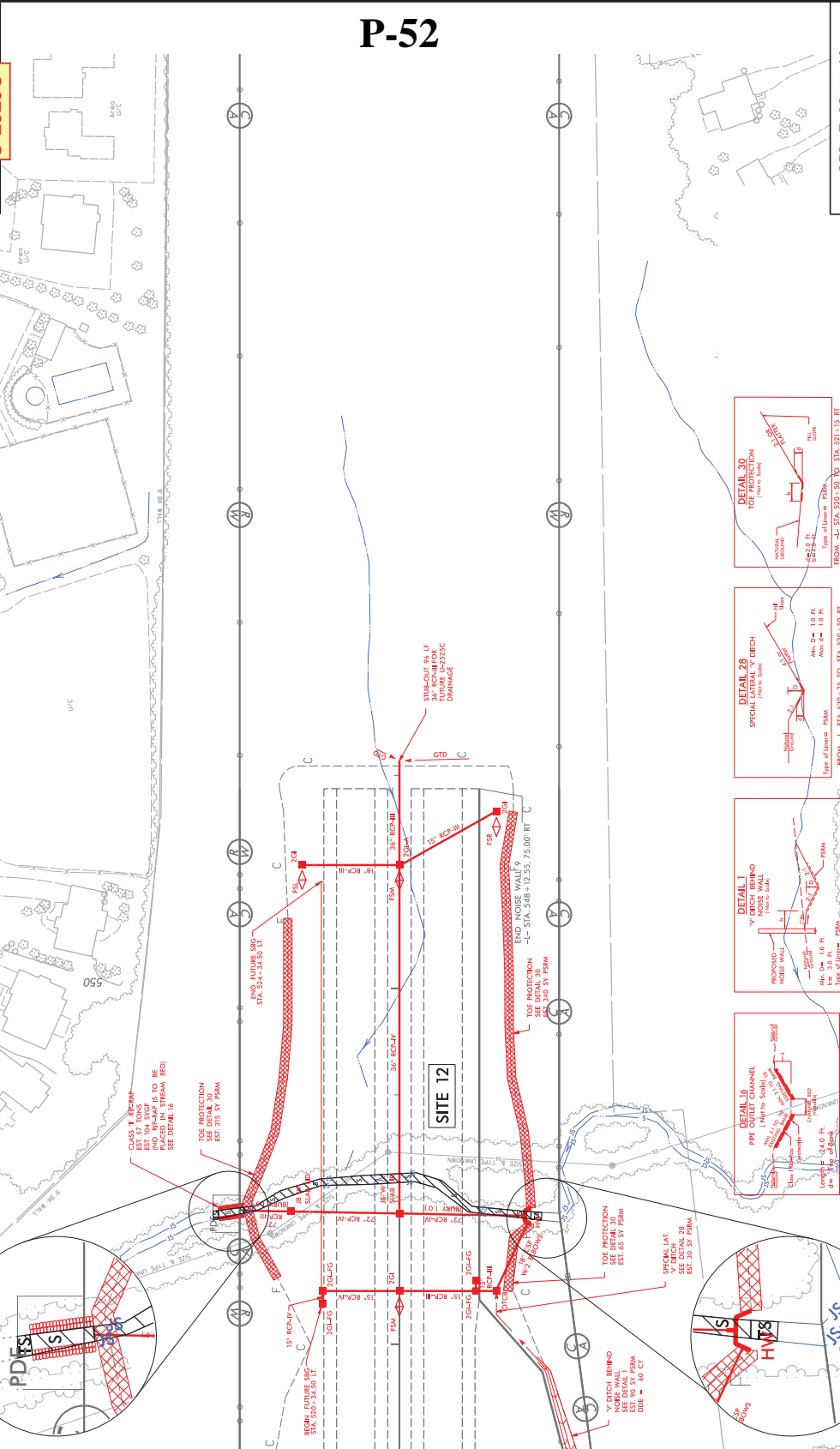
PROJECT REFERENCE NO. U-2524D
 SHEET NO. 10A
 HYDRAULICS ENGINEER
 ROADWAY DESIGN ENGINEER

**INCOMPLETE PLANS
 PRELIMINARY PLANS**
 NO PART SHALL BE CONSTRUCTION

U-2525C

PARSONS
 100 NORTH GOSWELL ST., SUITE 200, N.C.
 RALEIGH, NORTH CAROLINA 27609

ANTB
 100 NORTH GOSWELL ST., SUITE 200, N.C.
 RALEIGH, NORTH CAROLINA 27609



**PERMIT DRAWINGS
 SHEET 5 of 8**

LEGEND

- Denotes IMPACTS IN SURFACE WATER
- Denotes TEMPORARY IMPACTS IN SURFACE WATER

NOTE: SEE SHEET 19 FOR L-PROFILE

DETAIL 1
 V-DITCH BRIND
 (Note to Scale)
 PROPOSED: 18" RC-IV
 EXISTING: 18" RC-IV
 TOP OF CHANNEL: 1.0 FT
 FROM -L- STA. 519+00 TO STA. 520+75 RT

