

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

C204746

CONTRACT AND
CONTRACT BONDS
FOR CONTRACT NO. C204746

WBS 34839.3.13 0074226

T.I.P NO. U-2579AA

COUNTY OF FORSYTH

THIS IS THE ROADWAY & STRUCTURE CONTRACT

ROUTE NUMBER I-74 LENGTH 1.536 MILES

LOCATION FUTURE I-74 (WINSTON-SALEM NORTHERN BELTWAY) FROM US-311 TO I-40.

CONTRACTOR FLATIRON CONSTRUCTORS INC

ADDRESS 860 AVIATION PARKWAY
MORRISVILLE, NC 27560

BIDS OPENED OCTOBER 18, 2022

CONTRACT EXECUTION 11/14/2022

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

PROPOSAL

INCLUDES ADDENDUM No.4 DATED 10-14-2022

DATE AND TIME OF BID OPENING: **Oct 18, 2022 AT 02:00 PM**

CONTRACT ID C204746
WBS 34839.3.13

FEDERAL-AID NO. 0074226
COUNTY FORSYTH
T.I.P NO. U-2579AA
MILES 1.536
ROUTE NO. I-74
LOCATION FUTURE I-74 (WINSTON-SALEM NORTHERN BELTWAY) FROM US-311 TO I-40.

TYPE OF WORK GRADING, DRAINAGE, PAVING, AND 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. C204746 IN FORSYTH 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. C204746 has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2018 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. C204746 in Forsyth 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 2018* 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:

Ronald Elton Davenport, Jr.

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PROPOSAL ITEM SHEET

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PROJECT SPECIAL PROVISIONS**GENERAL****INTERESTED PARTIES LIST:**

(6-21-22)(Rev. 7-19-22)

102

SP1 G02

Revise the *2018 Standard Specifications* as follows:

Page 1-12, Article 102-3 PROPOSALS AND PLAN HOLDER LISTS, lines 45-49, delete and replace with the following:

102-3 PROPOSALS AND INTERESTED PARTIES LIST

On Department projects advertised, the prospective bidder shall sign up on the *Interested Parties List* no later than one business day prior to the Letting day of that project, for which he intends to submit a bid. There is no cost for signing up on the *Interested Parties List* that can be found on the Department's website at connect.ncdot.gov/letting.

Page 1-12, Article 102-3 PROPOSALS AND PLAN HOLDER LISTS, lines 1-3, delete and replace the first sentence of the second paragraph with the following:

The proposal will state the location of the contemplated construction and show a schedule of contract items with the approximate quantity of each of these items for which bid prices are invited.

Page 1-14, Article 102-8 PREPARATION AND SUBMISSION OF BIDS, lines 30-31, delete and replace the first paragraph with the following:

Prior to submitting a bid on a project, the bidder shall sign up on the *Interested Parties List* in conformance with Article 102-3. The bidder shall submit a unit or lump sum price for every item in the proposal other than items that are authorized alternates to those items for which a bid price has been submitted.

CONTRACT TIME AND LIQUIDATED DAMAGES:

(8-15-00) (Rev. 12-18-07)

108

SP1 G07 A

The date of availability for this contract is **November 28, 2022**, 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 **March 30, 2027**.

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 **November 28, 2022**.

The completion date for this intermediate contract time is **November 1, 2026**.

The liquidated damages for this intermediate contract time are **Seven Thousand Dollars (\$ 7,000.00)** 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 **I-40 and/or US 52 (including any Ramp and/or Loop associated with these roads)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

**Monday thru Friday, 6:00 A.M. to 9:00 P.M.
Saturday and Sunday, 11:00 A.M. to 9:00 P.M.**

In addition, the Contractor shall not close or narrow a lane of traffic on **Existing I-74 (-Y2-), I-40, US 421, NC 74 (Proposed I-74), US 52 and/or any associated Ramp or Loop**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **6:00 A.M.** December 31st to **9:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 P.M.** the following Tuesday.
3. For **Easter**, between the hours of **6:00 A.M.** Thursday and **9:00 P.M.** Monday.
4. For **Memorial Day**, between the hours of **6:00 A.M.** Friday and **9:00 P.M.** Tuesday.
5. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **9:00 P.M.** the day after Independence Day.

If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 A.M.** the Thursday before Independence Day and **9:00 P.M.** the Tuesday after Independence Day.
6. For **Labor Day**, between the hours of **6:00 A.M.** Friday and **9:00 P.M.** Tuesday.
7. For **Thanksgiving**, between the hours of **6:00 A.M.** Tuesday and **9:00 P.M.** Monday.
8. For **Christmas**, between the hours of **6:00 A.M.** the Friday before the week of Christmas Day and **9:00 P.M.** the following Tuesday after the week of Christmas Day.

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

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:

(2-20-07)

108

SP1 G14 C

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 **Existing I-74 (-Y2-), US 421, and/or NC 74 (Proposed I-74) (including any Ramp and/or Loop associated with these roads)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 A.M. to 9:00 P.M.
Saturday and Sunday, 11:00 A.M. to 9:00 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 the lane closures according to the time restrictions stated herein.

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

The liquidated damages are **One Thousand Two Hundred Fifty Dollars (\$ 1,250.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:

(2-20-07)

108

SP1 G14 C

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 **SR 1003/High Point Road (Old US 311) (-Y1-), and/or SR 2698/Ridgewood Road (-Y3-) (including any Ramp and/or Loops associated with these roads)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

On Scheduled School Days

Monday thru Friday, 6:00 A.M. to 9:00 A.M. and 2:00 P.M. to 4:30 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 the lane closures according to the time restrictions stated herein.

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

The liquidated damages are **Two Hundred Fifty Dollars (\$ 250.00)** per hour. **The Day and Time Restrictions, and associated liquidated damages, will not apply to construction operations requiring the closure of SR 1003 / High Point Road (Old US 311) (-Y1-) per Area 2, Phase 1, Step #2 thru Area 2, Phase 3, Step #1 per Sheet TMP-3.**

INTERMEDIATE CONTRACT TIME NUMBER 5 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 **US 421 Ramps for Sign Installation** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 6:00 A.M. to 12:00 A.M. (Midnight)

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

INTERMEDIATE CONTRACT TIME NUMBER 6 AND LIQUIDATED DAMAGES:

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

108

SP1 G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **Existing I-74 (-Y2-), I-40, US 421, NC 74 (Proposed I-74), US 158, US 52 and/or any associated Ramp or Loop** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 6:00 A.M. to 12:00 A.M. (Midnight)

The maximum allowable time for Overhead Sign Installation and/or Overhead Bridge Work is **thirty (30) minutes for Existing I-74 (-Y2-), I-40, US 421, NC 74 (Proposed I-74), US 158, US 52 and/or any associated Ramp or Loop**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 7 AND LIQUIDATED DAMAGES:

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

108

SP1 G14 H

The Contractor shall complete the work required of **Area 3, Phase 2, Steps #2 thru #2C** as shown on Sheet **TMP-3A** 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 **fourteen (14)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Seven Hundred Fifty Dollars (\$ 750.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 8 AND LIQUIDATED DAMAGES:

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

108

SP1 G14 H

The Contractor shall complete the work required of **Area 3, Phase 2, Steps #4 thru #4B** as shown on Sheet **TMP-3A** 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 **One Thousand Five Hundred Dollars (\$ 1,500.00)** per calendar day.

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 *2018 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 *2018 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

CONSTRUCTION MORATORIUM:

(1-19-16)

SP1 G18C

No tree cutting will be allowed from **April 1** through **October 15** of any year, effective April 1, 2024.

DELAY IN RIGHT OF ENTRY:

(7-1-95)

108

SP1 G22 A

The Contractor will not be allowed right of entry to the parcels listed below before October 31, 2022 unless otherwise permitted by the Engineer.

<u>Parcel No.</u>	<u>Property Owner</u>
007	Michael & Virginia Menzel
015	Everette & Martha Kirby
039	Crown Castle Towers

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 *2018 Standard Specifications*):

Line #	Description
19	Borrow Excavation
410	Reinforced Concrete Deck Slab
412	Class A Concrete (Bridge)

SPECIALTY ITEMS:

(7-1-95)(Rev. 7-20-21)

108-6

SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the 2018 *Standard Specifications*).

Line #	Description
146-155	Guardrail
156-159	Fencing
164-202	Signing
226-234, 240-241	Long-Life Pavement Markings
248-249	Permanent Pavement Markers
251-283	Utility Construction
284-322	Erosion Control
323-359	Signals/ITS System
404-406, 408-409	Drilled Piers
424, 441-442, 458	Bridge Painting
453-454, 464	Polyester Polymer Concrete Overlay

Or

146-155	Guardrail
156-159	Fencing
164-202	Signing
226-234, 240-241	Long-Life Pavement Markings
248-249	Permanent Pavement Markers
251-283	Utility Construction
284-322	Erosion Control
323-359	Signals/ITS System
404-406, 408-409	Drilled Piers
424, 441-442, 458	Bridge Painting
453-454, 465	Epoxy Polymer Concrete Overlay

FUEL PRICE ADJUSTMENT:

(11-15-05)(Rev. 7-20-21)

109-8

SP1 G43

Revise the 2018 *Standard Specifications* as follows:

Page 1-87, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is \$ **3.7538** 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	0.90 or 2.90
Asphalt Concrete Intermediate Course, Type _____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Surface Course, Type _____	Gal/Ton	0.90 or 2.90
Open-Graded Asphalt Friction Course	Gal/Ton	0.90 or 2.90
Permeable Asphalt Drainage Course, Type _____	Gal/Ton	0.90 or 2.90
Sand Asphalt Surface Course, Type _____	Gal/Ton	0.90 or 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

For the asphalt items noted in the chart as eligible for fuel adjustments, the bidder may include the *Fuel Usage Factor Adjustment Form* with their bid submission if they elect to use the fuel usage factor. The *Fuel Usage Factor Adjustment Form* is found at the following link:

<https://connect.ncdot.gov/letting/LetCentral/Fuel%20Usage%20Factor%20Adjustment%20Form.pdf>

Select either 2.90 Gal/Ton fuel factor or 0.90 Gal/Ton fuel factor for each asphalt line item on the *Fuel Usage Factor Adjustment Form*. The selected fuel factor for each asphalt item will remain in effect for the duration of the contract.

Failure to complete the *Fuel Usage Factor Adjustment Form* will result in using 2.90 gallons per ton as the Fuel Usage Factor for Diesel for the asphalt items noted above. The contractor will not be permitted to change the Fuel Usage Factor after the bids are submitted.

STEEL PRICE ADJUSTMENT:

(4-19-22)(Rev. 9-20-22)

SP1 G47

Description and Purpose

Steel price adjustments will be made to the payments due the Contractor for items as defined herein that are permanently incorporated into the work, when the price of raw steel mill products utilized on the contract have fluctuated. The Department will adjust monthly progress payments up or down as appropriate for cost changes in steel according to this provision.

Eligible Items

The list of eligible bid items for steel price adjustment can be found on the Departments website at the following address:

<https://connect.ncdot.gov/letting/LetCentral/Eligible%20Bid%20Items%20for%20Steel%20Price%20Adjustment.xlsx>

Nuts, bolts, anchor bolts, rebar chairs, connecting bands and other miscellaneous hardware associated with these items shall not be included in the price adjustment.

Adjustments will only be made for fluctuations in the material cost of the steel used in the above products as specified in the Product Relationship Table below. The producing mill is defined as the source of steel product before any fabrication has occurred (e.g., coil, plate, rebar, hot rolled shapes, etc.). No adjustment will be made for changes in the cost of fabrication, coating, shipping, storage, etc.

No steel price adjustments will be made for any products manufactured from steel having an adjustment date, as defined by the Product Relationship Table below, prior to the letting date.

Bid Submittal Requirements

The successful bidder, within 14 calendar days after the notice of award is received by him, shall provide the completed Form SPA-1 to the Department (State Contract Officer or Division Contract Engineer) along with the payment bonds, performance bonds and contract execution signature sheets in a single submittal. If Form SPA-1 is not included in the same submittal as the payment bonds, performance bonds and contract execution signature sheets, the Contractor will not be eligible for any steel price adjustment for any item in the contract for the life of the contract. Form SPA-1 can be found on the Department's website at the following address:

<https://connect.ncdot.gov/letting/LetCentral/Form%20SPA-1.xlsm>

The Contractor shall provide Form SPA-1 listing the Contract Line Number, (with corresponding Item Number, Item Description, and Category) for the steel products they wish to have an adjustment calculated. Only the contract items corresponding to the list of eligible item numbers for steel price adjustment may be entered on Form SPA-1. The Contractor may choose to have steel price adjustment applied to any, all, or none of the eligible items. However, the Contractor's selection of items for steel price adjustment or non-selection (non-participation) may not be changed once Form SPA-1 has been received by the Department. Items the Bidder chooses for steel price adjustment must be designated by writing the word "Yes" in the column titled "Option" by each Pay Item chosen for adjustment. Should the bidder elect an eligible steel price item, the entire quantity of the line item will be subject to the price adjustment for the duration of the Contract. The Bidder's designations on Form SPA-1 must be written in ink or typed and signed by the Bidder (Prime Contractor) to be considered complete. Items not properly designated, designated with "No", or left blank on the Bidder's Form SPA-1 will automatically be removed from consideration for adjustment. No steel items will be eligible for steel price adjustment on this Project if the Bidder fails to return Form SPA-1 in accordance with this provision.

Establishing the Base Price

The Department will use a blend of monthly average prices as reported from the Fastmarkets platform to calculate the monthly adjustment indices (BI and MI). This data is typically available on the first day of the month for the preceding month. The indices will be calculated by the Department for the different categories found on the Product Relationship Table below. For item numbers that include multiple types of steel products, the category listed for that item number will be used for adjusting each steel component.

The bidding index for Category 1 Steel items is **\$ 53.88** per hundredweight.
The bidding index for Category 2 Steel items is **\$ 85.49** per hundredweight.

The bidding index for Category 3 Steel items is **\$ 71.54** per hundredweight.
 The bidding index for Category 4 Steel items is **\$ 46.74** per hundredweight.
 The bidding index for Category 5 Steel items is **\$ 63.69** per hundredweight.
 The bidding index for Category 6 Steel items is **\$ 89.42** per hundredweight.
 The bidding index for Category 7 Steel items is **\$ 57.67** per hundredweight.
 The bidding index represents a selling price of steel based on Fastmarkets data for the month of **July 2022**.

MI = Monthly Index. – in Dollars (\$) per hundredweight (CWT). Use the adjustment indices from the month the steel was shipped from the producing mill, received on the project, or member cast as defined in the Product Relationship Table.

BI = Bidding Index. - in Dollars (\$) per hundredweight (CWT). Use the adjustment indices as listed in the proposal.

<i>Steel Product (Title)</i>	BI, MI*	Adjustment Date for MI	Category
Reinforcing Steel, Bridge Deck, and SIP Forms	Based on one or more Fastmarkets indices	Delivery Date from Producing Mill	1
Structural Steel and Encasement Pipe	Based on one or more Fastmarkets indices	Delivery Date from Producing Mill	2
Steel H-Piles, Soldier Pile Walls	Based on one or more Fastmarkets indices	Delivery Date from Producing Mill	3
Guardrail Items and Pipe Piles	Based on one or more Fastmarkets indices	Material Received Date**	4
Fence Items	Based on one or more Fastmarkets indices	Material Received Date**	5
Overhead Sign Assembly, Signal Poles, High Mount Standards	Based on one or more Fastmarkets indices	Material Received Date**	6
Prestressed Concrete Members	Based on one or more Fastmarkets indices	Cast Date of Member	7

Submit documentation to the Engineer for all items listed in the Contract for which the Contractor is requesting a steel price adjustment.

Submittal Requirements

The items in categories 1,2, and 3, shall be specifically stored, labeled, or tagged, recognizable by color marking, and identifiable by Project for inspection and audit verification immediately upon arrival at the fabricator.

Furnish the following documentation for all steel products to be incorporated into the work and documented on Form SPA-2, found on the Departments website at the following address:

<https://connect.ncdot.gov/projects/construction/Construction%20Forms/Form%20SPA-2.xlsx>

Submit all documentation to the Engineer prior to incorporation of the steel into the completed work. The Department will withhold progress payments for the affected contract line item if the

documentation is not provided and at the discretion of the Engineer the work is allowed to proceed. Progress payments will be made upon receipt of the delinquent documentation.

Step 1 (Form SPA -2)

Utilizing Form SPA-2, submit separate documentation packages for each line item from Form SPA-1 for which the Contractor opted for a steel price adjustment. For line items with multiple components of steel, each component should be listed separately. Label each SPA-2 documentation package with a unique number as described below.

- a. Documentation package number: (Insert the contract line-item) - (Insert sequential package number beginning with "1").
Example: 412 - 1,
412 - 2,
424 - 1,
424 - 2,
424 - 3, etc.
- b. The steel product quantity in pounds
 - i. The following sources should be used, in declining order of precedence, to determine the weight of steel/iron, based on the Engineers decision:
 1. Department established weights of steel/iron by contract pay item per pay unit;
 2. Approved Shop Drawings;
 3. Verified Shipping Documents;
 4. Contract Plans;
 5. Standard Drawing Sheets;
 6. Industry Standards (i.e., AISC Manual of Steel Construction, AWWA Standards, etc.); and
 7. Manufacture's data.
 - ii. Any item requiring approved shop drawings shall have the weights of steel calculated and shown on the shop drawings or submitted and certified separately by the fabricator.
- c. The date the steel product, subject to adjustment, was shipped from the producing mill (Categories 1-3), received on the project (Categories 4-6), or casting date (Category 7).