DETAIL 2
 PIPE OUTLET CHANNEL
 (Note to Scale)
 PROPOSED: 18" RC-IV
 EXISTING: 18" RC-IV
 TOP OF CHANNEL: 24.0 FT
 FROM -L- STA. 524+00 TO STA. 525+00 RT

DETAIL 28
 SPECIAL LATERAL DITCH
 (Note to Scale)
 PROPOSED: 18" RC-IV
 EXISTING: 18" RC-IV
 TOP OF CHANNEL: 1.0 FT
 FROM -L- STA. 520+75 TO STA. 521+50 RT

DETAIL 30
 TOE PROTECTION
 (Note to Scale)
 PROPOSED: 18" RC-IV
 EXISTING: 18" RC-IV
 TOP OF CHANNEL: 1.0 FT
 FROM -L- STA. 521+50 TO STA. 522+00 RT

MATCH LINE -L- STA 519+00 SEE SHEET 10

SCALE 1"=40'

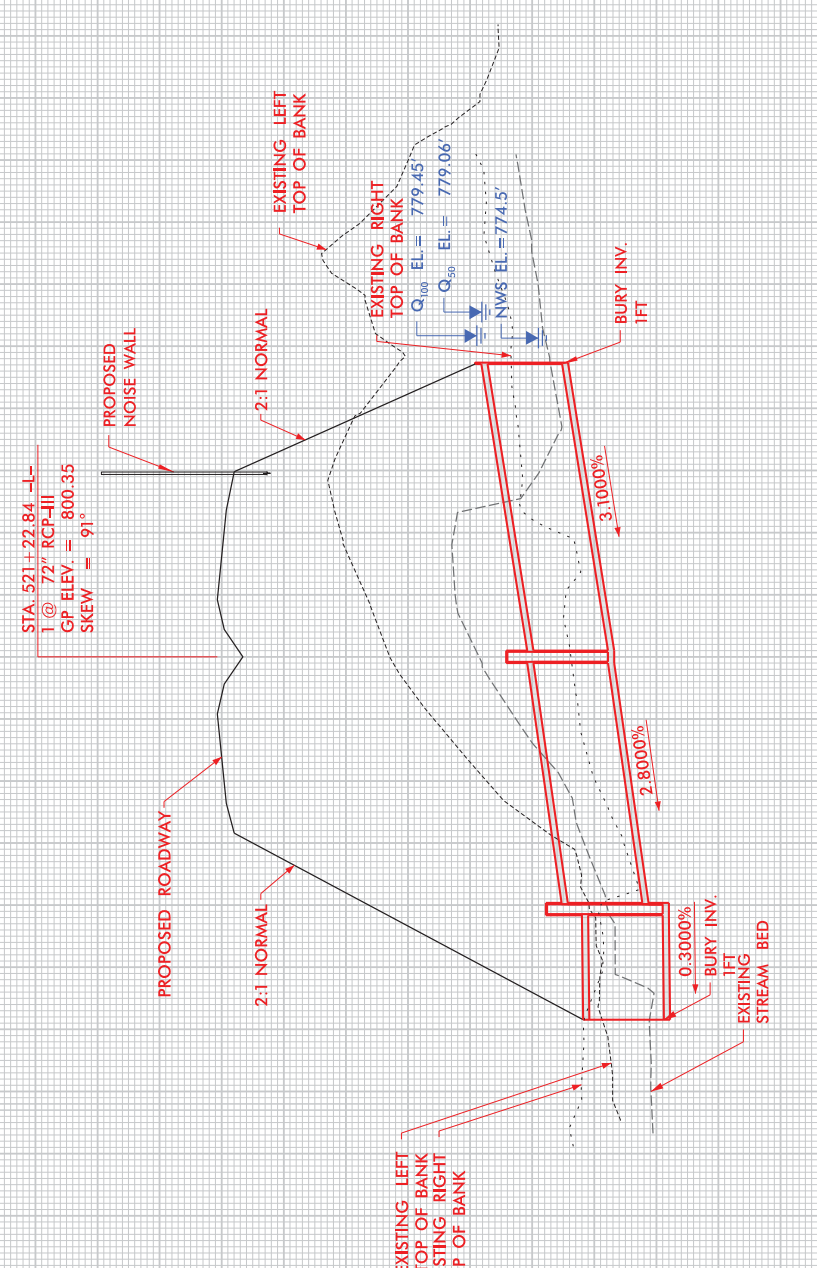
SCALE 1"=40'