Step 2 (Monthly Calculator Spreadsheet)

For each month, upon the incorporation of the steel product into the work, provide the Engineer the following:

- 1) Completed NCDOT Steel Price Adjustment Calculator Spreadsheet, summarizing all the steel submittal packages (Form SPA-2) actually incorporated into the completed work in the given month.
 - a. Contract Number
 - b. Bidding Index Reference Month
 - c. Contract Completion Date or Revised Completion Date
 - d. County, Route, and Project TIP information
 - e. Item Number
 - f. Line-Item Description

- g. Submittal Number from Form SPA-2
 - h. Adjustment date
 - i. Pounds of Steel
- 2) An affidavit signed by the Contractor stating the documentation provided in the NCDOT Steel Price Adjustment Calculator Spreadsheet is true and accurate.

Price Adjustment Conditions

Download the Monthly Steel Adjustment Spreadsheet with the most current reference data from the Department's website each month at the following address:

<https://connect.ncdot.gov/projects/construction/Construction%20Forms/Form%20SPA-3%20NCDOT%20Steel%20Price%20Adjustment%20Calculator.xlsx>

If the monthly Fastmarkets data is not available, the data for the most recent immediately preceding month will be used as the basis for adjustment.

Price Adjustment Calculations

The price adjustment will be determined by comparing the percentage of change in index value listed in the proposal (BI) to the monthly index value (MI). (See included sample examples). Weights and date of shipment must be documented as required herein. The final price adjustment dollar value will be determined by multiplying this percentage increase or decrease in the index by the represented quantity of steel incorporated into the work, and the established bidding index (BI) subject to the limitations herein.

Price increase/decrease will be computed as follows:

$$\text{SPA} = ((\text{MI} / \text{BI}) - 1) * \text{BI} * (\text{Q} / 100)$$

Where;

SPA = Steel price adjustment in dollars

MI = Monthly Shipping Index. – in Dollars (\$) per hundredweight (CWT). Use the adjustment indices from the month the steel was shipped from the producing mill, received on the project, or member cast as defined in the Product Relationship Table.

BI = Bidding Index. - in Dollars (\$) per hundredweight (CWT). Use the adjustment indices as listed in the proposal.

Q = Quantity of steel, product, pounds actually incorporated into the work as documented by the Contractor, or Design Build Team and verified by the Engineer.

Calculations for price adjustment shall be shown separate from the monthly progress estimate and will not be included in the total cost of work for determination of progress or for extension of Contract time in accordance with Subarticle 108-10(B)(1).

Any apparent attempt to unbalance bids in favor of items subject to price adjustment may result in rejection of the bid proposal.

Adjustments will be paid or charged to the Contractor only. Any Contractor receiving an adjustment under this provision shall distribute the proper proportional part of such adjustments to the subcontractor who performed the applicable work.

Delays to the work caused by steel shortages may be justification for a Contract time extension but will not constitute grounds for claims for standby equipment, extended office overhead, or other costs associated with such delays.

If an increase in the steel material price is anticipated to exceed 50% of the original quoted price, the contractor must notify the Department within 7 days prior to purchasing the material. Upon receipt of such notification, the Department will direct the Contractor to either (1) proceed with the work or (2) suspend the work and explore the use of alternate options.

If the decrease in the steel material exceeds 50% of the original quoted price, the contractor may submit to the Department additional market index information specific to the item in question to dispute the decrease. The Department will review this information and determine if the decrease is warranted.

When the steel product adjustment date, as defined in the Product Relationship Table, is after the approved contract completion date, the steel price adjustments will be based on the lesser value of either the MI for the month of the approved contract completion date or the MI for the actual adjustment date.

If the price adjustment is based on estimated material quantities for that time, and a revision to the total material quantity is made in a subsequent or final estimate, an appropriate adjustment will be made to the price adjustment previously calculated. The adjustment will be based on the same indices used to calculate the price adjustment which is being revised. If the adjustment date of the revised material quantity cannot be determined, the adjustment for the quantity in question, will be based on the indices utilized to calculate the steel price adjustment for the last initial documentation package submission, for the steel product subject to adjustment, that was incorporated into the particular item of work, for which quantities are being finalized.

Example: Structural steel for a particular bridge was provided for in three different shipments with each having a different mill shipping date. The quantity of structural steel actually used for the bridge was calculated and a steel price adjustment was made in a progress payment. At the conclusion of the work an error was found in the plans of the final quantity of structural steel used for the bridge. The quantity to be adjusted cannot be directly related to any one of the three mill shipping dates. The steel price adjustment for the quantity in question would be calculated using the indices that were utilized to calculate the steel price adjustment for the quantity of structural steel represented by the last initial structural steel documentation package submission. The package used will be the one with the greatest sequential number.

Extra Work/Force Account:

When steel products, as specified herein, are added to the contract as extra work, in accordance with the provisions of Article 104-7 or 104-3, the Engineer will determine and specify in the supplemental agreement, the need for application of steel price adjustments on a case-by-case basis. No steel price adjustments will be made for any products manufactured from steel having an adjustment date prior to the supplemental agreement execution date. Price adjustments will

be made as provided herein, except the Bidding Index will be based on the month in which the supplemental agreement pricing was executed.

For work performed on force account basis, reimbursement of actual material costs, along with the specified overhead and profit markup, will be considered to include full compensation for the current cost of steel and no steel price adjustments will be made.

Examples Form SPA-2**Steel Price Adjustment Submission Form**

Contract Number C203394 Bid Reference Month January 2019

Submittal Date 8/31/2019

Contract Line Item 237

Line Item Description APPROX....LBS Structural Steel

Sequential Submittal
Number 2

Supplier	Description of material	Location information	Quantity in lbs.	Adjustment Date
XYZ mill	Structural Steel	Structure 3, Spans A-C	1,200,000	May 4, 2020
ABC distributing	Various channel & angle shapes	Structure 3 Spans A-C	35,000	July 14, 2020
		Total Pounds of Steel	1,235,000	

Note: Attach the following supporting documentation to this form.

- Bill of Lading to support the shipping dates
- Supporting information for weight documentation (e.g., Pay item reference, Shop drawings, shipping documents, Standards Sheets, industry standards, or manufacturer's data)

By providing this data under my signature, I attest to the accuracy of and validity of the data on this form and certify that no deliberate misrepresentation in any manner has occurred.

Printed Name

Signature

Examples Form SPA-2**Steel Price Adjustment Submission Form**Contract Number C203394 Bid Reference Month January 2019Submittal Date August 31, 2019Contract Line Item 237Line Item Description SUPPORT, OVRHD SIGN STR -DFEB – STA 36+00Sequential Submittal
Number 2

Supplier	Description of material	Location information	Quantity in lbs.	Adjustment Date
XYZ mill	Tubular Steel (Vertical legs)	<u>-DFEB – STA 36+00</u>	12000	December 11, 2021
PDQ Mill	4” Tubular steel (Horizontal legs)	<u>-DFEB – STA 36+00</u>	5900	December 11, 2021
ABC distributing	Various channel & angle shapes (see quote)	<u>-DFEB – STA 36+00</u>	1300	December 11, 2021
	Catwalk assembly	<u>-DFEB – STA 36+00</u>	2000	December 11, 2021
Nucor	Flat plate	<u>-DFEB – STA 36+00</u>	650	December 11, 2021
		Total Pounds of Steel	21,850	

Note: Attach the following supporting documentation to this form.

- Bill of Lading to support the shipping dates
- Supporting information for weight documentation (e.g., Pay item reference, Shop drawings, shipping documents, Standards Sheets, industry standards, or manufacturer's data)

By providing this data under my signature, I attest to the accuracy of and validity of the data on this form and certify that no deliberate misrepresentation in any manner has occurred.

Printed Name

Signature

Price Adjustment Sample Calculation (increase)

Project bid on September 17, 2019

Line Item 635 “Structural Steel” has a plan quantity of 2,717,000 lbs.

Bidding Index for Structural Steel (Category 2) in the proposal was \$36.12/CWT = BI

450,000 lbs. of Structural Steel for Structure 2 at Station 44+08.60 were shipped to fabricator from the producing mill in same month, May 2021.

Monthly Index for Structural Steel (Category 2) for May 2021 was \$64.89/CWT = MI

The Steel Price Adjustment formula is as follows:

$$\text{SPA} = ((\text{MI} / \text{BI}) - 1) * \text{BI} * (\text{Q} / 100)$$

Where; SPA = Steel price adjustment in dollars

BI = Bidding Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices as listed in the proposal.

MI = Mill Shipping Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices from the month the steel was shipped from the producing mill, received on the project, or member cast as defined in the Product Relationship Table.

Q = Quantity of steel product, in pounds (lbs.) actually incorporated into the work as documented by the Contractor, or Design Build Team and verified by the Engineer.

$$\text{BI} = \$36.12 / \text{CWT}$$

$$\text{MI} = \$64.89 / \text{CWT}$$

$$\% \text{ change} = ((\text{MI} / \text{BI}) - 1) = (\$64.89 / \$36.12 - 1) = (1.79651 - 1) = 0.79651162791$$

$$\text{Q} = 450,000 \text{ lbs.}$$

$$\text{SPA} = 0.79651162791 \times \$36.12 \times (450,000 / 100)$$

$$\text{SPA} = 0.79651162791 * \$36.12 * 4,500$$

$$\text{SPA} = \$129,465 \text{ pay adjustment to Contractor for Structural Steel (Structure 2 at Station 44+08.60)}$$

Price Adjustment Sample Calculation (decrease)

Project bid on December 18, 2018

Line Item 635 Structural Steel has a plan quantity of 2,717,000 lbs.

Bidding Index for Structural Steel (Category 2) in the proposal was \$46.72/CWT = BI

600,000 lbs. of Structural Steel for Structure 1 at Station 22+57.68 were shipped to fabricator from the producing mill in same month, August 2020.

Monthly Index for Structural Steel (Category 2) for August 2020 was \$27.03/CWT = MI

The Steel Price Adjustment formula is as follows:

$$\text{SPA} = ((\text{MI} / \text{BI}) - 1) * \text{BI} * (\text{Q} / 100)$$

Where; SPA = Steel price adjustment in dollars

BI = Bidding Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices as listed in the proposal.

MI = Mill Shipping Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices from the month the steel was shipped from the producing mill, received on the project, or member cast as defined in the Product Relationship Table.

Q = Quantity of steel product, in pounds (lbs.) actually incorporated into the work as documented by the Contractor, or Design Build Team and verified by the Engineer.

$$\text{BI} = \$46.72 / \text{CWT}$$

$$\text{MI} = \$27.03 / \text{CWT}$$

$$\% \text{ change} = ((\text{MI} / \text{BI}) - 1) = (\$27.03 / \$46.72 - 1) = (0.57855 - 1) = -0.421446917808$$

$$\text{Q} = 600,000 \text{ lbs.}$$

$$\text{SPA} = -0.421446917808 * \$46.72 * (600,000 / 100)$$

$$\text{SPA} = -0.421446917808 * \$46.72 * 6,000$$

$$\text{SPA} = \$ 118,140.00 \text{ Credit to the Department for Structural Steel (Structure 1 at Station 22+57.68)}$$

Price Adjustment Sample Calculation (increase)

Project bid on July 16, 2020

Line Item 614 Reinforced Concrete Deck Slab has a plan quantity of 241974 lbs.

Bidding Index Reference Month was May 2020. Bidding Index for Reinforced Concrete Deck Slab (Category 1) in the proposal was \$29.21/CWT = BI

51,621 lbs. of reinforcing steel and 52,311 lbs. of epoxy coated reinforcing steel for Structure 2 at Station 107+45.55 -L- was shipped to fabricator from the producing mill in same month, May 2021.

Monthly Index for Reinforced Concrete Deck Slab (Category 1) for May 2021 was \$43.13/CWT = MI

The Steel Price Adjustment formula is as follows:

$$\text{SPA} = ((\text{MI} / \text{BI}) - 1) * \text{BI} * (\text{Q} / 100)$$

Where; SPA = Steel price adjustment in dollars

BI = Bidding Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices as listed in the proposal.

MI = Mill Shipping Index – in dollars (\$) per hundredweight (CWT). Use the adjustment indices from the month the steel was shipped from the producing mill, received on the project, or member cast as defined in the Product Relationship Table.

Q = Quantity of steel product, in pounds (lbs.) actually incorporated into the work as documented by the Contractor, or Design Build Team and verified by the Engineer.

$$\text{BI} = \$29.21 / \text{CWT}$$

$$\text{MI} = \$43.13 / \text{CWT}$$

$$\% \text{ change} = ((\text{MI} / \text{BI}) - 1) = (\$43.13 / \$29.21 - 1) = (1.47655 - 1) = 0.47654912701$$

$$\text{Q} = 103932 \text{ lbs.}$$

$$\text{SPA} = 0.47654912701 * \$29.21 * (103,932 / 100)$$

$$\text{SPA} = 0.47654912701 * \$29.21 * 1,039.32$$

SPA = \$14,467.33 Pay Adjustment to Contractor for Reinforced Concrete Deck Slab (Category 1) at Station 107+45.55 -L-

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. 7-19-22)

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>
2023	(7/01/22 - 6/30/23) 24% of Total Amount Bid
2024	(7/01/23 - 6/30/24) 34% of Total Amount Bid
2025	(7/01/24 - 6/30/25) 23% of Total Amount Bid
2026	(7/01/25 - 6/30/26) 16% of Total Amount Bid
2027	(7/01/26 - 6/30/27) 3% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2018 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. 8-17-21)

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.

Replacement / Substitution – A full or partial reduction in the amount of work subcontracted to a committed (or an approved substitute) DBE firm.

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.
<https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf>

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 estimated amount (based on quantities and unit prices) 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 **3.0%**

- (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:// www.ebs.nc.gov/VendorDirectory/default.html](https://www.ebs.nc.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 the electronic submittal file.

- (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 the electronic submittal file, 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 10:00 a.m. 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 10:00 a.m. 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 10:00 a.m. 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 10:00 a.m. 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 10:00 a.m. on 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 10:00 a.m. on the next official state business day. If the contractor cannot send the information electronically, then one complete set and 5 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, 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 Opportunity and Work Force Development Unit at BOWD@ncdot.gov 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 Prequalification 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 Prequalification 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 subcontractor (or an approved substitute DBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE subcontractor 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.

The Contractor must give notice in writing both by certified mail and email to the DBE subcontractor, with a copy to the Engineer of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the DBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the DBE subcontractor objects to the intended termination/substitution, the DBE, within five (5) business days must advise the Contractor and the Department of the reasons why the action should not be approved. The five-day notice period shall begin on the next business day after written notice is provided to the DBE subcontractor.

A committed DBE subcontractor may only be terminated after receiving the Department's written approval based upon a finding of good cause for the proposed termination and/or substitution. For purposes of this section, good cause shall include the following circumstances:

- (a) The listed DBE subcontractor fails or refuses to execute a written contract;
- (b) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
- (c) The listed DBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
- (d) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (e) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1,200 or applicable state law;
- (f) The listed DBE subcontractor is not a responsible contractor;
- (g) The listed DBE voluntarily withdraws from the project and provides written notice of withdrawal;
- (h) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (i) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;

- (j) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime contractor can self-perform the work for which the DBE contractor was engaged or so that the prime contractor can substitute another DBE or non-DBE contractor after contract award.

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).

- (3) Exception: If the DBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract, 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 and overall goal.

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.

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 *2018 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).

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:

(11-17-20)

SP01 G090

All telecommunications, video or other ITS equipment or services installed or utilized on this project must be in conformance with UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS **2 CFR, § 200.216**
Prohibition on certain telecommunications and video surveillance services or equipment.

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):

(8-20-19)

SP1 G092

The Contractor shall adhere to all Federal, State and Local regulations and guidelines for the use of Unmanned Aircraft Systems (UAS). This includes but is not limited to US 14 CFR Part 107 *Small UAS Rule*, NC GS 15A-300.2 *Regulation of launch and recovery sites*, NC GS 63-95 *Training required for the operation of unmanned aircraft systems*, NC GS 63-96 *Permit required for commercial operation of unmanned aircraft system*, and NCDOT UAS Policy. The required operator certifications include possessing a current Federal Aviation Administration (FAA) Remote Pilot Certificate, a NC UAS Operator Permit as well as operating a UAS registered with the FAA.

Prior to beginning operations, the Contractor shall complete the NCDOT UAS – Flight Operation Approval Form and submit it to the Engineer for approval. All UAS operations shall be approved by the Engineer prior to beginning the operations.

All contractors or subcontractors operating UAS shall have UAS specific general liability insurance to cover all operations under this contract.

The use of UAS is at the Contractor's discretion. No measurement or payment will be made for the use of UAS. In the event that the Department directs the Contractor to utilize UAS, payment will be in accordance with Article 104-7 Extra Work.

EQUIPMENT IDLING GUIDELINES:

(1-19-21)

107

SP1 G096

Exercise reduced fuel consumption and reduced equipment emissions during the construction of all work associated with this contract. Employees engaged in the construction of this project should turn off vehicles when stopped for more than thirty (30) minutes and off-highway equipment should idle no longer than fifteen (15) consecutive minutes.