NAD 83

REVIEWS

8/17/99

11:24 AM
 11/24/99
 PSH:104.dgn



PROFILE ALONG STRUCTURE

SITE 12

SCALE
 1"=50' HORIZONTAL
 1"=10' VERTICAL

810
800
790
780
770
760

810
800
790
780
770
760

County : Guilford

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	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUB- BING	3 ACR		
0005	0022000000-E	225	UNCLASSIFIED EXCAVATION	804,300 CY		
0006	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ***** (25+19 -Y6-)	Lump Sum	L.S.	
0007	0036000000-E	225	UNDERCUT EXCAVATION	3,490 CY		
0008	0106000000-E	230	BORROW EXCAVATION	447,800 CY		
0009	0134000000-E	240	DRAINAGE DITCH EXCAVATION	13,020 CY		
0010	0141000000-E	240	BERM DITCH CONSTRUCTION	50 LF		
0011	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	3,800 SY		
0012	0192000000-N	260	PROOF ROLLING	40 HR		
0013	0195000000-E	265	SELECT GRANULAR MATERIAL	4,000 CY		
0014	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA- TION	9,650 SY		
0015	0318000000-E	300	FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES	2,805 TON		
0016	0320000000-E	300	FOUNDATION CONDITIONING GEO- TEXTILE	10,586 SY		
0017	0342000000-E	310	*** SIDE DRAIN PIPE (30")	100 LF		
0018	0342000000-E	310	*** SIDE DRAIN PIPE (36")	112 LF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0019	0343000000-E	310	15" SIDE DRAIN PIPE	1,148	LF	
0020	0344000000-E	310	18" SIDE DRAIN PIPE	204	LF	
0021	0345000000-E	310	24" SIDE DRAIN PIPE	24	LF	
0022	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (15")	12	EA	
0023	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (18")	2	EA	
0024	0354000000-E	310	**** RC PIPE CULVERTS, CLASS ***** (30", V)	300	LF	
0025	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	3,468	LF	
0026	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	2,140	LF	
0027	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	2,212	LF	
0028	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	1,072	LF	
0029	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	1,976	LF	
0030	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	432	LF	
0031	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	532	LF	
0032	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	44	LF	
0033	0448000000-E	310	***** RC PIPE CULVERTS, CLASS IV (72")	216	LF	
0034	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	5,144	LF	
0035	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	164	LF	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0036	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	420		LF
0037	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	512		LF
0038	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	324		LF
0039	0576000000-E	310	*** CS PIPE CULVERTS, ***** THICK (36", 0.079")	134		LF
0040	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	132		LF
0041	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	200		LF
0042	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	24		LF
0043	0600000000-E	310	30" CS PIPE CULVERTS, 0.079" THICK	32		LF
0044	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (15", 0.064")	4		EA
0045	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (18", 0.064")	5		EA
0046	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (30", 0.079")	1		EA
0047	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (36", 0.079")	4		EA
0048	0938000000-E	SP	*** X *** CS STRUCTURAL PLATE PIPE ARCH, ** GAUGE (154" X 100", 8)	125		LF
0049	0995000000-E	340	PIPE REMOVAL	6,176		LF
0050	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0051	1044000000-E	501	LIME TREATED SOIL (SLURRY METHOD)	54,150		SY

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0052	1066000000-E	501	LIME FOR LIME TREATED SOIL	550 TON		
0053	1110000000-E	510	STABILIZER AGGREGATE	2,000 TON		
0054	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STA-BILIZATION	63,312 SY		
0055	1121000000-E	520	AGGREGATE BASE COURSE	7,400 TON		
0056	1176000000-E	542	SOIL CEMENT BASE	81,230 SY		
0057	1187000000-E	542	PORTLAND CEMENT FOR SOIL CE-MENT BASE	2,234 TON		
0058	1198000000-E	542	AGGREGATE FOR SOIL CEMENT BASE	2,240 TON		
0059	1209000000-E	543	ASPHALT CURING SEAL	19,350 GAL		
0060	1220000000-E	545	INCIDENTAL STONE BASE	100 TON		
0061	1275000000-E	600	PRIME COAT	2,590 GAL		
0062	1308000000-E	607	MILLING ASPHALT PAVEMENT, **** TO ***** (0" TO 3")	270 SY		
0063	1330000000-E	607	INCIDENTAL MILLING	1,920 SY		
0064	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	20,020 TON		
0065	1498000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0B	7,430 TON		
0066	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	1,630 TON		
0067	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	7,350 TON		
0068	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	1,210 TON		
0069	1525000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	5,730 TON		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0070	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	2,490	TON	
0071	1682000000-E	652	PERMEABLE ASPHALT DRAINAGE COURSE, TYPE P-57	11,070	TON	
0072	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	266	TON	
0073	1847000000-E	710	***** PORT CEM CONC PAVEMENT, THROUGH LANES (WITH DOWELS) (10-1/2")	64,205	SY	
0074	1858000000-E	710	***** PORT CEM CONC PAVEMENT, RAMPS (WITH DOWELS) (10-1/2")	12,740	SY	
0075	1869000000-E	710	***** PORT CEM CONC PAVEMENT, MISCELLANEOUS (WITHOUT DOWELS) (3-1/2")	632	SY	
0076	1881000000-E	SP	GENERIC PAVING ITEM MILLED RUMBLE STRIPS (CONCRETE SHOULDER)	31,000	LF	
0077	1913000000-E	720	CONCRETE SHOULDERS ADJACENT TO ***** PAVEMENT (10-1/2")	45,023	SY	
0078	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum	L.S.	
0079	2022000000-E	815	SUBDRAIN EXCAVATION	672	CY	
0080	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	2,000	SY	
0081	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	336	CY	
0082	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	2,000	LF	
0083	2070000000-N	815	SUBDRAIN PIPE OUTLET	4	EA	
0084	2077000000-E	815	6" OUTLET PIPE	24	LF	
0085	2099000000-E	816	SHOULDER DRAIN	18,890	LF	
0086	2110000000-E	816	4" SHOULDER DRAIN PIPE	20,660	LF	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0087	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	1,580	LF	
0088	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	30	EA	
0089	2143000000-E	818	BLOTTING SAND	20	TON	
0090	2209000000-E	838	ENDWALLS	11.7	CY	
0091	2220000000-E	838	REINFORCED ENDWALLS	13	CY	
0092	2275000000-E	SP	FLOWABLE FILL	455	CY	
0093	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	197	EA	
0094	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	39.62	CY	
0095	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	203.7	LF	
0096	2354000000-N	840	FRAME WITH GRATE, STD 840.22	7	EA	
0097	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	14	EA	
0098	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	40	EA	
0099	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	74	EA	
0100	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	2	EA	
0101	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	12	EA	
0102	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	19	EA	
0103	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	20	EA	
0104	2396000000-N	840	FRAME WITH COVER, STD 840.54	7	EA	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0105	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	5 EA		
0106	2462000000-E	SP	*** SLUICE GATE (30")	1 EA		
0107	2462000000-E	SP	*** SLUICE GATE (36")	1 EA		
0108	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	12,340 LF		
0109	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	1,360 LF		
0110	2591000000-E	848	4" CONCRETE SIDEWALK	4,170 SY		
0111	2605000000-N	848	CONCRETE CURB RAMP	52 EA		
0112	2612000000-E	848	6" CONCRETE DRIVEWAY	120 SY		
0113	2619000000-E	850	4" CONCRETE PAVED DITCH	1,900 SY		
0114	2647000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	600 SY		
0115	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	8,260 LF		
0116	2738000000-E	SP	GENERIC PAVING ITEM TEMPORARY SIDEWALK	1,000 SY		
0117	2759000000-N	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	1 EA		
0118	2850000000-N	858	GENERIC DRAINAGE ITEM ADJUSTMENT OF JUNCTION BOX	1 EA		
0119	2860000000-N	859	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX	1 EA		
0120	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	1 EA		
0121	3030000000-E	862	STEEL BM GUARDRAIL	18,525 LF		
0122	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	20 EA		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0123	3210000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE CAT-1	8 EA		
0124	3215000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE III	3 EA		
0125	3270000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE 350	12 EA		
0126	3285000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE M-350	1 EA		
0127	3317000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE B-77	30 EA		
0128	3380000000-E	862	TEMPORARY STEEL BM GUARDRAIL	275 LF		
0129	3387000000-N	862	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ***** (CAT-1)	1 EA		
0130	3389100000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE 350	1 EA		
0131	3435000000-N	SP	GENERIC GUARDRAIL ITEM STEEL BOLLARDS	3 EA		
0132	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	5,240 LF		
0133	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	314 EA		
0134	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	111 EA		
0135	3536000000-E	866	CHAIN LINK FENCE, 48" FABRIC	15,863 LF		
0136	3542000000-E	866	METAL LINE POSTS FOR 48" CHAIN LINK FENCE	1,224 EA		
0137	3548000000-E	866	METAL TERMINAL POSTS FOR 48" CHAIN LINK FENCE	124 EA		
0138	3551000000-E	866	METAL GATE POSTS FOR *** CHAIN LINK FENCE, SINGLE GATE (48")	2 EA		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0139	3564000000-E	866	SINGLE GATES, *** HIGH, ** WIDE, **' OPENING (48", 15', 15')	1 EA		
0140	3575000000-E	SP	GENERIC FENCING ITEM TEMPORARY 48" CHAIN LINK FENCE WITH POSTS	1,181 LF		
0141	3628000000-E	876	RIP RAP, CLASS I	1,716 TON		