These guidelines for turning off vehicles and equipment when idling do not apply to:

1. Idling when queuing.
2. Idling to verify the vehicle is in safe operating condition.
3. Idling for testing, servicing, repairing or diagnostic purposes.
4. Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane, mixing concrete, etc.).
5. Idling required to bring the machine system to operating temperature.
6. Emergency vehicles, utility company, construction, and maintenance vehicles where the engines must run to perform needed work.
7. Idling to ensure safe operation of the vehicle.
8. Idling when the propulsion engine is providing auxiliary power for other than heating or air conditioning. (such as hydraulic systems for pavers)
9. When specific traffic, safety, or emergency situations arise.
10. If the ambient temperature is less than 32 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants (e.g. to run the heater).
11. If the ambient temperature is greater than 90 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants of off-highway equipment (e.g. to run the air conditioning) no more than 30 minutes.
12. Diesel powered vehicles may idle for up to 30 minutes to minimize restart problems.

Any vehicle, truck, or equipment in which the primary source of fuel is natural gas or electricity is exempt from the idling limitations set forth in this special provision.

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:

(11-22-94)

108-5

SP1 G100

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

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

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

SUBSURFACE INFORMATION:

(7-1-95)

450

SP1 G112 C

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

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 *2018 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2018 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 *2018 Standard Specifications* as follows:

Page 1-39, 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 1-39, 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 1-39, 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 *2018 Standard Specifications*.

U-2579AB (C204633 Forsyth County) is located adjacent to this project. U-2579AB is currently under construction and not anticipated to be complete prior to the letting of this project.

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

ELECTRONIC BIDDING:

(2-19-19)

101, 102, 103

SP1 G140

Revise the *2018 Standard Specifications* as follows:

Page 1-4, Article 101-3, DEFINITIONS, BID (OR PROPOSAL) *Electronic Bid*, line 1, replace “Bid Express®” with “the approved electronic bidding provider”.

Page 1-15, Subarticle 102-8(B), Electronic Bids, lines 39-40, replace “to Bid Express®” with “via the approved electronic bidding provider”.

Page 1-15, Subarticle 102-8(B)(1), Electronic Bids, line 41, delete “from Bid Express®”

Page 1-17, Subarticle 102-9(C)(2), Electronic Bids, line 21, replace “Bid Express® miscellaneous folder within the .ebs” with “electronic submittal”.

Page 1-29, Subarticle 103-4(C)(2), Electronic Bids, line 32, replace “.ebs miscellaneous data file of Expedite” with “electronic submittal file”

AWARD LIMITS:

(4-19-22)

103

SP1 G141

Revise the *2018 Standard Specifications* as follows:

Page 1-29, Subarticle 103-4(C), Award Limits, line 4-8, delete and replace the first sentence in the first paragraph with the following:

A bidder who desires to bid on more than one project on which bids are to be opened in the same letting and who desires to avoid receiving an award of more projects than he is equipped to handle, may bid on any number of projects but may limit the total amount of work awarded to him on selected projects by completing the form Award Limits on Multiple Projects for each project subject to the award limit.

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.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev 12-15-20)

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 and within 24 hours after a rainfall event equal to or greater than 1.0 inch that occurs within a 24 hour period. Additional monitoring may be required at the discretion of Division of Water Resources personnel if the receiving stream is 303(d) listed for turbidity and the project has had documented problems managing turbidity.
 - (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. 4-5-19)

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 *2018 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 <https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/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.

NOTE TO CONTRACTOR:

Parcel 54 is owned by NCDOT and may be evaluated for borrow at the contractor's risk. This parcel must be accessed from the project limits. The Department shall not provide any guarantee of availability or acceptance and it is the contractor's responsibility if pursuing borrow at this site to meet all NCDOT and environmental agency requirements. A 50' buffer will be required along any private property adjacent to the limits of the borrow pit top of slope. In addition, a 50' buffer will be required along the top of bank of Swaim Creek.

PROJECT SPECIAL PROVISIONS**ROADWAY****FIELD OFFICE:**

(6-1-07)(Rev. 2-15-22)

SPI 8-01

Description

This work consists of furnishing, erecting, equipping, maintaining, and removing a field office for the exclusive use of Department Engineers and Inspectors at a location on the project approved by the Engineer. Provide a field office that complies with the current ADA Design and Accessibility Standards, the National Electric Code, local, state, and federal regulations, and the following requirements.

Procedures

The field office and equipment will remain the property of the Contractor upon completion of the contract. The field office shall be separated from buildings and trailers used by the Contractor and shall be erected and functional as an initial operation. Failure to have the field office functional when work first begins on the project and maintained, as determined by the Engineer, throughout the life of the project will result in withholding payment of the Contractor's monthly progress estimate. Maintain the field office in an operational state throughout the duration of the project. Remove the field office when directed by the Engineer.

Provide a field office that is weatherproof, tightly floored and roofed, constructed with an air space above the ceiling for ventilation, supported above the ground, has a width of at least 10 feet, and the floor-to-ceiling height that is at least 7 feet 6 inches. Provide inside walls and a ceiling constructed of plywood, fiber board, gypsum board, or other suitable materials. Have the exterior walls, ceiling, and floor insulated.

Provide a field office with at least 1,500 square feet of floor space and that is equipped with the following:

Item

Internet Connection Service with modem for Wi-Fi with 2 Data ports in all rooms
(with exception of kitchenette and bathrooms).

Number**Item**

- | | |
|----|--|
| 3 | Double-pedestal desk (approximately 60 by 34 inches, at least 2,000 square inches). |
| 1 | Plan and drafting table (approximately 30 by 96 inches) with adjustable stool. |
| 1 | Computer table at least 48 by 30 by 29 inches. |
| 1 | Plan rack for 24 by 36 inch drawings with 6 plan clamps. |
| 2 | 4-drawer fire protection file, 15 inch drawer width, minimum UL rating of Class 350. |
| 6 | Adjustable five-leg base rolling office chairs. |
| 1 | Wastebasket per room. |
| 1 | Print/Copy/Scan (11 inch x 17 inch copies). |
| 1 | Ice Machine. |
| 4 | 6 ft. Folding Tables. |
| 16 | Folding Chairs. |

Windows and Doors

Provide a field office with at least three windows with blinds, each having an area of at least 540 square inches, capable of being opened and secured from the inside and having at least two exterior passage doors. Provide doors at least 30 inches in width and 78 inches in height. Provide screens for windows and doors. Equip exterior passage doors with locks and furnish at least two keys to the Engineer. Provide accessibility in compliance with the current ADA Design and Accessibility Standards, and the State Building Code and maintain them free from obstructions.

Steps

Provide accessibility in compliance with the current ADA Design and Accessibility Standards, and the State Building Code and maintain them free from obstructions.

Storage Facility for Nuclear Gauge

Provide an outside storage facility for the Department's nuclear gauge. Provide a facility that has at least 64 square feet of floor space, is weatherproof, tightly floored and roofed, and has a tamper resistant key operated lock. The storage facility shall not be located within 10 feet of any other structure including the field office. Furnish at least two keys to the Engineer.

Lighting, Heating, and Air Conditioning

The field office shall have satisfactory lighting, electrical outlets, heating equipment, an exhaust fan, and an air conditioner connected to an operational power source. Provide at least one lighting fixture in each room and at least one fluorescent light fixture over the plan and drafting table. Furnish electrical current and fuel for heating equipment.

Fire Extinguishers

Furnish and maintain one fire extinguisher for each exterior passage door. Fire extinguisher may be chemical or dry powder. UL Classification 10-B:C (minimum), suitable for Type A:B:C: fires. Provide, mount, and maintain fire extinguishers in accordance with OSHA Safety and Health Standards.

Toilets

Provide a toilet conforming to the requirements of the state and local boards of health or other bodies or courts having jurisdiction in the area. When separate facilities for men and women are not available, place a sign with the words "Rest Room" (with letters at least 1 inch in height) over the doorway, and provide an adequate positive locking system on the inside of the doorway. Maintain responsibility for the water and sewer connections or the installation and connection of a water well and septic tank and drain field. These facilities shall conform to all local and state permits.

Utilities

Except for telephone service, make necessary utility and internet connections, maintain utilities and internet connections, pay internet and utility service fees and bills, and handle final disconnection of internet and utilities. Furnish a telephone in each field office and permit the work necessary to install it.

Storage Facility for Test Equipment

Provide a storage facility, separate from the office for storage of test equipment, other than the nuclear gauge. Provide a facility that has at least 100 square feet of floor space, is weatherproof, tightly floored and roofed, and has a tamper resistant key operated lock. Furnish at least two keys to the Engineer.

Miscellaneous Items

The field office shall also include the following:

1. A certification that the office is free of asbestos and other hazardous materials.
2. A broom, dustpan, mop and bucket, and general cleaning supplies.
3. Provide and maintain an all-weather parking area for twelve vehicles, including graveled access to the paved surface.

Measurement and Payment

Payment at the contract lump sum bid price for *Field Office* will be full compensation for all work covered by this provision including but not limited to furnishing, erecting, equipping, maintaining, and removing the field office as outlined in this provision.

Installation and service fees for the telephone will be paid for by the Department.

Payment will be made under:

Pay Item
Field Office

Pay Unit
Lump Sum

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 *2018 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 PAVEMENT:

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

1101

SP2 R30B (Rev)

Construct temporary pavement required on this project in accordance with the plans or as directed by the Engineer.

After the pavement has served its purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Place pavement and earth material removed in embankments or dispose of in waste areas furnished by the Contractor.

Earth material and aggregate base course 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 Asphalt Pavement*. Pipe culverts removed from the pavement 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 pavement will be made at the contract unit prices for the various items involved.

Such prices and payments will be full compensation for removing earth material, aggregate base course, and asphalt pavement; 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 *2018 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 *2018 Standard Specifications*.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS:

(4-16-02) (Rev. 12-15-20)

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 Materials and Tests 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 in accordance with NCGS § 130A-309.219(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 Resource Conservation Program (RCP) Engineer at ResourceConservation@ncdot.gov for review. The Engineer and the RCP Engineer will coordinate the requirements of NCGS § 130A-309.219(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 2018 *Standard Specifications*.

MANUFACTURED QUARRY FINES IN EMBANKMENTS:

(01-17-17)

235

SP02 R72

Description

This specification addresses the use of manufactured quarry fines that are not classified as select materials. The specification allows the Contractor an option, with the approval of the Engineer, to use manufactured quarry fines (MQFs) in embankments as a substitute for conventional borrow material. Furnish and place geotextile for pavement stabilization in accordance with the Geotextile for Pavement Stabilization special provision and detail. Geotextile for pavement stabilization is required to prevent pavement cracking and provide separation between the subgrade and pavement section at embankment locations where manufactured quarry fines are utilized and as directed by the Engineer.

Materials

Manufactured Quarry Fines.

Site specific approval of MQFs material will be required prior to beginning construction as detailed in the preconstruction requirements of this provision.

The following MQFs are unacceptable:

- (A) Frozen material,
- (B) Material with a maximum dry unit weight of less than 90 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C.
- (C) Material with greater than 80% by weight Passing the #200 sieve

Collect and transport MQFs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the MQFs as needed and transport in covered trucks to prevent dusting. If MQFs are blended with natural earth material, follow Borrow Criteria in Section 1018 of the *Standard Specifications*.

Geotextiles

Areas of embankment where MQFs are incorporated, Geotextile for Pavement Stabilization shall be used. If the Geotextile for Pavement Stabilization special provision is not included elsewhere in this contract, then it along with a detail will be incorporated as part of the contractors request to use. Notification of subgrade elevation, sampling and waiting period as required in the Construction Methods section of the Geotextile for Pavement Stabilization special provision are not required.

Preconstruction Requirements

When MQFs 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 MQFs and include the following details:

- (A) Description, purpose and location of project.
- (B) Estimated start and completion dates of project.
- (C) Estimated volume of MQFs to be used on project with specific locations and construction details of the placement.
- (D) The names, address, and contact information for the generator of the MQFs.
- (E) Physical location of the site at which the MQFs were generated.

The Engineer will forward this information to the State Materials Engineer for review and material approval.

Construction Methods

Place MQFs in the core of the embankment section with at least 4 feet of earth cover to the outside limits of the embankments or subgrade.

Construct embankments by placing MQFs 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.

Areas of embankment where MQFs are incorporated, Geotextile for Pavement Stabilization shall be used. See Geotextile for Pavement Stabilization special provision for geotextile type and construction method.

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *2018 Standard Specifications*. As an alternate weigh tickets can be provided and payment made by converting weight to cubic yards based on the verifiable unit weight.

Where the pay item of *Geotextile for Pavement Stabilization* is included in the original contract the material will be measured and paid in square yards (see Geotextile for Pavement Stabilization special provision). Where the pay item of *Geotextile for Pavement Stabilization* is not included in the original contract then no payment will be made for this item and will be considered incidental to the use of MQFs in embankment.

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 *2018 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

CORRUGATED ALUMINUM ALLOY CULVERT PIPE:

(9-21-21)

305, 310

SP3 R34

Revise the *Standard Specifications* as follows:

Page 3-5, Article 305-2, MATERIALS, add the following after line 16:

Item

Waterborne Paint

Hot Bitumen

Section

1080-9

1081-3

Page 3-5, Article 305-3, CONSTRUCTION METHODS, add the following after line 24:

Coating must be applied to the aluminum when in contact with concrete. Immediately prior to coating, aluminum surfaces to be coated shall be cleaned by a method that will remove all dirt, oil,

grease, chips, and other foreign substances. Aluminum to be coated shall be given one coat of suitable quality coating such as:

Approved waterborne paint (Section 1080-9)

Approved Hot Bitumen (Section 1081-3)

Other coating materials may be submitted to the Engineer for approval.

Page 3-7, Article 310-6, MEASUREMENT AND PAYMENT, lines 6-11, delete the fourth sentence and replace with the following:

Select bedding and backfill material and coating will be included in the cost of the installed pipe. Such price and payment will be full compensation for all materials, labor, equipment, and other incidentals necessary to complete the work.

CULVERT PIPE:

(8-20-19)(Rev. 5-17-22)

305,310

SP3 R35

Revise the *2018 Standard Specifications* as follows:

Page 3-5, Article 305-1 DESCRIPTION, lines 12-14, replace with the following:

Where shown in the plans, the Contractor may use reinforced concrete pipe, aluminum alloy pipe, aluminized corrugated steel pipe, galvanized corrugated steel pipe, HDPE pipe, Polypropylene pipe or PVC pipe in accordance with the following requirements.

Page 3-5, Article 305-2 MATERIALS, add the following after line 16:

Item	Section
Polypropylene Pipe	1032-9
Galvanized Corrugated Steel Pipe	1032-3

Page 3-6, Article 310-2 MATERIALS, add the following after line 9:

Item	Section
Polypropylene Pipe	1032-9
Galvanized Corrugated Steel Pipe	1032-3

Page 3-6, Article 310-4 SIDE DRAIN PIPE, lines 24-25, replace the first sentence of the second paragraph with the following:

Where shown in the plans, side drain pipe may be Class II reinforced concrete pipe, aluminized corrugated steel pipe, galvanized corrugated steel pipe, corrugated aluminum alloy pipe, Polypropylene pipe, HDPE pipe or PVC pipe.

Page 3-7, Article 310-5 PIPE END SECTIONS, lines 2-4, replace the second sentence with the following:

Both corrugated steel and concrete pipe end sections will work on concrete pipe, corrugated steel pipe, Polypropylene pipe and HDPE smooth lined corrugated plastic pipe.

Page 3-7, Article 310-6 MEASUREMENT AND PAYMENT, add the following after line 14:

Pay Item	Pay Unit
___" Polypropylene Pipe	Linear Foot

Page 10-60, add Article 1032-9:

(A) General

Use polypropylene pipe from sources participating in the Department's Polypropylene Pipe QA/QC Program. A list of participating sources is available from the Materials and Tests Unit. The Department will remove a manufacturer of polypropylene pipe from this program if the monitoring efforts indicated that non-specification material is being provided or test procedures are not being followed.

Use polypropylene culvert pipe that meets AASHTO M 330 for Type S or Type D, or ASTM F2881 or ASTM F2764 Double or Triple wall; and has been evaluated by NTPEP.

(B) End Treatments, Pipe Tees and Elbows

End treatments, pipe tees and elbows shall meet AASHTO M 330, Section 7.7, or ASTM F2764, Section 6.6.

(C) Marking

Clearly mark each section of pipe, end section, tee and elbow and other accessories according to the Department's Polypropylene Pipe QC/QA Program:

- (1) AASHTO or ASTM Designation
- (2) The date of manufacture
- (3) Name or trademark of the manufacturer

When polypropylene pipe, end sections, tees and elbows have been inspected and accepted a sticker will be applied to the inside of the pipe. Do not use pipe sections, flared end sections, tees or elbows which do not have this seal of approval.

DRAINING PONDS:

The contractor shall drain the ponds on this project at the locations designated as such on the plans. The proposed method of draining ponds shall be approved by the Engineer.

The proposed method cannot result in fish kills in downstream waters. Fish in the ponds cannot be relocated to public waters including streams, public lakes and private ponds with streams flowing into or out of the ponds.

Pond dams shall not be breached until the pond is drained. Pond bottoms will be stabilized as shown on the plans and may require adjustment after drainage.

Seeding and mulching of ponds as required on the plans shall be accomplished in accordance with the provision contained elsewhere in these special provisions.

No direct payment will be made for the work of draining the ponds as the cost of the work will be considered incidental to other work being paid for by the various items in the contract. Payment for satisfactorily installed erosion control measures will be paid for at the contract unit prices for the items involved.

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-16-18)

422

SP4 R02A

Description

Bridge approach fills consist of backfilling behind bridge end bents with select material or aggregate to support all or portions of bridge approach slabs. Install drains to drain water from bridge approach fills and geotextiles to separate approach fills from embankment fills, ABC and natural ground as required. For bridge approach fills behind end bents with mechanically stabilized earth (MSE) abutment walls, reinforce bridge approach fills with MSE wall reinforcement connected to end bent caps. Construct bridge approach fills in accordance with the contract, accepted submittals and 2018 Roadway Standard Drawing Nos. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10.