0142	3635000000-E	876	RIP RAP, CLASS II	145 TON		
0143	3649000000-E	876	RIP RAP, CLASS B	85 TON		
0144	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	6,522 SY		
0145	4048000000-E	902	REINFORCED CONCRETE SIGN FOUN- DATIONS	3 CY		
0146	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDA- TIONS	1 CY		
0147	4057000000-E	SP	OVERHEAD FOOTING	164 CY		
0148	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	2,925 LB		
0149	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	1,334 LF		
0150	4080000000-N	903	SUPPORTS, BARRIER (LARGE)	2 EA		
0151	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUC- TURE AT STA ***** (01+50 -SPC Y8-)	Lump Sum	L.S.	
0152	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUC- TURE AT STA ***** (10+00 -RPAY8-)	Lump Sum	L.S.	
0153	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUC- TURE AT STA ***** (15+00 -Y8-)	Lump Sum	L.S.	
0154	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUC- TURE AT STA ***** (22+25 -Y8-)	Lump Sum	L.S.	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0155	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (425+50 -L- LT)	Lump Sum	L.S.	
0156	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (453+00 -L- LT)	Lump Sum	L.S.	
0157	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (457+50 -L-)	Lump Sum	L.S.	
0158	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (484+00 -L-)	Lump Sum	L.S.	
0159	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (492+00 -L-)	Lump Sum	L.S.	
0160	4096000000-N	904	SIGN ERECTION, TYPE D	1 EA		
0161	4102000000-N	904	SIGN ERECTION, TYPE E	61 EA		
0162	4108000000-N	904	SIGN ERECTION, TYPE F	4 EA		
0163	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	7 EA		
0164	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	1 EA		
0165	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	4 EA		
0166	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	1 EA		
0167	4114000000-N	904	SIGN ERECTION, MILEMARKERS	6 EA		
0168	4116200000-N	904	SIGN ERECTION, REPOSITION OVERHEAD	3 EA		
0169	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	40 EA		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0170	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	3 EA		
0171	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	1,493 SF		
0172	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	672 SF		
0173	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	796 SF		
0174	4415000000-N	1115	FLASHING ARROW BOARD	2 EA		
0175	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	4 EA		
0176	4430000000-N	1130	DRUMS	243 EA		
0177	4445000000-E	1145	BARRICADES (TYPE III)	432 LF		
0178	4455000000-N	1150	FLAGGER	255 DAY		
0179	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	5 EA		
0180	4470000000-N	1160	RESET TEMPORARY CRASH CUSHION	5 EA		
0181	4480000000-N	1165	TMA	4 EA		
0182	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	2,426 LF		
0183	4520000000-N	1266	TUBULAR MARKERS (FIXED)	52 EA		
0184	4589000000-N	SP	GENERIC TRAFFIC CONTROL ITEM PROTECTIVE CANOPY	Lump Sum	L.S.	
0185	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	373 EA		
0186	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	275 LF		
0187	4697000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 120 MILS)	224 LF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0188	4710000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 120 MILS)	1,205 LF		
0189	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	89 EA		
0190	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	61,383 LF		
0191	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	4,160 LF		
0192	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	2,799 LF		
0193	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	162 EA		
0194	4847000000-E	1205	POLYUREA PAVEMENT MARKING LINES (4", *****) (HIGHLY REFELCTIVE ELEMENTS)	11,487 LF		
0195	4847100000-E	1205	POLYUREA PAVEMENT MARKING LINES (6", *****) (HIGHLY REFELCTIVE ELEMENTS)	58,957 LF		
0196	4847110000-E	1205	POLYUREA PAVEMENT MARKING LINES (8", *****) (HIGHLY REFELCTIVE ELEMENTS)	628 LF		
0197	4847120000-E	1205	POLYUREA PAVEMENT MARKING LINES (12", *****) (HIGHLY REFELCTIVE ELEMENTS)	2,653 LF		
0198	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	5,033 LF		
0199	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	5,789 LF		
0200	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	163 LF		
0201	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	9 EA		
0202	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	208 EA		
0203	4905000000-N	1253	SNOWPLOWABLE PAVEMENT MARKERS	811 EA		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0204	5325600000-E	1510	6" WATER LINE	242	LF	
0205	5325800000-E	1510	8" WATER LINE	430	LF	
0206	5326200000-E	1510	12" WATER LINE	367	LF	
0207	5546000000-E	1515	8" VALVE	1	EA	
0208	5571600000-E	1515	6" TAPPING VALVE	2	EA	
0209	5672000000-N	1515	RELOCATE FIRE HYDRANT	5	EA	
0210	5691300000-E	1520	8" SANITARY GRAVITY SEWER	4,313	LF	
0211	5691500000-E	1520	12" SANITARY GRAVITY SEWER	5,315	LF	
0212	5691600000-E	1520	16" SANITARY GRAVITY SEWER	25	LF	
0213	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	35	EA	
0214	5775000000-E	1525	4' DIA UTILITY MANHOLE	43	EA	
0215	5781000000-E	1525	UTILITY MANHOLE WALL, 4' DIA	370	LF	
0216	5798000000-E	1530	ABANDON *** UTILITY PIPE (15")	922	LF	
0217	5800000000-E	1530	ABANDON 6" UTILITY PIPE	660	LF	
0218	5801000000-E	1530	ABANDON 8" UTILITY PIPE	9,691	LF	
0219	5802000000-E	1530	ABANDON 10" UTILITY PIPE	546	LF	
0220	5804000000-E	1530	ABANDON 12" UTILITY PIPE	330	LF	
0221	5815000000-N	1530	REMOVE WATER METER	71	EA	
0222	5815500000-N	1530	REMOVE FIRE HYDRANT	4	EA	
0223	5816000000-N	1530	ABANDON UTILITY MANHOLE	38	EA	
0224	5828000000-N	1530	REMOVE UTILITY MANHOLE	13	EA	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0225	5835800000-E	1540	18" ENCASEMENT PIPE	400	LF	
0226	5836000000-E	1540	24" ENCASEMENT PIPE	1,430	LF	
0227	5872000000-E	1550	TRENCHLESS INSTALLATION OF 18" IN SOIL	40	LF	
0228	5872010000-E	1550	TRENCHLESS INSTALLATION OF 18" NOT IN SOIL	40	LF	
0229	5872200000-E	1550	TRENCHLESS INSTALLATION OF 24" IN SOIL	310	LF	
0230	5872210000-E	1550	TRENCHLESS INSTALLATION OF 24" NOT IN SOIL	310	LF	
0231	6000000000-E	1605	TEMPORARY SILT FENCE	68,265	LF	
0232	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	2,100	TON	
0233	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	16,860	TON	
0234	6012000000-E	1610	SEDIMENT CONTROL STONE	23,300	TON	
0235	6015000000-E	1615	TEMPORARY MULCHING	90.5	ACR	
0236	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	4,300	LB	
0237	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	23.5	TON	
0238	6024000000-E	1622	TEMPORARY SLOPE DRAINS	8,630	LF	
0239	6029000000-E	SP	SAFETY FENCE	200	LF	
0240	6030000000-E	1630	SILT EXCAVATION	174,210	CY	
0241	6036000000-E	1631	MATTING FOR EROSION CONTROL	86,000	SY	
0242	6037000000-E	SP	COIR FIBER MAT	450	SY	
0243	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	6,540	SY	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0244	6042000000-E	1632	1/4" HARDWARE CLOTH	10,340	LF	
0245	6045000000-E	SP	*** TEMPORARY PIPE (18")	620	LF	
0246	6045000000-E	SP	*** TEMPORARY PIPE (24")	315	LF	
0247	6045000000-E	SP	*** TEMPORARY PIPE (30")	162	LF	
0248	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	200	LF	
0249	6070000000-N	1639	SPECIAL STILLING BASINS	6	EA	
0250	6071012000-E	SP	COIR FIBER WATTLE	7,560	LF	
0251	6071014000-E	SP	COIR FIBER WATTLE BARRIER	270	LF	
0252	6071020000-E	SP	POLYACRYLAMIDE (PAM)	5,940	LB	
0253	6071030000-E	1640	COIR FIBER BAFFLE	13,785	LF	
0254	6071050000-E	SP	*** SKIMMER (1-1/2")	23	EA	
0255	6071050000-E	SP	*** SKIMMER (2")	7	EA	
0256	6071050000-E	SP	*** SKIMMER (2-1/2")	2	EA	
0257	6071050000-E	SP	*** SKIMMER (3")	1	EA	
0258	6071050000-E	SP	*** SKIMMER (4")	1	EA	
0259	6084000000-E	1660	SEEDING & MULCHING	108	ACR	
0260	6087000000-E	1660	MOWING	99	ACR	
0261	6090000000-E	1661	SEED FOR REPAIR SEEDING	900	LB	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0262	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	4.25	TON	
0263	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	2,575	LB	
0264	6108000000-E	1665	FERTILIZER TOPDRESSING	77	TON	
0265	6111000000-E	SP	IMPERVIOUS DIKE	585	LF	
0266	6114500000-N	1667	SPECIALIZED HAND MOWING	80	MHR	
0267	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	100	EA	
0268	6132000000-N	SP	GENERIC EROSION CONTROL ITEM CONCRETE WASHOUT STRUCTURE	8	EA	
0269	6147000000-E	SP	GENERIC EROSION CONTROL ITEM REINSTALLATION OF TEMPORARY PIPE FOR CLEAN WATER DIVERSION	800	LF	
0270	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	27	EA	
0271	7060000000-E	1705	SIGNAL CABLE	12,900	LF	
0272	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	35	EA	
0273	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	1	EA	
0274	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	1	EA	
0275	7252000000-E	1710	MESSENGER CABLE (1/4")	200	LF	
0276	7264000000-E	1710	MESSENGER CABLE (3/8")	1,350	LF	
0277	7279000000-E	1715	TRACER WIRE	11,445	LF	
0278	7288000000-E	1715	PAVED TRENCHING (***** (1, 2"))	25	LF	
0279	7300000000-E	1715	UNPAVED TRENCHING (***** (1, 2"))	1,900	LF	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0280	7300000000-E	1715	UNPAVED TRENCHING (*****) (2, 2")	1,730 LF		
0281	7300000000-E	1715	UNPAVED TRENCHING (*****) (4, 1-1/4")	5,650 LF		
0282	7300000000-E	1715	UNPAVED TRENCHING (*****) (4, 1-1/4") (1, 2")	470 LF		
0283	7301000000-E	1715	DIRECTIONAL DRILL (*****) (1, 2")	1,905 LF		
0284	7301000000-E	1715	DIRECTIONAL DRILL (*****) (2, 2")	695 LF		
0285	7301000000-E	1715	DIRECTIONAL DRILL (*****) (4, 1-1/4")	2,870 LF		
0286	7301000000-E	1715	DIRECTIONAL DRILL (*****) (4, 1-1/4") (1, 2")	230 LF		
0287	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	55 EA		
0288	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	27 EA		
0289	7360000000-N	1720	WOOD POLE	1 EA		
0290	7372000000-N	1721	GUY ASSEMBLY	3 EA		
0291	7408000000-E	1722	1" RISER WITH WEATHERHEAD	3 EA		
0292	7420000000-E	1722	2" RISER WITH WEATHERHEAD	1 EA		
0293	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	2 EA		
0294	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	4,225 LF		
0295	7456000000-E	1726	LEAD-IN CABLE (*****) (14-2)	10,225 LF		
0296	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (144)	11,420 LF		
0297	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (24)	1,400 LF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0298	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (6)	1,810 LF		
0299	7528000000-E	1730	DROP CABLE	1,675 LF		
0300	7540000000-N	1731	SPLICE ENCLOSURE	5 EA		
0301	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	8 EA		
0302	7552000000-N	1731	INTERCONNECT CENTER	3 EA		
0303	7566000000-N	1733	DELINEATOR MARKER	22 EA		
0304	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	3,900 LF		
0305	7576000000-N	SP	METAL STRAIN SIGNAL POLE	16 EA		
0306	7613000000-N	SP	SOIL TEST	21 EA		
0307	7614100000-E	SP	DRILLED PIER FOUNDATION	120 CY		
0308	7636000000-N	1745	SIGN FOR SIGNALS	7 EA		
0309	7642100000-N	1743	TYPE I POST WITH FOUNDATION	6 EA		
0310	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND- ATION	14 EA		
0311	7684000000-N	1750	SIGNAL CABINET FOUNDATION	3 EA		
0312	7686000000-N	1752	CONDUIT ENTRANCE INTO EXISTING FOUNDATION	2 EA		
0313	7756000000-N	1751	CONTROLLER WITH CABINET (TYPE 2070L, BASE MOUNTED)	3 EA		
0314	7780000000-N	1751	DETECTOR CARD (TYPE 2070L)	16 EA		
0315	7901000000-N	1753	CABINET BASE EXTENDER	3 EA		
0316	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	2 EA		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0317	7960000000-N	SP	METAL POLE FOUNDATION REMOVAL	5	EA	
0318	7972000000-N	SP	METAL POLE REMOVAL	5	EA	
0319	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	22	EA	
0320	7980000000-N	SP	GENERIC SIGNAL ITEM 6" X 6" WOOD PEDESTAL	1	EA	
0321	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	4	EA	
0322	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET	4	EA	
0323	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE	4	EA	
0324	7980000000-N	SP	GENERIC SIGNAL ITEM CENTRAL MEDIA CONVERTER	1	EA	
0325	7980000000-N	SP	GENERIC SIGNAL ITEM CENTRAL VIDEO DECODER UNIT	4	EA	
0326	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	1	EA	
0327	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	1	EA	
0328	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN	1	EA	
0329	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	5	EA	
0330	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET CORE SWITCH INTERFACE MODULE	1	EA	
0331	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD ETHERNET SWITCH	5	EA	
0332	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CCTV CAMERA ASSEMBLY	1	EA	
0333	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH FIELD ETHERNET SWITCH	1	EA	