Define bridge approach fill types as follows:

Approach Fills – Bridge approach fills in accordance with 2018 Roadway Standard Drawing Nos. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10;

Standard Approach Fill – Type I Standard Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.01;

Modified Approach Fill – Type II Modified Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.02 and

Reinforced Approach Fill – Type III Reinforced Bridge Approach Fill in accordance with Roadway Detail Drawing No. 422D10.

Materials

Refer to Division 10 of the *2018 Standard Specifications*.

Item	Section
Geotextiles, Type 1	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044

Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for standard and modified approach fills. For an approach fill behind a bridge end bent with an MSE abutment wall, backfill the reinforced approach fill with the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal. For

MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

Excavate as necessary for approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place separation geotextiles or aggregate until approach fill dimensions and foundation material are approved.

For reinforced approach fills, cast MSE wall reinforcement or connectors into end bent cap backwalls within 3" of locations shown in the accepted MSE wall submittals. Install MSE wall reinforcement with the orientation, dimensions and number of layers shown in the accepted MSE wall submittals. If a reinforced approach fill is designed with geogrid reinforcement embedded in an end bent cap, cut geogrids to the required lengths and after securing ends of geogrids in place, reroll and rewrap portions of geogrids not embedded in the cap to protect geogrids from damage. Before placing aggregate, pull geosynthetic reinforcement taut so that it is in tension and free of kinks, folds, wrinkles or creases.

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent separation 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 separation geotextiles or MSE wall reinforcement.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with 2018 Roadway Standard Drawing Nos. 422.01 or 422.02. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the *2018 Standard Specifications* and place outlet pads in accordance with 2018 Roadway Standard Drawing No. 815.03.

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

Place select material or aggregate in 8" to 10" thick lifts. Compact fine aggregate for reinforced approach fills in accordance with Subarticle 235-3(C) of the *2018 Standard Specifications* except compact fine aggregate to a density of at least 98%. Compact select material for standard or modified approach fills and coarse aggregate for reinforced approach fills with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, MSE wall reinforcement or drains when placing and compacting select material or aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics or drain pipes until they are covered with at least 8" of select material or aggregate. Replace any damaged geosynthetics or drains to the satisfaction of the Engineer. When approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material or aggregate as shown in 2018 Roadway Standard Drawing No. 422.01 or 2018 Roadway Detail Drawing No. 422D10.

Measurement and Payment

Type I Standard Approach Fill, Station ____, *Type II Modified Approach Fill, Station ____* and *Type III Reinforced Approach Fill, Station ____* will be paid at the contract lump sum price. The lump sum price for each approach fill will be full compensation for providing labor, tools, equipment and approach fill materials, excavating, backfilling, hauling and removing excavated materials, installing geotextiles and drains, compacting backfill and supplying select material, aggregate, separation geotextiles, drain pipes, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct approach fills behind bridge end bents.

The contract lump sum price for *Type III Reinforced Approach Fill, Station ____* will also be full compensation for supplying and connecting MSE wall reinforcement to end bent caps but not designing MSE wall reinforcement and connectors. The cost of designing reinforcement and connectors for reinforced approach fills behind bridge end bents with MSE abutment walls will be incidental to the contract unit price for *MSE Retaining Wall No. ____*.

Payment will be made under:

Pay Item

Type I Standard Approach Fill, Station ____
 Type II Modified Approach Fill, Station ____
 Type III Reinforced Approach Fill, Station ____

Pay Unit

Lump Sum
 Lump Sum
 Lump Sum

ALTERNATE BRIDGE APPROACH FILLS FOR INTEGRAL ABUTMENTS:

(1-16-18)

422

SP4 R02B

Description

At the Contractors option, use Type A Alternate Bridge Approach Fills instead of Type I or II Bridge Approach Fills to support bridge approach slabs for integral bridge abutments. An alternate bridge approach fill consists of constructing an approach fill with a temporary geotextile wall before placing all or a portion of the concrete for the backwall and wing walls of the integral end bent cap. The temporary geotextile wall is designed for a crane surcharge, remains in place and aligned so the wall face functions as a form for the end bent cap backwall and wing walls. Install drains, welded wire facing and geotextiles and backfill approach fills and temporary walls with select material as required. Define “geotextiles” as separation or reinforcement geotextiles, “temporary wall” as a temporary geotextile wall and “alternate approach fill” as a Type A Alternate Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.03.

Materials

Refer to Division 10 of the *2018 Standard Specifications*.

Item

Geotextiles
 Portland Cement Concrete
 Select Materials
 Subsurface Drainage Materials
 Welded Wire Reinforcement

Section

1056
 1000
 1016
 1044
 1070-3

For temporary walls, use welded wire reinforcement for welded wire facing and Type 5 geotextile for reinforcement geotextiles. Use Type 5 geotextile with lengths and an ultimate tensile strength as shown in 2018 Roadway Standard Drawing No. 422.03. Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for alternate approach fills and temporary walls. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

Excavate as necessary for alternate approach fills and temporary walls in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geotextiles until approach fill dimensions and foundation material are approved.

Install geotextiles as shown in 2018 Roadway Standard Drawing No. 422.03. Attach separation geotextiles to end bent cap backwalls and wing walls as needed with adhesives, tapes or other approved methods. 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 geotextiles.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with 2018 Roadway Standard Drawing No. 422.03. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the *2018 Standard Specifications* and place outlet pads in accordance with 2018 Roadway Standard Drawing No. 815.03.

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

At the Contractor's option, construct bottom portion of integral end bents before temporary walls as shown in 2018 Roadway Standard Drawings No. 422.03. Erect and set welded wire facing so facing functions as a form for the end bent cap backwall. Place welded wire facing adjacent to each other in the horizontal and vertical directions to completely cover the temporary wall face. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap reinforcement geotextiles at the temporary wall face in accordance with 2018 Roadway Standard Drawing No. 422.03 and cover geotextiles with at least 3" of select material. Place layers of reinforcement geotextiles within 3" of locations shown in 2018 Roadway Standard Drawing No. 422.03. Before placing select material, pull reinforcement geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Install reinforcement geotextiles with the direction shown in 2018 Roadway Standard Drawing No. 422.03. Do not splice or overlap reinforcement geotextiles so seams are parallel to the temporary wall face.

Place select material in 8" to 10" thick lifts and compact select material with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geotextiles or drains when placing

and compacting select material. End dumping directly on geotextiles is not permitted. Do not operate heavy equipment on geotextiles or drain pipes until they are covered with at least 8" of select material. Replace any damaged geotextiles or drains to the satisfaction of the Engineer. When alternate approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material as shown in 2018 Roadway Standard Drawing No. 422.03.

Temporary walls are designed for a surcharge pressure in accordance with 2018 Roadway Standard Drawing No. 422.03. If the crane surcharge will exceed the wall design, contact the Engineer before positioning the crane over reinforcement geotextiles.

Measurement and Payment

Alternate approach fills will be paid at the contract lump sum for either *Type I Standard Approach Fill, Station ____* or *Type II Modified Approach Fill, Station ____* based on the approach fill type that the alternate approach fill is replacing. The lump sum price for each approach fill will be full compensation for providing labor, tools, equipment and alternate approach fill materials, excavating, backfilling, hauling and removing excavated materials, constructing temporary walls, installing wall facing, geotextiles and drains, compacting backfill and supplying select material, separation and reinforcement geotextiles, welded wire facing, drain pipes, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct alternate approach fills for integral abutments.

BRIDGE APPROACH FILLS – GEOTEXTILE:

(5-17-22)

SP4 R03

Place a single layer of Type 5 Geotextile one foot below the approach slab for the full width and length of the approach fill. Type 5 Geotextile shall meet the requirements of Section 1056 of the *Standard Specifications*. This revision applies to Roadway Standard 422.01, 422.02, 422.03 and Detail in Lieu of Standard 422DO10.

No separate measurement or payment will be made for the work required by this provision as the cost of such work shall be included in the lump sum price bid for *Type I Standard Approach Fill Station _____*, *Type III Reinforced Approach Fill, Station _____* or *Type II Modified Approach Fill, Station _____*.

AUTOMATED FINE GRADING:

(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 *2018 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.

AGGREGATE SUBGRADE:**(SPECIAL)**

Revise the *2018 Standard Specifications* as follows:

Replace Section 505 with the following:

**SECTION 505
AGGREGATE SUBGRADE**

505-1 DESCRIPTION

Construct aggregate subgrades in accordance with the contract. Install geotextile for soil stabilization and place Class IV subgrade stabilization at locations shown in the plans and as directed.

Define “subsoil” as the portion of the roadbed below the Class IV subgrade stabilization. For Type 2 aggregate subgrades, undercut subsoils as needed. The types of aggregate subgrade with thickness and compaction requirements for each are as shown below.

Type 1 – When undercut of subsoil is required, a 6- to 24 inch thick aggregate subgrade with Class IV subgrade stabilization compacted to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

Type 2 – A 10 inch thick aggregate subgrade on a proof rolled subsoil with Class IV subgrade stabilization compacted to 97% of AASHTO T 180 as modified by the Department.

505-2 MATERIALS

Refer to Division 10.

Item	Section
Geotextile for Soil Stabilization, Type 4	1056
Select Material, Class IV	1016

Use Class IV select material for Class IV subgrade stabilization.

505-3 CONSTRUCTION METHODS

When shallow undercut is required to construct aggregate subgrades, undercut 6 inches to 24 inches as shown on the plans or as directed. For Type 2 aggregate subgrades, proof roll subsoil in accordance with Section 260 before installing geotextile for soil stabilization. Perform undercut excavation in accordance with Section 225. Install geotextile for soil stabilization in accordance with Article 270-3. Place Class IV subgrade stabilization (standard size no. ABC) by end dumping ABC on geotextiles. Do not operate heavy equipment on geotextiles until geotextiles are covered with Class IV subgrade stabilization. Compact ABC as required for the type of aggregate subgrade constructed.

Maintain Class IV subgrade stabilization in an acceptable condition and minimize the use of heavy

equipment on ABC in order to avoid damaging aggregate subgrades. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate subgrades.

505-4 MEASUREMENT AND PAYMENT

Shallow Undercut for Type 1 aggregate subgrade will be measured and paid in cubic yards. Shallow undercut will be measured in accordance with Article 225-7. The contract unit price for *Shallow Undercut* will be full compensation for excavating, hauling and disposing of materials to construct aggregate subgrades.

Undercut Excavation of natural soil materials from subsoils for Type 2 aggregate subgrades will be measured and paid in accordance with Article 225-7 or 226-3. No measurement will be made for any undercut excavation of fill materials from subsoils.

Class IV Subgrade Stabilization will be measured and paid in tons. Class IV subgrade stabilization will be measured by weighing material in trucks in accordance with Article 106-7. The contract unit price for *Class IV Subgrade Stabilization* will be full compensation for furnishing, hauling, handling, placing, compacting and maintaining ABC.

Geotextile for Soil Stabilization will be measured and paid in accordance with Article 270-4.

Payment will be made under:

Pay Item	Pay Unit
Shallow Undercut	Cubic Yard
Class IV Subgrade Stabilization	Ton

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 *2018 Standard Specifications*.

The base price index for asphalt binder for plant mix is **\$ 790.00** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **August 1, 2022**.

ASPHALT CONCRETE SURFACE COURSE, TYPE xxx (Leveling Course):

(7-1-95) (Rev. 8-21-12)

610

SP6 R85R

Place a leveling course of *Asphalt Concrete Surface Course, Type ____* at locations shown on the sketch maps and as directed by the Engineer. The rate of this leveling course is not established but will be determined by allowing the screed to *drag* the high points of the section. It is anticipated that some map numbers will be leveled from beginning to end while others may only require a leveling course for short sections.

The Asphalt Concrete Surface Course, Type ____ (Leveling Course) shall meet the requirements of Section 610 of the *2018 Standard Specifications* except payment will be made at the contract unit price per ton for *Asphalt Concrete Surface Course, Type ____ (Leveling Course)*.

MILLING ASPHALT PAVEMENT:

(1-15-19)

607

SP6 R59

Revise the *2018 Standard Specifications* as follows:

Page 6-5, Article 607-2, EQUIPMENT, lines 14-16, delete the seventh sentence of this Article and replace with the following:

Use either a non-contacting laser or sonar type ski system with a minimum of three referencing stations mounted on the milling machine at a length of at least 24 feet.

ASPHALT CONCRETE PLANT MIX PAVEMENTS:

(2-20-18) (Rev.1-15-19)

610, 1012

SP6 R65

Revise the 2018 *Standard Specifications* as follows:

Page 6-14, 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
25.0 mm sieve (Base Mix)	± 10.0%
19.0 mm sieve (Base Mix)	± 10.0%
12.5 mm sieve (Intermediate & Type P-57)	± 6.0%
9.5 mm sieve (Surface Mix)	± 5.0%
4.75 mm sieve (Surface Mix)	± 5.0%
2.36 mm sieve (All Mixes, except S4.75A)	± 5.0%
1.18 mm sieve (S4.75A)	± 5.0%
0.075 mm sieve (All Mixes)	± 2.0%
Asphalt Binder Content	± 0.5%
Maximum Specific Gravity (G_{mm})	± 0.020
Bulk Specific Gravity (G_{mb})	± 0.030
TSR	± 15.0%
QA retest of prepared QC Gyratory Compacted Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Density Gauge Comparison of QC Test	± 2.0% (% Compaction)
QA Density Gauge Verification Test	± 2.0% (% Compaction)

Page 6-17, Table 610-1, MIXING TEMPERATURE AT THE ASPHALT PLANT, replace with the following:

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

Page 6-17, Subarticle 610-3(C), Job Mix Formula (JMF), lines 38-39, delete the fourth paragraph.

Page 6-18, Subarticle 610-3(C), Job Mix Formula (JMF), line 12, replace “SF9.5A” with “S9.5B”.

Page 6-18, Table 610-3, MIX DESIGN CRITERIA, replace with the following:

TABLE 610-3 MIX DESIGN CRITERIA					
Mix Type			Compaction Levels	Max. Rut	Volumetric Properties^B

	Design ESALs millions ^A	Binder PG Grade	G _{mm} @		Depth (mm)	VMA	VTM	VFA	%G _{mm} @ N _{ini}
			N _{ini}	N _{des}		% Min.	%	Min.-Max.	
S4.75A	< 1	64 - 22	6	50	11.5	16.0	4.0 - 6.0	65 - 80	≤ 91.5
S9.5B	0 - 3	64 - 22	6	50	9.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S9.5C	3 - 30	64 - 22	7	65	6.5	15.5	3.0 - 5.0	65 - 78	≤ 90.5
S9.5D	> 30	76 - 22	8	100	4.5	15.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0C	ALL	64 - 22	7	65	-	13.5	3.0 - 5.0	65 - 78	≤ 90.5
B25.0C	ALL	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
Design Parameter						Design Criteria			
All Mix Types	Dust to Binder Ratio (P _{0.075} / P _{be})					0.6 - 1.4 ^C			
	Tensile Strength Ratio (TSR) ^D					85% Min. ^E			

A. Based on 20 year design traffic.

B. Volumetric Properties based on specimens compacted to N_{des} as modified by the Department.

C. Dust to Binder Ratio (P_{0.075} / P_{be}) for Type S4.75A is 1.0 - 2.0.

D. NCDOT-T-283 (No Freeze-Thaw cycle required).

E. TSR for Type S4.75A & B25.0C mixes is 80% minimum.

Page 6-19, Table 610-5, BINDER GRADE REQUIREMENTS (BASED ON RBR%), replace with the following:

**TABLE 610-5
BINDER GRADE REQUIREMENTS (BASED ON RBR%)**

Mix Type	%RBR ≤ 20%	21% ≤ %RBR ≤ 30%	%RBR ≥ 30%
S4.75A, S9.5B, S9.5C, I19.0C, B25.0C	PG 64-22	PG 64-22 ^A	PG-58-28
S9.5D, OGFC	PG 76-22 ^B	n/a	n/a

A. If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.

B. Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22 binder.

Page 6-20, Table 610-6, PLACEMENT TEMPERATURES FOR ASPHALT, replace with the following:

TABLE 610-6 PLACEMENT TEMPERATURES FOR ASPHALT	
Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0C	35°F
I19.0C	35°F
S4.75A, S9.5B, S9.5C	40°F ^A
S9.5D	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 6-21, Article 610-8, SPREADING AND FINISHING, lines 34-35, delete the second sentence and replace with the following:

Use an MTV for all surface mix regardless of binder grade on Interstate, US Routes, and NC Routes (primary routes) that have 4 or more lanes and median divided.

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 36-38, delete the fourth sentence and replace with the following:

Use MTV for all ramps, loops, Y-line that have 4 or more lanes and are median divided, full width acceleration lanes, full width deceleration lanes, and full width turn lanes that are greater than 1000 feet in length.

Page 6-23, Table 610-7, DENSITY REQUIREMENTS, replace with the following:

TABLE 610-7 DENSITY REQUIREMENTS	
Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0 ^A
S9.5B	90.0
S9.5C, S9.5D, I19.0C, B25.0C	92.0

A. Compaction to the above specified density will be required when the S4.75A mix is applied at a rate of 100 lbs/sy or higher.

Page 6-24, Article 610-13, FINAL SURFACE TESTING, lines 35-36, delete the second sentence and replace with the following:

Final surface testing is not required on ramps, loops and turn lanes.