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0334	7980000000-N	SP	GENERIC SIGNAL ITEM INTERCONNECT CENTER (6-FIBER)	5 EA		
0335	7980000000-N	SP	GENERIC SIGNAL ITEM MASTER DISTRIBUTION AMPLIFIER	1 EA		
0336	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COM- BINATION PANEL (WOOD PEDESTAL MOUNT)	1 EA		
0337	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTOR - SINGLE ZONE	1 EA		
0338	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE EQUIPMENT	2 EA		
0339	7980000000-N	SP	GENERIC SIGNAL ITEM RACK-MOUNTED VIDEO DECODER CHASSIS	1 EA		
0340	7985000000-N	SP	GENERIC SIGNAL ITEM INTEGRATION AND CONFIGURATION	Lump Sum	L.S.	
0341	7985000000-N	SP	GENERIC SIGNAL ITEM OVERHEAD CABLE TRAY	Lump Sum	L.S.	
0342	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTOR	440 LF		
0343	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS	1,930 LF		
0344	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS	220 LF		
0345	7992000000-E	SP	GENERIC SIGNAL ITEM DMS FOUNDATION	5 CY		
0401	5776000000-E	1525	5' DIA UTILITY MANHOLE	8 EA		
0402	5782000000-E	1525	UTILITY MANHOLE WALL, 5' DIA	93 LF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
CULVERT ITEMS						
0346	8126000000-N	414	CULVERT EXCAVATION, STA ***** (1+26.46 -SPBY8-, CULVERT #2)	Lump Sum	L.S.	
0347	8126000000-N	414	CULVERT EXCAVATION, STA ***** (2+22.93 -SPCY8, CULVERT #3)	Lump Sum	L.S.	
0348	8126000000-N	414	CULVERT EXCAVATION, STA ***** (478+64.55 -L-, CULVERT #1)	Lump Sum	L.S.	
0349	8126000000-N	414	CULVERT EXCAVATION, STA ***** (505+19.00 -L-, CULVERT #4)	Lump Sum	L.S.	
0350	8126000000-N	414	CULVERT EXCAVATION, STA ***** (9+04.29 -RPAY8-, CULVERT #2 & CULVERT #3)	Lump Sum	L.S.	
0351	8133000000-E	414	FOUNDATION CONDITIONING MATER- IAL, BOX CULVERT	3,894 TON		
0352	8196000000-E	420	CLASS A CONCRETE (CULVERT)	4,459.8 CY		
0353	8245000000-E	425	REINFORCING STEEL (CULVERT)	566,881 LB		
WALL ITEMS						
0354	8801000000-E	SP	MSE RETAINING WALL NO **** (W10)	5,050 SF		
0355	8801000000-E	SP	MSE RETAINING WALL NO **** (W7)	6,665 SF		
0356	8801000000-E	SP	MSE RETAINING WALL NO **** (W8)	7,475 SF		
0357	8801000000-E	SP	MSE RETAINING WALL NO **** (W9)	9,585 SF		
0358	8802030000-E	SP	SEGMENTAL GRAVITY RETAINING WALLS	400 SF		
0359	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 1	7,455 SF		
0360	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 2	32,285 SF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0361	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 3	22,845	SF	
0362	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 6	81,315	SF	
0363	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 7	65,100	SF	
0364	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 8	31,365	SF	
0365	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO 9	61,965	SF	
0366	8847000000-E	SP	GENERIC RETAINING WALL ITEM STEEL SHEET PILE RETAINING WALL	370	SF	