Page 6-26, Subarticle 610-13(A)(1), Acceptance for New Construction, lines 29-30, delete the second sentence and replace with the following:

Areas excluded from testing by the profiler may be tested using a 10-foot straightedge in accordance with Article 610-12.

Page 6-27, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 41-46, delete the eighth and ninth sentence of this paragraph and replace with the following:

Take profiles over the entire length of the final surface travel lane pavement exclusive of structures, approach slabs, paved shoulders, tapers, or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width acceleration or deceleration lanes and collector lanes.

Page 6-28, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 1-2, delete these two lines.

Page 6-32, Article 610-16 MEASUREMENT AND PAYMENT, replace with the following:

Pay Item	Pay Unit
Asphalt Concrete Base Course, Type B25.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0C	Ton
Asphalt Concrete Surface Course, Type S4.75A	Ton
Asphalt Concrete Surface Course, Type S9.5B	Ton
Asphalt Concrete Surface Course, Type S9.5C	Ton
Asphalt Concrete Surface Course, Type S9.5D	Ton

Page 10-30, Table 1012-1, AGGREGATE CONSENSUS PROPERTIES, replace with the following:

TABLE 1012-1 AGGREGATE CONSENSUS PROPERTIES^A				
Mix Type	Coarse Aggregate Angularity^B	Fine Aggregate Angularity % Minimum	Sand Equivalent % Minimum	Flat and Elongated 5 : 1 Ratio % Maximum
<i>Test Method</i>	<i>ASTM D5821</i>	<i>AASHTO T 304</i>	<i>AASHTO T 176</i>	<i>ASTM D4791</i>
S4.75A; S9.5B	75 / -	40	40	-

S9.5C; I19.0C; B25.0C	95 / 90	45	45	10
S9.5D	100 / 100	45	50	10
OGFC	100 / 100	45	45	10
UBWC	100 / 85	45	45	10

A. Requirements apply to the design aggregate blend.

B. 95 / 90 denotes that 95% of the coarse aggregate has one fractured face and 90% has 2 or more fractured faces.

SUPPLEMENTAL SURVEYING:

(4-20-21)

801

SP8 R03

Revise the *2018 Standard Specifications* as follows:

Page 8-7, Article 801-3 MEASUREMENT AND PAYMENT, lines 10-11, replace with the following:

Supplemental Surveying Office Calculations will be paid at the stated price of \$85.00 per hour. *Supplemental Field Surveying* will be paid at the stated price of \$145.00 per hour. The

GUARDRAIL END UNITS, TYPE - TL-3:

(4-20-04) (Rev. 7-1-17)

862

SP8 R65

Description

Furnish and install guardrail end units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2018 Standard Specifications*, and at locations shown in the plans.

Materials

Furnish guardrail end 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 end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 3, in accordance with Article 106-2 of the *2018 Standard Specifications*.
- (B) Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the *2018 Standard Specifications*.

No modifications shall be made to the guardrail end 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 *2018 Standard Specifications* and is incidental to the cost of the guardrail end unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2018 Standard Specifications*.

Payment will be made under:

Pay Item

Guardrail End Units, Type TL-3

Pay Unit

Each

GUARDRAIL ANCHOR UNITS AND TEMPORARY GUARDRAIL ANCHOR UNITS:

(1-16-2018)

862

SP8 R70

Guardrail anchor units will be in accordance with the details in the plans and the applicable requirements of Section 862 of the *2018 Standard Specifications*.

Revise the *2018 Standard Specifications* as follows:

Page 8-42, Article 862-6 MEASUREMENT AND PAYMENT, add the following:

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

Payment will be made under:

Pay Item

Guardrail Anchor Units, Type ____

Temporary Guardrail Anchor Units, Type ____

Pay Unit

Each

Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 1-16-18)

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 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 foundations for signal pedestals; see Section 1743 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing No. 1743.01.

Materials

Refer to the *2018 Standard Specifications*.

Item	Section
Conduit	1091-3
Grout, Type 2	1003
Polymer Slurry	411-2(B)(2)
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 *2018 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 *2018 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 *2018 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 *2018 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 the required slurry properties at all times 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 polymer 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 *2018 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 *2018 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2018 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2018 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2018 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 *2018 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 *2018 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 *2018 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. Place concrete against undisturbed soil or backfill and fill in accordance with Article 410-8 of the *2018 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces.

(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
$\geq 1 \frac{1}{2}$	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 *2018 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

(1-16-18)

SP9 R07

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.

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 pcf,
- (B) Friction angle (ϕ) = 30°,
- (C) Cohesion (c) = 0 psf and
- (D) Groundwater 7 feet 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 feet 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 *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 psf 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 2016 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 *2018 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 in 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, supplying and placing 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 *2018 Standard Specifications*.

Payment will be made under:

Pay Item
Overhead Footings

Pay Unit
Cubic Yard

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY:

(9-15-20)

1000, 1014, 1024

SP10 R01

Revise the *2018 Standard Specifications* as follows:

Page 10-6, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1000-1 REQUIREMENTS FOR CONCRETE											
Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum 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	4500	0.381	0.426	---	---	3.5 ^A	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 – 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5 ^A	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 2.5 ^A hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0 ^A	---	715	---	---	---
Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	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	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---
Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

- A. The slump may be increased to 6 inches, provided the increase in slump is achieved by adding a chemical admixture conforming to Section 1024-3. In no case shall the water-cement ratio on the approved design be exceeded. Concrete exhibiting segregation and/or excessive bleeding will be rejected. Utilizing an Admixture to modify slump does not relinquish the contractor's responsibility to ensure the final product quality and overall configuration meets design specifications. Caution should be taken when placing these modified mixes on steep grades to prevent unintended changes to the set slope.

THERMOPLASTIC INTERMIXED BEAD TESTING:

7-19-22

1087

SP10 R04

Revise the *2018 Standard Specifications* as follows:

Page 10-183, Subarticle 1087-7(B) Thermoplastic Pavement Marking Material Composition, delete line 34 and 35.

Page 10-184, Article 1087-8 MATERIAL CERTIFICATION, delete and replace with the following after line 34:

Drop-on Glass Beads	Type 3 Material Certification and Type 4 Material Certification
Intermix Glass Beads	Type 2 Material Certification and Type 3 Material Certification
Paint	Type 3 Material Certification
Removable Tape	Type 3 Material Certification
Thermoplastic	Type 3 Material Certification and Type 4 Material Certification
Cold Applied Plastic	Type 2 Material Certification and Type 3 Material Certification
Polyurea	Type 2 Material Certification and Type 3 Material Certification

THERMOPLASTIC PAVEMENT MARKING MATERIAL – COLOR TESTING:

3-19-19

1087

SP10 R05

Revise the *2018 Standard Specifications* as follows:

Pages 10-183 and 10-184, Subarticle 1087-7(D)(1)(b) Yellow, lines 9-11, delete and replace with the following:

Obtain Color Values Y,x,y per ASTM E1349 using C/2° illuminant/observer.
Results shall be $Y \geq 45\%$, and x,y shall fall within PR#1 chart chromaticity limits.

POLYUREA PAVEMENT MARKING MATERIAL – TYPE 2 TYPICAL CERTIFIED MILL TEST REPORT:

3-19-19

1087

SP10 R06

Amend the *2018 Standard Specifications* as follows:

Page 10-184, Subarticle 1087-8 Material Certification, in accordance with Subarticle 106-3 provide a Type 2 Typical Certified Mill Test Report and a Type 3 Manufacturer's Certification for Polyurea pavement marking material.

When tested, the material shall meet the physical and chemical characteristics provided by the manufacturer. NCDOT reserves the right to compare these test results to baseline test results gathered by the NCDOT Materials and Test Unit.

NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS:

10-19-21 (Rev. 11-16-21)

1086, 1250, 1253

SP10 R08

Revise the *2018 Standard Specifications* as follows:

Pages 10-177 and 10-178, Subarticle 1086-3 SNOWPLOWABLE PAVEMENT MARKERS, delete items (A), (B) and (C)(1) and replace with the following:

(A) General

Use non-cast iron snowplowable pavement markers evaluated by NTPEP. The non-cast iron snowplowable pavement marker shall consist of a housing with one or more glass or plastic face lens type reflective lenses to provide the required color designation. The marker shall be designed or installed in a manner that minimizes damage from snowplow blades. Plastic lens faces shall use an abrasion resistant coating.

(B) Housings

(1) Dimensions

The dimension, slope and minimum area of reflecting surface shall conform to dimensions as shown in the plans. The minimum area of each reflecting surface shall be 1.44 sq.in.

(2) Materials

Use non-cast iron snowplowable pavement markers that are on the NCDOT Approved Products List.

(3) Surface

The surface of the housing shall be free of scale, dirt, rust, oil, grease or any other contaminant which might reduce its bond to the epoxy adhesive.

(4) Identification

Mark the housing with the manufacturer's name and model number of marker.

(C) Reflectors**(1) General**

Laminate the reflector to an elastomeric pad and attach with adhesive to the housing. The thickness of the elastomeric pad shall be 0.04".

Pages 12-14, Subarticle 1250-3(C) Removal of Existing Pavement Markers, lines 19-29, delete and replace with the following:

Remove the existing raised pavement markers or the snowplowable pavement markers including the housings, before overlaying an existing roadway with pavement. Repair the pavement by filling holes as directed by the Engineer.

When traffic patterns are changed in work zones due to construction or reconstruction, remove all raised pavement markers or snowplowable markers including housings that conflict with the new traffic pattern before switching traffic to the new traffic pattern. Lens removal in lieu of total housing removal is not an acceptable practice for snowplowable markers.

Properly dispose of the removed pavement markers. No direct payment will be made for removal or disposal of existing pavement markers or repair of pavement, as such work will be incidental to other items in the contract.

Pages 12-16, Subarticle 1253-1 DESCRIPTION, lines 4-5, delete and replace with the following:

Furnish, install and maintain non-cast iron snowplowable pavement markers in accordance with the contract.

Pages 12-16 and 12-17, Subarticle 1253-3 CONSTRUCTION METHODS, delete items (A), (B) and (C) and replace with the following:

(A) General

Bond marker housings to the pavement with epoxy adhesive. Mechanically mix and dispense epoxy adhesives as required by the manufacturer's specifications. Place the markers immediately after the adhesive has been mixed and dispensed.

If saw cutting, milling, or grooving operations are used, promptly remove all resulting debris from the pavement surface. Install the marker housings within 7 calendar days after saw cutting, milling, or grooving the pavement. Remove and dispose of loose material from the slots by brushing, blow cleaning, or vacuuming. Dry the slots before applying the epoxy adhesive. Install non-cast iron snowplowable pavement markers according to the manufacturer's recommendations.

Protect the non-cast iron snowplowable pavement markers until the epoxy has initially cured and is track free.

(B) Reflector Replacement

In the event that a reflector is damaged, replace the damaged reflector by using adhesives and methods recommended by the manufacturer of the markers and approved by the Engineer.

This work is considered incidental if damage occurs during the initial installation of the marker housings and maintenance of initial non-cast iron snowplowable markers specified in this section. This work will be paid for under the pay item for the type of reflector replacement if the damage occurred after the initial installation of the non-cast iron snowplowable pavement marker.

Missing housings shall be replaced. Broken housings shall be removed and replaced. In both cases the slot for the housings shall be properly prepared prior to installing the new housing; patch the existing marker slots as directed by the Engineer and install the new marker approximately one foot before or after the patch. Removal of broken housings and preparation of slots will be considered incidental to the work of replacing housings.

Pages 12-17, Subarticle 1253-4 MAINTENANCE, lines 5, delete and replace with the following:

Maintain all installed non-cast iron snowplowable pavement markers until acceptance.

Pages 12-17, Subarticle 1253-5 MEASUREMENT AND PAYMENT, lines 7-8, delete and replace with the following:

Non-Cast Iron Snowplowable Pavement Markers will be measured and paid as the actual number of non-cast iron snowplowable pavement markers satisfactorily placed and accepted by the Engineer.

Pages 12-17, Subarticle 1253-5 MEASUREMENT AND PAYMENT, lines 11, delete and replace with the following:

Payment will be made under:

Pay Item	Pay Unit
Non-Cast Iron Snowplowable Pavement Marker	Each
Replace Snowplowable Pavement Marker Reflector	Each

MATERIALS FOR PORTLAND CEMENT CONCRETE:

(9-15-20)

1000, 1024

SP10 R24

Revise the *2018 Standard Specifications* as follows:

Page 10-52, Article 1024-4, WATER, lines 3-6, delete and replace with the following:

Test water from wells at all locations. Test public water supplies from all out of state locations and in the following counties: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell and Washington unless the Engineer waives the testing requirements.

Page 10-52, Table 1024-2, PHYSICAL PROPERTIES OF WATER, replace with the following:

Property	Requirement	Test Method
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Compression Strength, minimum percent of control at 3 and 7 days	90%	ASTM C1602
Time of set, deviation from control	From 1:00 hr. earlier to 1:30 hr. later	ASTM C1602
pH	4.5 to 8.5	ASTM D1293 *
Chloride Ion Content, Max.	250 ppm	ASTM D512 *
Total Solids Content (Residue), Max.	1,000 ppm	SM 2540B *
Resistivity, Min.	0.500 kohm-cm	ASTM D1125 *

*Denotes an alternate method is acceptable. Test method used shall be referenced in the test report.

TEMPORARY SHORING:

(2-20-07) (Rev. 10-19-21)

SP11 R02

Description

Temporary shoring includes cantilever, braced and anchored shoring and temporary mechanically stabilized earth (MSE) walls. Temporary shoring does not include trench boxes. At the Contractor's option, use any type of temporary shoring unless noted otherwise in the plans or as directed. Design and construct temporary shoring based on actual elevations and shoring dimensions in accordance with the contract and accepted submittals. Construct temporary shoring at locations shown in the plans and as directed. Temporary shoring is required to maintain traffic when a 2:1 (H:V) slope from the top of an embankment or bottom of an excavation will intersect the existing ground line less than 5 feet from the edge of pavement of an open travelway. This provision does not apply to pipe, inlet or utility installation unless noted otherwise in the plans.

Positive protection includes concrete barrier and temporary guardrail. Provide positive protection for temporary shoring at locations shown in the plans and as directed. Positive protection is required if temporary shoring is located in the clear zone in accordance with the *AASHTO Roadside Design Guide*.

(A) Cantilever and Braced Shoring

Cantilever shoring consists of steel sheet piles or H-piles with timber lagging. Braced shoring consists of sheet piles or H-piles with timber lagging and bracing such as beams, plates, walers, struts, rakers, etc. Define "piles" as sheet piles or H-piles.

(B) Anchored Shoring

Anchored shoring consists of sheet piles with walers or H-piles with timber lagging anchored with ground or helical anchors. Driven anchors may be accepted at the discretion of the Engineer. A ground anchor consists of a grouted steel bar or multi-strand tendon with an anchorage. A helical anchor consists of a lead section with a central steel shaft and at least one helix steel plate followed by extensions with only central shafts (no helixes) and an anchorage. Anchorages consist of steel bearing plates with washers and hex nuts for bars or steel wedge plates and wedges for strands. Use a prequalified Anchored Wall

Contractor to install ground anchors. Define “anchors” as ground, helical or driven anchors.

(C) Temporary MSE Walls

Temporary MSE walls include temporary geosynthetic and wire walls. Define “temporary wall” as a temporary MSE wall and “Temporary Wall Vendor” as the vendor supplying the temporary MSE wall. Define “reinforcement” as geotextile, geogrid, geostrip, welded wire grid or metallic strip reinforcement.

Temporary geosynthetic walls consist of geotextiles or geogrids wrapped behind welded wire facing or geostrips connected to welded wire facing. Define “temporary geotextile wall” as a temporary geosynthetic wall with geotextile reinforcement, “temporary geogrid wall” as a temporary geosynthetic wall with geogrid reinforcement and “temporary geostrip wall” as a temporary geosynthetic wall with geostrip reinforcement.

Temporary wire walls consist of welded wire grid or metallic strip reinforcement connected to welded wire facing. Define “Wire Wall Vendor” as the vendor supplying the temporary wire wall.

(D) Embedment

Define “embedment” for cantilever, braced and anchored shoring as the pile depth below the grade in front of shoring. Define “embedment” for temporary walls as the wall embedment below the grade at the wall face.

(E) Positive Protection

Define “unanchored or anchored portable concrete barrier” as portable concrete barrier (PCB) that meets 2018 Roadway Standard Drawing No. 1170.01. Define “concrete barrier” as unanchored or anchored PCB or an approved equal. Define “temporary guardrail” as temporary steel beam guardrail that meets 2018 Roadway Standard Drawing No. 862.02.

Materials

Refer to the *2018 Standard Specifications*.

Item	Section
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Grout, Type 1	1003
Portland Cement	1024-1
Portland Cement Concrete	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2
Steel Sheet Piles and H-Piles	1084

Item	Section
Untreated Timber	1082-2
Water	1024-4
Welded Wire Reinforcement	1070-3

Provide Type 6 material certifications for shoring materials in accordance with Article 106-3 of the *2018 Standard Specifications*. Use Class IV select material for temporary guardrail and Class A concrete that meets Article 450-2 of the *2018 Standard Specifications* or Type 1 grout for drilled-in piles. Provide untreated timber with a thickness of at least 3 inches and a bending stress of at least 1,000 pounds per square inch for timber lagging. Provide steel bracing that meets ASTM A36.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use A-2-4 soil for backfill around culverts.

(B) Anchors

Store anchor materials on blocking a minimum of 12 inches 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 anchor materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

(1) Ground Anchors

Use high-strength deformed steel bars that meet AASHTO M 275 or seven-wire strands that meet ASTM A886 or Article 1070-5 of the *2018 Standard Specifications*. Splice bars in accordance with Article 1070-9 of the *2018 Standard Specifications*. Do not splice strands. Use bondbreakers, spacers and centralizers that meet Article 6.3.5 of the *AASHTO LRFD Bridge Construction Specifications*.

Use neat cement grout that only contains cement and water with a water cement ratio of 0.4 to 0.5 which is approximately 5.5 gallons of water per 94 pounds of Portland cement. Provide grout with a compressive strength at 3 and 28 days of at least 1,500 and 4,000 psi, respectively.

(2) Helical Anchors

Use helical anchors with an ICC Evaluation Service, Inc. (ICC-ES) report. Provide couplers, thread bar adapters and bolts recommended by the Anchor Manufacturer to connect helical anchors together and to piles.

(3) Anchorages

Provide steel plates for bearing plates and steel washers, hex nuts, wedge plates and wedges recommended by the Anchor Manufacturer.

(C) Temporary Walls

(1) Welded Wire Facing

Use welded wire reinforcement for welded wire facing, struts and wires. For temporary wire walls, provide welded wire facing supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. For temporary wire walls with separate reinforcement and facing components, provide connectors (e.g., bars, clamps, plates, etc.) and fasteners (e.g., bolts, nuts, washers, etc.) required by the Wire Wall Vendor.

(2) Geotextiles

Provide Type 2 geotextile for separation and retention geotextiles. Provide Type 5 geotextile for geotextile reinforcement with ultimate tensile strengths in accordance with the accepted submittals.

(3) Geogrid and Geostrip Reinforcement

Use geogrids with a roll width of at least 4 feet. Use geogrids for geogrid reinforcement and geostrips for geostrip reinforcement with an “approved” status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids and geostrips is available from: connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Provide geogrids and geostrips with design strengths in accordance with the accepted submittals. Geogrids and geostrips are approved for short-term design strengths (3-year design life) in the machine direction (MD) and cross-machine direction (CD) based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

(4) Welded Wire Grid and Metallic Strip Reinforcement

Provide welded wire grid and metallic strip reinforcement supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. Use welded wire grid reinforcement (“mesh”, “mats” and “ladders”) that meet Article 1070-3 of the *2018 Standard Specifications* and metallic strip reinforcement (“straps”) that meet ASTM A572 or A1011.

Preconstruction Requirements

(A) Concrete Barrier

Define “clear distance” behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor’s option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of temporary shoring except for barrier above temporary walls. Concrete barrier with the minimum required clear distance is required above temporary walls.

(B) Temporary Guardrail

Define “clear distance” behind temporary guardrail as the horizontal distance between guardrail posts and temporary shoring. At the Contractor’s option or if clear distance for cantilever, braced and anchored shoring is less than 4 feet, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above temporary walls.

(C) Temporary Shoring Designs

Before beginning temporary shoring design, survey existing ground elevations in the vicinity of shoring locations to determine actual design heights (H). Submit PDF files of working drawings and design calculations for temporary shoring designs in accordance with Article 105-2 of the *2018 Standard Specifications*. Submit working drawings showing plan views, shoring profiles, typical sections and details of temporary shoring design and construction sequence. Do not begin shoring construction until a design submittal is accepted.

Have cantilever and braced shoring designed, detailed and sealed by an engineer licensed in the state of North Carolina. Use a prequalified Anchored Wall Design Consultant to design anchored shoring. Provide anchored shoring designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for an Anchored Wall Design Consultant. Include details in anchored shoring working drawings of anchor locations and lock-off loads, unit grout/ground bond strengths for ground anchors or minimum installation torque and torsional strength rating for helical anchors and if necessary, obstructions extending through shoring or interfering with anchors. Include details in the anchored shoring construction sequence of pile and anchor installation, excavation and anchor testing.

Provide temporary wall designs sealed by a Design Engineer licensed in the state of North Carolina and employed or contracted by the Temporary Wall Vendor. Include details in temporary wall working drawings of geotextile and reinforcement types, locations and directions and obstructions extending through walls or interfering with reinforcement.

(1) Soil Parameters

Design temporary shoring for the assumed soil parameters and groundwater or flood elevations shown in the plans. Assume the following soil parameters for shoring backfill:

- (a) Unit weight (γ) = 120 pcf,

(b)	Friction Angle (ϕ)	Shoring Backfill
	30°	A-2-4 Soil
	34°	Class II, Type 1 or Class III Select Material
	38°	Class V or VI Select Material

(c) Cohesion (c) = 0 psf.

(2) Traffic Surcharge

Design temporary shoring for a traffic surcharge of 250 pounds per square foot if traffic will be above and within H of shoring. This traffic surcharge does not apply to construction traffic. Design temporary shoring for any construction surcharge if construction traffic will be above and within H of shoring. Design temporary shoring for a traffic (live load) surcharge in accordance with Article 11.5.6 of the *AASHTO LRFD Bridge Design Specifications*.

(3) Cantilever, Braced and Anchored Shoring Designs

Use shoring backfill for fill sections and voids between cantilever, braced and anchored shoring and the critical failure surface. Use concrete or Type 1 grout for embedded portions of drilled-in H-piles. Do not use drilled-in sheet piles.

Define “top of shoring” for cantilever, braced and anchored shoring as where the grade intersects the back of sheet piles or H-piles and timber lagging. Design cantilever, braced and anchored shoring for a traffic impact load of 2,000 pounds per foot applied 18 inches above top of shoring if concrete barrier is above and next to shoring or temporary guardrail is above and attached to shoring. Extend cantilever, braced and anchored shoring at least 32 inches above top of shoring if shoring is designed for traffic impact. Otherwise, extend shoring at least 6 inches above top of shoring.

Design cantilever, braced and anchored shoring for a maximum deflection of 3 inches if the horizontal distance to the closest edge of pavement or structure is less than H. Otherwise, design shoring for a maximum deflection of 6 inches. Design cantilever and braced shoring in accordance with the plans and *AASHTO Guide Design Specifications for Bridge Temporary Works*.

Design anchored shoring in accordance with the plans and Article 11.9 of the *AASHTO LRFD Bridge Design Specifications*. Use a resistance factor of 0.80 for tensile resistance of anchors with bars, strands or shafts. Extend the unbonded length for ground anchors and the shallowest helix for helical anchors at least 5 feet behind the critical failure surface. Do not extend anchors beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail posts, pavements, pipes, inlets or utilities will interfere with anchors, maintain a clearance of at least 6 inches between obstructions and anchors.

(4) Temporary Wall Designs

Use shoring backfill in the reinforced zone of temporary walls. Separation

geotextiles are required between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, separation geotextiles are also required between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Design temporary walls in accordance with the plans and Article 11.10 of the *AASHTO LRFD Bridge Design Specifications*. Embed temporary walls at least 18 inches except for walls on structures or rock as determined by the Engineer. Use a uniform reinforcement length throughout the wall height of at least $0.7H$ or 6 feet, whichever is longer. Extend the reinforced zone at least 6 inches beyond end of reinforcement. Do not locate the reinforced zone outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads in accordance with the AASHTO LRFD specifications. For geotextile reinforcement, use geotextile properties approved by the Department or default values in accordance with the AASHTO LRFD specifications. For geogrid and geostrip reinforcement, use approved geosynthetic reinforcement properties available from the website shown elsewhere in this provision. Use geosynthetic properties for the direction reinforcement will be installed, a 3-year design life and shoring backfill to be used in the reinforced zone.

Do not use more than 4 different reinforcement strengths for each temporary geosynthetic wall. Design temporary geotextile walls for a reinforcement coverage ratio (R_c) of 1.0. For temporary geogrid walls with an R_c of less than 1.0, use a maximum horizontal clearance between geogrids of 3 feet and stagger reinforcement so geogrids are centered over gaps in the reinforcement layer below.

For temporary geosynthetic walls, use “L” shaped welded wire facing with 18 to 24 inch long legs. Locate geosynthetic reinforcement so reinforcement layers are at the same level as the horizontal legs of welded wire facing. Use vertical reinforcement spacing equal to facing height. Wrap geotextile or geogrid reinforcement behind welded wire facing and extend reinforcement at least 3 feet back behind facing into shoring backfill. Attach geostrip reinforcement to welded wire facing with a connection approved by the Department.

For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing with a connection approved by the Department. For temporary geogrid, geostrip and wire walls, retain shoring backfill at welded wire facing with retention geotextiles and extend geotextiles at least 3 feet back behind facing into backfill.

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction, inspection and testing of the temporary shoring. If required and if this meeting occurs before all shoring submittals have been accepted, additional preconstruction meetings may be required before beginning construction of temporary shoring without accepted

submittals. The Resident, District or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend preconstruction meetings.

Construction Methods

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

Install positive protection in accordance with the contract and accepted submittals. Use PCB in accordance with Section 1170 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing No. 1170.01. Use temporary guardrail in accordance with Section 862 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing Nos. 862.01, 862.02 and 862.03.

(A) Tolerances

Construct shoring with the following tolerances:

- (1) Horizontal wires of welded wire facing are level in all directions,
- (2) Shoring location is within 6 inches of horizontal and vertical alignment shown in the accepted submittals, and
- (3) Shoring plumbness (batter) is not negative and within 2 degrees of vertical.

(B) Cantilever, Braced and Anchored Shoring Installation

If overexcavation behind cantilever, braced or anchored shoring is shown in the accepted submittals, excavate before installing piles. Otherwise, install piles before excavating for shoring. Install cantilever, braced or anchored shoring in accordance with the construction sequence shown in the accepted submittals. Remove piles and if applicable, timber lagging when shoring is no longer needed.

(1) Pile Installation

Install piles with the minimum required embedment and extension in accordance with Subarticles 450-3(D) and 450-3(E) of the *2018 Standard Specifications* except that a pile driving equipment data form is not required. Piles may be installed with a vibratory hammer as approved by the Engineer.

Do not splice sheet piles. Use pile excavation to install drilled-in H-piles. After filling holes with concrete or Type 1 grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least 7 days before excavating.

Notify the Engineer if refusal is reached before pile excavation or driven piles attain the minimum required embedment. When this occurs, a revised design submittal may be required.

(2) Excavation

Excavate in front of piles from the top down in accordance with the accepted submittals. For H-piles with timber lagging and braced and anchored shoring, excavate in staged horizontal lifts with a maximum height of 5 feet. Remove flowable fill and material in between H-piles as needed to install timber lagging. Position lagging with at least 3 inches of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until timber lagging for the current lift is installed and if applicable, bracing and anchors for the current lift are accepted. Backfill behind cantilever, braced or anchored shoring with shoring backfill.

(3) Anchor Installation

If applicable, install foundations located behind anchored shoring before installing anchors. Fabricate and install ground anchors in accordance with the accepted submittals, Articles 6.4 and 6.5 of the *AASHTO LRFD Bridge Construction Specifications* and the following unless otherwise approved:

- (a) Materials in accordance with this provision are required instead of materials conforming to Articles 6.4 and 6.5.3 of the *AASHTO LRFD Specifications*,
- (b) Encapsulation-protected ground anchors in accordance with Article 6.4.1.2 of the *AASHTO LRFD specifications* are not required, and
- (c) Corrosion protection for unbonded lengths of ground anchors and anchorage covers are not required.
- (d) Mix and place neat cement grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *2018 Standard Specifications*. 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.

Install helical anchors in accordance with the accepted submittals and Anchor Manufacturer's instructions. Measure torque during installation and do not exceed the torsional strength rating of the helical anchor. Attain the minimum required installation torque and penetration before terminating anchor installation. When replacing a helical anchor, embed last helix of the replacement anchor at least 3 helix plate diameters past the location of the first helix of the previous anchor.

(4) Anchor Testing

Proof test and lock-off anchors in accordance with the accepted submittals and Article 6.5.5 of the *AASHTO LRFD Bridge Construction Specifications* except for

the acceptance criteria in Article 6.5.5.5. For the AASHTO LRFD specifications, “ground anchor” refers to a ground or helical anchor and “tendon” refers to a bar, strand or shaft.

(a) Anchor Acceptance

Anchor acceptance is based in part on the following criteria.

- (i) For ground and helical anchors, total movement is less than 0.04 inches between the 1 and 10 minute readings or less than 0.08 inches between the 6 and 60 minute readings.
- (ii) For ground anchors, total movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(b) Anchor Test Results

Submit PDF files of anchor test records including movement versus load plots for each load increment within 24 hours of completing each row of anchors. The Engineer will review the test records to determine if the anchors are acceptable.

If the Engineer determines an anchor is unacceptable, revise the anchor design or installation methods. Submit a revised anchored shoring design for acceptance and provide an acceptable anchor with the revised design or installation methods. If required, replace the anchor or provide additional anchors with the revised design or installation methods.

(C) Temporary Wall Installation

Excavate as necessary for temporary walls in accordance with the plans and accepted submittals. If applicable, install foundations located in the reinforced zone before placing shoring backfill or reinforcement unless otherwise approved. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or reinforcement until excavation dimensions and foundation material are approved.

Erect welded wire facing so the wall position is as shown in the plans and accepted submittals. Set welded wire facing adjacent to each other in the horizontal and vertical direction to completely cover the wall face with facing. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Attach geostrip reinforcement to welded wire facing and wrap geotextile reinforcement and retention geotextiles behind welded wire facing as shown in the plans and accepted submittals. Cover geotextiles with at least 3" of shoring backfill. Overlap adjacent geotextile reinforcement and retention and separation geotextiles at least 18 inches with seams oriented perpendicular to the wall face. Hold geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement within 3 inches of locations shown in the plans and accepted submittals. Before placing shoring backfill, pull geosynthetic reinforcement taut so it is in

tension and free of kinks, folds, wrinkles or creases. Install reinforcement with the direction shown in the plans and accepted submittals. For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing as shown in the accepted submittals. Do not splice or overlap reinforcement so seams are parallel to the wall face. Contact the Engineer when unanticipated existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement.

Place shoring backfill in the reinforced zone in 8 to 10 inch thick lifts. Compact A-2-4 soil and Class II, Type 1 and Class III select material in accordance with Subarticle 235-3(C) of the *2018 Standard Specifications*. Use only hand operated compaction equipment to compact backfill within 3 feet of welded wire facing. At a distance greater than 3 feet, compact shoring backfill with at least 4 passes of an 8 to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting backfill. Do not use sheepfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting shoring backfill. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8 inches of shoring backfill. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for temporary walls outside the reinforced zone in accordance with Article 410-8 of the *2018 Standard Specifications*. Bench temporary walls into the sides of excavations where applicable. For temporary geosynthetic walls with top of wall within 5 feet of finished grade, remove top facing and incorporate top reinforcement layer into fill when placing fill in front of wall. Temporary walls remain in place permanently unless otherwise required.

Measurement and Payment

Temporary Shoring will be measured and paid in square feet. Temporary walls will be measured as the square feet of exposed wall face area. Cantilever, braced or anchored shoring will be measured as the square feet of exposed shoring face area with the shoring height equal to the difference between the top and bottom of shoring elevations. Define “top of shoring” as where the grade intersects the back of sheet piles or H-piles and timber lagging. Define “bottom of shoring” as where the grade intersects front of sheet piles or H-piles and timber lagging. No measurement will be made for any embedment, shoring extension above top of shoring or pavement thickness above temporary walls.

The contract unit price for *Temporary Shoring* will be full compensation for providing shoring designs, submittals and materials, excavating, backfilling, hauling and removing excavated materials and supplying all labor, tools, equipment and incidentals necessary to construct temporary shoring.

No payment will be made for temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor’s convenience. No value engineering proposals will be accepted based solely on revising or eliminating shoring locations shown in the plans or estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

PCB will be measured and paid in accordance with Section 1170 of the *2018 Standard Specifications*. No additional payment will be made for anchoring PCB for temporary shoring. Costs for anchoring PCB will be incidental to temporary shoring.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *2018 Standard Specifications*.

Payment will be made under:

Pay Item
Temporary Shoring

Pay Unit
Square Foot

MATERIAL AND EQUIPMENT STORAGE & PARKING OF PERSONAL VEHICLES:

11-17-21(Rev. 8-16-22)

1101

SP11 R03

Revise the *2018 Standard Specifications* as follows:

Page 11-2, Article 1101-8 MATERIAL AND EQUIPMENT STORAGE, line 35-38, delete and replace with the following:

When work is not in progress, keep all personnel, equipment, machinery, tools, construction debris, materials and supplies away from active travel lanes that meets Table 1101-1.

TABLE 1101-1	
MATERIAL AND EQUIPMENT STORAGE FROM ACTIVE TRAVEL LANES	
Posted Speed Limit (mph)	Distance (ft)
40 or less	≥ 18
45-50	≥ 28
55	≥ 32
60 or higher	≥ 40

When vehicles, equipment and materials are protected by concrete barrier or guardrail, they shall be offset at least 5 feet from the barrier or guardrail.

Page 11-2, Article 1101-9 PARKING OF PERSONAL VEHICLES, line 40-41, delete and replace with the following:

Provide staging areas for personal vehicle parking in accordance with Article 1101-8 or as directed by the Engineer before use.

WORK ZONE INSTALLER:

(7-20-21)(Rev. 8-16-22)

1101, 1150

SP11 R04

Provide the service of at least one qualified work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way. The qualified work zone installer shall serve as crew leader and shall be on site and directing the installation and removal of temporary traffic control. If multiple temporary traffic control installations or removals are occurring simultaneously, then each shall have a qualified work zone installer.