***** BEGIN SCHEDULE IA *****
***** (2 ALTERNATES) *****

0367	8802010000-E	SP	SOIL NAIL RETAINING WALLS	80,475	SF	
IA1						
0368	8802015100-N	SP	SOIL NAIL VERIFICATION TESTS	19	EA	
IA1						
0369	8802015110-N	SP	SOIL NAIL PROOF TESTS	127	EA	
IA1						

*** OR ***

0370	8801000000-E	SP	MSE RETAINING WALL NO **** (W12)	3,330	SF	
IA2						
0371	8801000000-E	SP	MSE RETAINING WALL NO **** (W13)	3,080	SF	
IA2						
0372	8802010000-E	SP	SOIL NAIL RETAINING WALLS	74,545	SF	
IA2						
0373	8802015100-N	SP	SOIL NAIL VERIFICATION TESTS	15	EA	
IA2						
0374	8802015110-N	SP	SOIL NAIL PROOF TESTS	115	EA	
IA2						

***** END SCHEDULE IA *****

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
STRUCTURE ITEMS						
0375	3524000000-E	SP	VINYL COATED CHAIN LINK FENCE, *** FABRIC (79")	323.39 LF		
0376	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 13+62.84 -PED-)	Lump Sum	L.S.	
0377	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 25+18.62 -Y6-)	Lump Sum	L.S.	
0378	8112730000-N	450	PDA TESTING	2 EA		
0379	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	43,532 SF		
0380	8161000000-E	420	GROOVING BRIDGE FLOORS	43,838 SF		
0381	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	637 CY		
0382	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (25+18.62 -Y6-)	Lump Sum	L.S.	
0383	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (495+22.00 -LREV- LT)	Lump Sum	L.S.	
0384	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (495+22.00 -LREV- RT)	Lump Sum	L.S.	
0385	8217000000-E	425	REINFORCING STEEL (BRIDGE)	110,201 LB		
0386	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	1,588 LB		
0387	8265000000-E	430	54" PRESTRESSED CONCRETE GIR- DERS	2,039.55 LF		
0388	8280000000-E	440	APPROX LBS STRUCTURAL STEEL	1,791,580 LS		
0389	8364000000-E	450	HP12X53 STEEL PILES	6,320 LF		
0390	8393000000-N	450	PILE REDRIVES	5 EA		
0391	8475000000-E	460	TWO BAR METAL RAIL	740.64 LF		

County : Guilford

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0392	8503000000-E	460	CONCRETE BARRIER RAIL	943.4		LF
0393	8517000000-E	460	1'-***"X *****" CONCRETE PARA-PET (1'-2" X 2'-6")	340		LF
0394	8517000000-E	460	1'-***"X *****" CONCRETE PARA-PET (1'-2" X 3'-2 3/4")	433.24		LF
0395	8531000000-E	462	4" SLOPE PROTECTION	122		SY
0396	8654000000-N	SP	DISC BEARINGS	Lump Sum		L.S.
0397	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum		L.S.
0398	8692000000-N	SP	FOAM JOINT SEALS	Lump Sum		L.S.
0399	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum		L.S.
0400	8867000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE BARRIER RAIL WITH MOMENT SLAB	1,252.7		LF

1032/Sep08/Q5684470.99/D1949700276420/E402

Total Amount Of Bid For Entire Project :