The work zone installer shall be qualified by an NCDOT approved training agency or other

NCDOT approved training provider in the safe and competent set up of temporary traffic control. For a complete listing of approved training agencies, see the Work Zone Safety Training webpage.

A work zone supervisor, in accordance with Article 1101-13 of the *Standard Specifications*, may fulfill the role of the work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way provided they are on site and directing the installation and removal of temporary traffic control.

All other individuals participating in the setup, installation, and removal of temporary traffic control within the highway right of way shall be certified as a qualified flagger in accordance with Article 1150-3 of the *Standard Specifications*, even if flagging is not being performed as part of the traffic control.

Provide the name and contact information of all qualified work zone installers to the Engineer prior to or at the preconstruction conference. Additionally, provide a qualification statement that all other individuals participating in the setup, installation, and removal of temporary traffic control are qualified flaggers that have been properly trained through an NCDOT approved training agency or other NCDOT approved training provider.

All certification records for qualified work zone installers and flaggers shall be uploaded by the approved training agency or other NCDOT approved training provider to the Department's Work Zone Education Verification App (WZ-EVA) prior to the qualified work zone installer or flagger performing any traffic control duties on the project. For more information about WZ-EVA, see the Work Zone Safety Training webpage.

PORTABLE CHANGEABLE MESSAGE SIGNS:

(9-20-22)

1089, 1120

SP11 R10

Revise the *2018 Standard Specifications* as follows:

Page 10-197, Subarticle 1089-7(D) Controller, line 16, add the following after the third sentence of the first paragraph:

Change the controller password from the factory default and periodically change the controller password to deter unauthorized programming of the controller.

Page 10-197, Subarticle 1089-7(D) Controller, line 24 replace the sentence with the following:

The controller shall be stored in a locked, weather and vandal resistant box when not in use and after changes to the messages are made.

Page 11-8, Article 1120-3 CONSTRUCTION METHODS, lines 26-32, replace the second paragraph with the following:

Provide an experienced operator for the portable changeable message sign during periods of operation to ensure that the messages displayed on the sign panel are in accordance with the plans and Subarticle 1089-7(D). Change the controller password from the factory default and periodically change the controller password to deter unauthorized programming of the controller. Using two levels of password security is recommended such that operators at one level may only change message sequences displayed using preprogrammed sequences and operators at a higher level may create and store messages or message sequences. Lock the controller in a weather and vandal resistant box when not in use and after changes to the messages are made.

LAW ENFORCEMENT:

(6-21-22)

1190

SP11 R30

Revise the *2018 Standard Specifications* as follows:

Page 11-19, Article 1190-1 DESCRIPTION, lines 4-5, replace the paragraph with the following:

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

Page 11-19, Article 1190-2 CONSTRUCTION METHODS, lines 7-9, replace the first paragraph with the following:

Use off duty uniformed Law Enforcement Officers and official Law Enforcement vehicles equipped with blue lights to direct or control traffic as required by the plans or by the Engineer.

Page 11-19, Article 1190-3 MEASUREMENT AND PAYMENT, lines 14-15, replace the second sentence of the first paragraph with the following:

There will be no direct payment for official Law Enforcement vehicles as they are considered incidental to the pay item.

EXTRUDED THERMOPLASTIC PAVEMENT MARKING THICKNESS:

3-19-19 (Rev. 6-21-22)

1205

SP12 R05

Revise the *2018 Standard Specifications* as follows:

Page 12-6, Subarticle 1205-4(A)(1) General, lines 5-8, delete the second sentence and replace with the following:

Use application equipment that provides multiple width settings ranging from 4 inches to 12 inches and multiple thickness settings to achieve the required thickness above the surface of the pavement as shown in Table 1205-3.

Page 12-7, Table 1205-3, THICKNESS REQUIREMENTS FOR THERMOPLASTIC, replace with the following:

TABLE 1205-3 MINIMUM THICKNESS REQUIREMENTS FOR THERMOPLASTIC	
Thickness	Location
240 mils	In-lane and shoulder-transverse pavement markings (rumble strips). May be placed in 2 passes.
90 mils	Center lines, skip lines, transverse bands, mini-skip lines, characters, bike lane symbols, crosswalk lines, edge lines, gore lines, diagonals, and arrow symbols

PORTABLE CONSTRUCTION LIGHTING:

4-19-22

1413

SP14 R13

Revise the *2018 Standard Specifications* as follows:

Page 14-24, Article 1413-3 TOWER LIGHT, lines 2-7, delete and replace the first and second sentence in the first paragraph with the following:

Use tower lights which consist of mercury vapor, metal halide, high pressure sodium, low pressure sodium or light emitting diode (with correlated color temperature of 4000 Kelvin or less) fixtures mounted on a tower approximately 30 feet in height. Use tower light fixtures which are heavy duty flood, area, or roadway style with wide beam spread, have sufficient output to provide the minimum illumination requirements for the Category of work, are weatherproof and supplied with attached waterproof power cord and plug.

Page 14-24, Article 1413-3 TOWER LIGHT, lines 11-12, delete and replace the second paragraph with the following:

Provide tower lights of sufficient wattage or quantity to provide the minimum average maintained horizontal illuminance over the work area based on the Category of work as shown in Table 1413-1. For any work not covered in Table 1413-1, provide a minimum average maintained horizontal illuminance of 20.0 footcandles over the work area.

**TABLE 1413-1
MINIMUM ILLUMINATION REQUIREMENTS FOR PORTABLE
CONSTRUCTION LIGHTING**

Category	Description of Construction and Maintenance Task	Minimum Average Maintained Horizontal Illuminance
I	Excavation; Embankment, Fill and Compaction; Maintenance of Embankment; Asphalt Pavement Rolling; Subgrade, Stabilization and Construction; Base Course Rolling; Sweeping and Cleaning; Landscaping, Sod and Seeding; Reworking Shoulders.	5.0 footcandle
II	Barrier Wall and Traffic Separators; Milling, Removal of Pavement; Asphalt Paving and Resurfacing; Concrete Pavement; Base Course Grading and Shaping; Surface Treatment; Waterproofing and Sealing; Sidewalk Construction; Guardrails and Fencing; Striping and Pavement Marking; Highway Signs; Bridge Decks; Drainage Structures and Drainage Piping; Other Concrete Structures; Repair of Concrete Pavement; Pothole Filling; Repair of Guardrail and Fencing.	10.0 footcandle
III	Traffic Signals; Highway Lighting Systems; Crack Filling.	20.0 footcandle

Page 14-24, Article 1413-4 MACHINE LIGHTS, lines 18-21, delete and replace the first and second sentence in the first paragraph with the following:

Use machine lights which have mercury vapor, metal halide, high pressure sodium, low pressure sodium or light emitting diode (with correlated color temperature of 4000 Kelvin or less) fixtures mounted on supports attached to the construction machine at a height of approximately 13 feet.

Page 14-24, Article 1413-5 CONSTRUCTION METHODS, lines 33-34, delete and replace the third and fourth sentence in the first paragraph with the following:

Submit photometric calculations showing the minimum average maintained horizontal illuminance over the work area and the tower spacing to the Engineer for review and approval prior to installation.

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 *2018 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(D) of the *2018 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, Sickledod, 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	Japanese Millet
Crownvetch	Reed Canary Grass
Pensacola Bahiagrass	Zoysia
Creeping Red Fescue	

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**

(10-16-18) (Rev. 8-16-22)

Z-4

Revise the *2018 Standard Specifications* as follows:

Division 4

Page 4-84, Article 458-5 MEASUREMENT AND PAYMENT, line 31, replace article number “454-1” with “458-1”.

Division 6

Page 6-7, Article 609-1 DESCRIPTION, line 29, replace article number “609-10” with “609-9”.

Page 6-26, Subarticle 610-13(A)(1) Acceptance for New Construction, line 31, replace Table number “610-7” with “610-8”.

Page 6-29, Subarticle 610-13(B) North Carolina Hearne Straightedge, line 32, replace Table number “610-8” with “610-9”.

Page 6-31, Article 610-14 DENSITY ACCEPTANCE, Specified Density prior to line 30 and line 32, replace Table number “610-6” with “610-7”.

Division 7

Page 7-27, Article 725-1 MEASUREMENT AND PAYMENT, line 4, replace article number “725-1” with “724-4”.

Page 7-28, Article 725-1 MEASUREMENT AND PAYMENT, line 10, replace article number “725-1” with “725-3”.

Division 10

Page 10-37, Article 1012-4, LIGHTWEIGHT AGGREGATE, line 4, replace Table number “1012-8” with “1012-5”.

Page 10-78, Article 1056-4 GEOTEXTILES, TABLE 1056-1, Permittivity, Type 2, replace “Table 6^D” with “Table 7^D” and **Permittivity, Type 3^B,** replace “Table 7^D” with “Table 8^D”.

Page 10-121, Article 1076-7, REPAIR OF GALVANIZING, line 8, replace article number “1080-9” with “1080-7”.

Page 10-162, Article 1080-50 PAINT FOR VERTICAL MARKERS, line 1, replace article number “1080-50” with “1080-10”.

Page 10-162, Article 1080-61 EPOXY RESIN FOR REINFORCING STEEL, line 5, replace article number “1080-61” with “1080-11”.

Page 10-162, Article 1080-72 ABRASIVE MATERIALS FOR BLAST CLEANING STEEL, line 22, replace article number “1080-72” with “1080-12”.

Page 10-163, Article 1080-83 FIELD PERFORMANCE AND SERVICES, line 25, replace article number “1080-83” with “1080-13”.

Division 17

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, lines 42-44, replace the second sentence with the following:

An example is an installation of a single 1.25 inch HDPE conduit would be paid as:

Directional Drill (1)(1.25") Linear Foot

Page 17-15, Subarticle 1715-3(E) Bore and Jack, line 5, replace article number “1540-4” with “1550-4”.

Page 17-15, Subarticle 1715-3(E) Bore and Jack, lines 10 & 11, replace "*NCDOT Policies and Procedures for Accommodating Utilities on Highway Rights of Way*" with "*NCDOT Utilities Accommodations Manual*".

STANDARD SPECIAL PROVISION**PLANT AND PEST QUARANTINES****(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer, Guava Root Knot Nematode, And Other Noxious Weeds)**

(3-18-03) (Rev. 5-21-19)

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, 919-707-3730, or <https://www.ncagr.gov/plantindustry/Plant/quaran/table2.htm> 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, emerald ash borer, guava root knot nematode, or other noxious weeds.

STANDARD SPECIAL PROVISION**TITLE VI AND NONDISCRIMINATION:**

(6-28-77)(Rev 6/19/2018)

Z-6

Revise the *2018 Standard Specifications* as follows:

Replace Article 103-4(B) with the following:

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) Title VI Assurances (USDOT Order 1050.2A, Appendix A)

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:

(a) Compliance with Regulations

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) 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 directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) 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 Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and 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 Recipient or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the

exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:

In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:

(i) Withholding payments to the contractor under the contract until the contractor complies; and/or

(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions

The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**

The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:

1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:

"The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not

be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award.”

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.
 5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.
 6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.
- (b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))
- (c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))
- (d) The Contractor is responsible for notifying subcontractors of NCDOT’s External Discrimination Complaints Process.
1. Applicability
Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.
 2. Eligibility
Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.
 3. Time Limits and Filing Options
Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:
 - (i) The date of the alleged act of discrimination; or
 - (ii) The date when the person(s) became aware of the alleged discrimination; or
 - (iii) 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 related discrimination complaints may be submitted to the following entities:
 - North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
 - Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
 - 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

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 Civil Rights 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 (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

**TABLE 103-1
COMPLAINT BASIS**

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	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; 49 U.S.C. 5332(b); 49 U.S.C. 47123. (<i>Executive Order 13166</i>)
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin (<i>Limited English Proficiency</i>)	Place of birth. Citizenship is not a factor. (<i>Discrimination based on language or a person's accent is also covered</i>)	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. <i>Note:</i> Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990

Religion (in the context of employment) <i>(Religion/ Creed in all aspects of any aviation or transit-related construction)</i>	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. Note: Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. <i>(49 U.S.C. 5332(b); 49 U.S.C. 47123)</i>
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(3) 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:

- (a) 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.
- (b) 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);
- (c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- (d) 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;
- (e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- (f) 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);
- (g) 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);
- (h) 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;
- (i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- (j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination 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;

- (k) 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);
 - (l) 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).
 - (m) 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).
- (4) **Additional Title VI Assurances**
- **The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*
- (a) **Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)**
The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:
 - (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. *
3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non- discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. *
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

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 for 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 AreasArea 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 FemaleParticipation in Each Trade

(Statewide) 6.9%

FHWA-1273 -- Revised July 5, 2022

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Non-segregated 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. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

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, United States Code, as required in 23 CFR 633.102(b) (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). 23 CFR 633.102(e).

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. 23 CFR 633.102(e).

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) in accordance with 23 CFR 633.102. 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 solicitation-for-bids or request-for-proposals 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). 23 CFR 633.102(b).

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. 23 CFR 633.102(d).

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. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A 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 Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), 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 Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), 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 Part 230, Subpart A, 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 (*see* 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 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 Part 35 and 29 CFR Part 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. 23 CFR 230.409 (g)(4) & (5).

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, sexual orientation, gender identity, 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 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 or other knowledgeable company official.

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, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure 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. 23 CFR 230.409. 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, sexual orientation, gender identity, 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, sexual orientation, gender identity, 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 thereunder. 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, sexual orientation, gender identity, 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, 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. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient 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 recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

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.

a. 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 more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, 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, sexual orientation, gender identity, 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), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

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 (29 CFR 5.5)

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, 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 Administrator for determination. The 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 (29 CFR 5.5)

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 during 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 (29 CFR 5.5)

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. 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 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), 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 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 18 U.S.C. 1001 and 31 U.S.C. 231.

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 (29 CFR 5.5)

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. 23 CFR 230.111(e)(2). 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 as provided in 29 CFR 5.5.

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 as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, 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 (29 CFR 5.5)

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

Pursuant to 29 CFR 5.5(b), 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. 29 CFR 5.5.

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 currently provided in 29 CFR 5.5(b)(2)* 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. 29 CFR 5.5.

* \$27 as of January 23, 2019 (See 84 FR 213-01, 218) as may be adjusted annually by the Department of Labor; pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990).

3. Withholding for unpaid wages and liquidated damages.

The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 of this section. 29 CFR 5.5.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 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. 29 CFR 5.5.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

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" in paragraph 1 of Section VI 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: (based on longstanding interpretation)

- (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. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), 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. Pursuant to 23 CFR 635.116(c), 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. (based on longstanding interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

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 Part 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. 23 CFR 635.108.

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 Part 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). 29 CFR 1926.10.

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 Part 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 11, 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 (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.326.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders

or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.326.

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. 2 CFR 180.220 and 1200.220.

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. 2 CFR 180.320.

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. 2 CFR 180.325.

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. 2 CFR 180.345 and 180.350.

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, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient 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 recipient or subrecipient 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. 2 CFR 180.330.

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. 2 CFR 180.220 and 180.300.

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. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. 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 System for Award Management website (<https://www.sam.gov/>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

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 CFR 180.335;

(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, 2 CFR 180.800;

(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, 2 CFR 180.700 and 180.800; 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. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

3. 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). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant 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. 2 CFR 180.365.

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, Subpart I, 180.900 – 180.1020, 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 recipient or subrecipient of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers to 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. 2 CFR 1200.220 and 1200.332.

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. 2 CFR 180.220 and 1200.220.

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 System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

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. 2 CFR 180.325.

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:

(a) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(b) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(c) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

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.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor 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. 46 CFR 381.7.
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 Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT
HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS
ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)**
This provision is applicable to all Federal-aid projects funded
under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

STANDARD SPECIAL PROVISION**ON-THE-JOB TRAINING**

(10-16-07) (Rev. 4-21-15)

Z-10

Description

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

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

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

Minorities and Women

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

Assigning Training Goals

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

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC20220088 02/25/2022 NC88

Z-088

Date: February 25, 2022

General Decision Number: NC20220088 02/25/2022 NC88

Superseded General Decision Numbers: NC20210088

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: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<p>Executive Order 14026 generally applies to the contract.</p> <p>The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.</p>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<p>Executive Order 13658 generally applies to the contract.</p> <p>The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.</p>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Modification Number

0

1

Publication Date

01/07/2022

02/25/2022

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 **	
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 **	

	Rates	Fringes
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 26,001 Lbs or Greater	13.57 **	.03

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

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <http://www.dol.gov/agencies/whd/government-contracts>.

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 National Office because National Office has responsibility for the David-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**

MICROPILES (SPECIAL)	GT-1.1 - GT-1.9
GEOTEXTILE FOR PAVEMENT STABILIZATION - (5/15/2018)	GT-2.1 - GT-2.2
GEOTEXTILE FOR EMBANKMENT STABILIZATION (SPECIAL)	GT-3.1 - GT-3.2
MECHANICALLY STABILIZED EARTH RETAINING WALLS - (10/19/2021)	GT-4.1 - GT-4.12
SOIL NAIL RETAINING WALLS (LRFD) (10/19/2021)	GT-5.1 - GT-5.12
STANDARD SHORING (10/19/2021)	GT-6.1 - GT-6.4
TEMPORARY SOIL NAIL WALLS (10/19/2021)	GT-7.1 - GT-7.9

DocuSigned by:
Geotechnical Engineering Unit
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MICROPILES**(SPECIAL)****1.0 GENERAL**

A micropile is a small diameter, drilled and grouted non-displacement pile with a reinforcing casing and typically a center reinforcing bar. Load testing is required when noted in the plans. Design and construct micropiles with the required resistance in accordance with the contract and accepted submittals. Use a prequalified Micropile Contractor for micropile work. Define “pile” as a micropile, “casing” as reinforcing casing and “bar” as a center reinforcing bar.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Portland Cement	1024-1
Water	1024-4

Use neat cement grout that only contains cement and water with a water cement ratio of 0.4 to 0.5 which is approximately 5.5 gallons of water per 94 lb of Portland cement. Provide grout with a compressive strength at 3 and 28 days of at least 1,500 psi and 4,000 psi, respectively.

A. Reinforcement

Provide Type 1 material certifications in accordance with Article 106-3 of the *Standard Specifications* for steel casings and bars. Store casings and bars 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 micropile materials so materials are kept clean and free of damage.

1. Reinforcing Casings

Use steel pipes that meet American Petroleum Institute (API) 5CT, Grade N80 or ASTM A252 with a yield strength of 80 ksi for reinforcing casings. Provide prime mill certified steel pipes that meet Subarticle 106-1(B) of the *Standard Specifications* for casings. Do not use “New or Mill Secondary”, “Structural” or “Limited Service” steel pipes as described by the *National Association of Steel Pipe Distributors Tubular Products Manual*. Use casings with the nominal wall thickness shown in the plans and outside diameters ranging from the minimum shown in the plans to 3" larger.

2. Center Reinforcing Bars

Use deformed steel bars that meet AASHTO M 275 or M 31, Grade 60 or 75 for center reinforcing bars. Splice bars in accordance with Article 1070-9 of the *Standard Specifications*. Locate casing joints at least 2 ft from bar splices.

B. Centralizers

Use bar centralizers that meet Article 6.3.5 of the *AASHTO LRFD Bridge Construction Specifications*. Size centralizers to position bars within 1" of drill hole centers and allow tremies to be inserted to bottom of holes. Use centralizers that do not interfere with grout placement or flow around bars.

C. Corrosion Protection

Provide epoxy coated bars that meet Article 1070-7 of the *Standard Specifications*. Galvanize exposed casings in accordance with Section 1076 of the *Standard Specifications*. After installing piles, clean exposed galvanized surfaces of casings with a 2,500 psi pressure washer. Apply organic zinc repair paint to exposed casing joints and repair damaged galvanized surfaces that are exposed in accordance with Article 1076-7 of the *Standard Specifications*.

3.0 PRECONSTRUCTION REQUIREMENTS

A. Micropile Designs

For micropile designs, submit PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Do not begin micropile construction until a design submittal is accepted.

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

The pile layout and inclination, casing dimensions and tip elevations, pile to cap/footing connection, top of pile elevations and pile resistances are shown in the plans. Verify existing site conditions and survey information before designing piles.

Design piles in accordance with the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Define "bond length" as the pile length below the casing tip elevation noted in the plans. Determine the bond length and reinforcement for the factored resistance noted in the plans. Assume a design casing wall thickness of 12.5% less than nominal plus an additional 0.125" less due to corrosion. A bond length of at least 10 ft is required for each pile. If verification load testing is required, use a resistance factor of 0.70 for axial compression and uplift resistance. Otherwise, use a resistance factor of 0.55. When using tension load tests to determine nominal grout-to-ground bond resistances for axial compression resistance, neglect pile tip resistance.

Either extend casings below required tip elevations or use bars for reinforcement. Extend bars or casings full length of piles and provide at least 0.50" of grout cover outside casings. Design and locate casing joints as shown in the plans.

Submit working drawings and design calculations including estimated unit nominal resistances for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing all micropile details including any dimensions, quantities, elevations and cross-sections necessary to construct the piles.

B. Micropile Construction Plan

Submit a PDF file of a micropile construction plan at least 30 days before the preconstruction meeting. Do not begin micropile construction until the construction plan submittal is accepted. Provide detailed project specific information in the micropile construction plan that includes the following:

1. List and sizes of proposed equipment including micropile drilling rigs and tools, tremies and grouting equipment;
2. Sequence of pile construction and step-by-step description of pile installation including details of casing installation, drilling methods and flushing;
3. List of reinforcement including grades or yield strength and sizes;
4. Methods for placing reinforcement with procedures for supporting and positioning the reinforcement including centralizers;
5. Procedures for placing grout including how the grout will be initially placed in drill holes and acceptable ranges for grout pressures and volumes;
6. Equipment and procedures for monitoring and recording grout levels, pressures and volumes with calibration certificates dated within 90 days of the submittal date;
7. Examples of construction records to be provided that meet Section 4.0(C) of this provision;
8. Procedures for containment and disposal of drilling spoils, drill flush and waste grout;
9. Grout mix design with acceptable ranges for grout flow and density;
10. If load testing is required, load testing details, procedures and plan sealed by the Design Engineer or Project Engineer for the Load Test Supplier with calibration certificates dated within 90 days of the submittal date;
11. Load Test Supplier, when applicable, including Project Engineer; and
12. Other information shown in the plans or requested by the Engineer.

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

C. Demonstration Micropiles

When shown in the plans or as directed, construct demonstration piles in accordance with the accepted submittals and this provision. The pile inclination, minimum reinforcement and locations of demonstration piles are shown in the plans. Install demonstration piles to the depth of the longest pile on the project or the length required for verification load tests.

The purpose of demonstration piles is to demonstrate the Micropile Contractor's ability to successfully install micropiles. The demonstration pile results will be used to evaluate the grouting operation and possibly revise acceptable grouting ranges established with the micropile construction plan. If load testing is required for a demonstration pile, the results will be used to evaluate the pile design including estimated unit nominal resistances.

If the Engineer determines a demonstration pile is unsatisfactory, a replacement pile is required. Do not begin construction of any production piles until all demonstration piles are accepted.

D. Preconstruction Meeting

Before starting micropile construction, hold a preconstruction meeting to discuss the construction, monitoring and testing of the piles. If this meeting occurs before all pile submittals have been accepted, additional preconstruction meetings may be required before beginning pile construction without accepted submittals. The Resident or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Micropile Contractor Superintendent will attend preconstruction meetings.

4.0 CONSTRUCTION METHODS

Use equipment and methods accepted in the micropile construction plan or approved by the Engineer. Inform the Engineer of any deviations from the accepted plan. Install production piles in the same way as satisfactory demonstration piles, if applicable.

Dispose of drilling spoils, drill flush 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 drill holes.

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

A. Drilling and Reinforcement

Use micropile drilling rigs capable of drilling through whatever materials are encountered to the dimensions and elevations required for the pile design. Install piles with tip elevations no higher than shown in the accepted submittals or approved by the Engineer.

Do not install casings or begin drilling within 6 pile diameters, center to center, or 5 ft, whichever is greater, of completed piles until grout in piles reaches initial set. More clearance may be necessary if pile construction affects adjacent piles.

Install casings to a tip elevation no higher than that noted in the plans. Also, when noted in the plans, install casings with a penetration of at least 5 ft into rock as determined by the Engineer. Locate casing joints in accordance with the accepted submittals. If any welding is required for casings, comply with Article 33.3.6 of the *AASHTO LRFD Bridge Construction Specifications*. Submit welding procedures for approval before welding casings.

Use drilling methods that result in the annulus between casings and the ground filled with grout. Check for correct pile location and plumbness or proper inclination before beginning drilling. Stabilize drill holes with casings from beginning of drilling through grouting if unstable material is anticipated or encountered. After drilling, flush drill holes with water or air to remove drill cuttings and other loose materials.

Use centralizers to center bars in drill holes. Securely attach bar centralizers at maximum 10 ft intervals along bars. Attach upper and lowermost centralizers 5 ft from the top and bottom of piles.

Place bars before grouting or after while grout is still fluid. Do not vibrate or drive reinforcement. Bars may be gently pushed into grout. If bars can only be partially inserted, redrill or clean drill holes to permit complete insertion.

B. Grouting

Remove oil, rust inhibitors, residual drilling fluids and similar foreign materials from holding tanks/hoppers, stirring devices, pumps, lines, tremie pipes and all other equipment in contact with grout before use. Size grouting equipment to grout each pile in one continuous operation. Field calibrate grout pumps at the beginning of construction.

Mix and place grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. 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/API Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

Grout piles the same day the bond length is drilled and do not leave drill holes open overnight. Place grout with a tremie in accordance with the contract and accepted submittals until uncontaminated grout flows from the top of the pile. Extend tremie pipe into grout at least 5 ft at all times except when grout is initially placed in drill holes. Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing).

Monitor and record grout levels, pressures and volumes during placement. To monitor grout pressure, use pumps equipped with a pressure gauge and locate a second pressure gauge at the point of injection into the drill hole. Use pressure gauges that can measure pressures of at least 150 psi or twice the actual grout pressures, whichever is greater.

C. Construction Records

Provide 2 copies of pile construction records within 24 hours of completing each pile. Include the following in construction records:

1. Names of Micropile Contractor, Superintendent, Drill Rig Operator, Project Manager and Design Engineer;
2. Bridge description, county, Department's contract, TIP and WBS element number;
3. Bent station and number, pile location and identifier and required resistance;
4. Pile diameters, length and tip elevation and top of pile and ground surface elevations;
5. Reinforcement types, grades or yield strength, sizes and elevations;
6. Date and time drilling begins and ends, reinforcement is placed, grout is mixed and arrives on-site and grout placement begins and ends;
7. Grout level, pressure, volume, temperature, flow and density records;
8. Ground and surface water conditions and elevations;
9. Weather conditions including air temperature at time of grout placement; and
10. All other pertinent details related to pile construction.

After completing piles for each structure or stage of a structure, provide a PDF file of all corresponding construction records.

5.0 LOAD TESTING

When noted in the plans, load test piles in accordance with the accepted submittals, this provision and the plans. The piles to be tested are shown in the plans or as directed. "Verification tests" are performed on demonstration piles and "proof tests" are performed on piles incorporated into the structure, i.e., production piles based on test piles acceptable in accordance with Section 6.0 of this provision.

When using a Load Test Supplier, use a prequalified Load Test Supplier for foundation testing work. Provide load test reports sealed by an engineer approved as a Project Engineer (key person) for the Load Test Supplier.

Do not load test piles until grout attains the required 28 day compressive strength. Do not begin construction of any production piles until verification tests are satisfactorily completed. For proof tests, install only the test piles and those piles needed to anchor the reaction frame, if applicable. Do not install the remaining piles for the bent until the corresponding test piles are satisfactory.

Design test piles so that applied loads do not exceed 80% of the pile's structural resistance including steel yielding or buckling or grout failing. It may be necessary to design test piles with additional reinforcement to allow for higher applied loads. Use a center reinforcing bar for tension load tests when the reinforcement design for production piles does not include one.

If reinforcement design for production piles does not include a center reinforcing bar, tension load tests are required. Otherwise, test piles in either compression or tension at the Contractor's option.

Do not apply loads with known weights; a reaction frame and a hydraulic jack are required. Use reaction piles or cribbing and a frame with sufficient strength to prevent excessive deformation, misalignment or racking under peak loading. Do not use existing structures as part of the reaction frame.

Load test piles in accordance with the accepted submittals and Article 33.5 of the *AASHTO LRFD Bridge Construction Specifications*. For demonstration piles, cut off piles 2 ft below the ground surface when testing is complete.

Submit a PDF file of each load test report within 7 days of completing load testing. Submit reports sealed by the same engineer that sealed the load testing details, procedures and plan in the accepted micropile construction plan. Provide load test reports that meet ASTM D1143, D3689 or the Load Test Supplier's recommendations. Also, include load versus movement curves for the top of pile and pile tip.

6.0 MICROPILE ACCEPTANCE

The Engineer will review the load test reports, if applicable and construction records to determine if piles are acceptable. Micropile acceptance is based in part on the following criteria.

1. Grout pressures, volumes, flow and densities are within acceptable ranges. Grout is properly placed and does not have any evidence of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing).
2. Pile is within maximum tolerances per Article 33.4.4 of the *AASHTO LRFD Bridge Construction Specifications*.

3. Reinforcement is properly placed and inclination and top of reinforcement is within tolerances for the pile. Tip of casing is no higher than that noted in the plans and casing penetrates rock at least 5 ft when noted in the plans.
4. Pile is satisfactory based on results of load testing, when applicable. Creep and failure acceptance criteria for verification and proof tests is per Articles 33.5.2 and 33.5.3, respectively, of the AASHTO LRFD specifications. Movement acceptance criteria for verification and proof tests is per Articles 33.5.2 and 33.5.3, respectively, of the AASHTO LRFD specifications when the permissible total vertical movement at top of pile is noted in the plans.

If the Engineer determines a pile is unacceptable, remedial measures or replacement piles are required. Do not begin remediation work until remediation plans are approved. No extension of completion date or time will be allowed for remedial work or replacement piles.

7.0 MEASUREMENT AND PAYMENT

11.75" Dia. Micropiles will be measured and paid in units of each. Micropiles will be measured as the number of acceptable piles and no payment will be made for any costs associated with unacceptable micropiles. The contract unit price for *11.75" Dia. Micropiles* will be full compensation for submittals, design, monitoring and recording, labor, tools, equipment and reinforcement complete and in place and all incidentals necessary to drill through any material and construct piles in accordance with this provision. The contract unit price for *11.75" Dia. Micropiles* will be full compensation for grout up to twice the theoretical drill hole volume. Grout in excess of twice the theoretical drill hole volume will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*.

Demonstration Micropiles will be measured and paid in units of each. *Demonstration Micropiles* will be measured as the number of satisfactory demonstration piles and no payment will be made for any costs associated with unsatisfactory demonstration piles. The contract unit price for *Demonstration Micropiles* will be full compensation for submittals, design, monitoring and recording, labor, tools, equipment and reinforcement complete and in place and all incidentals necessary to drill through any material and construct demonstration piles in accordance with this provision. The contract unit price for *Demonstration Micropiles* will be full compensation for grout up to twice the theoretical drill hole volume. Grout in excess of twice the theoretical drill hole volume will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*.

Micropile Verification Tests and *Micropile Proof Tests* will be measured and paid in units of each, depending on the type of test. Load tests will be measured as the number of initial tests shown in the plans or required by the Engineer. No payment will be made for subsequent load tests performed on the same or replacement piles. The contract unit prices for *Micropile Verification Tests* and *Micropile Proof Tests* will be full compensation for load testing in accordance with Section 5.0 of this provision.

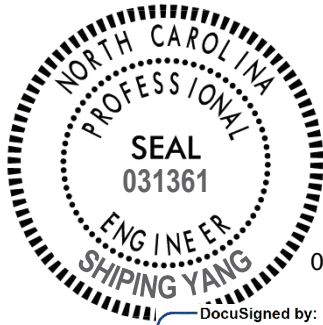
Payment will be made under:

Pay Item

11.75" Dia. Micropiles
Demonstration Micropiles
Micropile Verification Tests
Micropile Proof Tests

Pay Unit

Each
Each
Each
Each



06/27/2022

DocuSigned by:

Shiping Yang

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Shiping Yang, Ph.D., P.E.
Engineer, III

GEOTEXTILE FOR PAVEMENT STABILIZATION:**(5-15-18)****Description**

Supply and install geotextile for pavement stabilization in accordance with the contract. Geotextile for pavement stabilization may be required above chemically stabilized subgrades or below Class IV subgrade stabilization to prevent pavement cracking at locations shown in the plans and as directed. Define “subbase” as the portion of the roadbed below the Class IV subgrade stabilization.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextiles	1056
Select Material, Class IV	1016

Use Class IV select material for Class IV subgrade stabilization. Provide Type 5 geotextile for geotextile for pavement stabilization that meets the following tensile strength requirements in the machine direction (MD) and cross-machine direction (CD):

GEOTEXTILE FOR PAVEMENT STABILIZATION REQUIREMENTS		
Tensile Strength	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

A. MD, CD and MARV per Article 1056-3 of the *Standard Specifications*.

Construction Methods

Geotextile for pavement stabilization may be required at locations shown in the plans and other locations as directed. For locations with ABC on chemically stabilized subgrades, use of geotextile for pavement stabilization will be based on sampling and testing for chemical stabilization. For all other locations, notify the Engineer when the embankment is completed to within 2 ft of subgrade elevation and allow 3 days for the Engineer to determine if geotextile for pavement stabilization is required.

Before placing geotextile for pavement stabilization below Class IV subgrade stabilization, proof roll subbases in accordance with Section 260 of the *Standard Specifications*. Place geotextile for pavement stabilization above chemically stabilized subgrades or below Class IV subgrade stabilization as shown in the plans. Pull geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Install geotextile for pavement stabilization perpendicular to the survey or lane line in the MD and adjacent to each other in the CD as shown in the plans. Continuous geotextiles are required in the MD, i.e., do not splice or overlap geotextiles so seams are parallel to the survey or lane line. Completely cover stabilized subgrades or subbases with geotextile for pavement stabilization. Overlapping geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that aggregate will be placed to prevent lifting the edge of the top geotextile. Hold geotextiles in place with wire staples or anchor pins as needed.

Do not damage geotextile for pavement stabilization when placing ABC or Class IV subgrade stabilization. Place and compact ABC in accordance with the contract and *Standard*

Specifications. Place, compact and maintain Class IV subgrade stabilization in accordance with Article 505-3 of the *Standard Specifications* for a Type 2 aggregate subgrade. Do not operate heavy equipment on geotextiles any more than necessary to construct base courses or subgrades. 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 or subbases as the square yards of exposed geotextiles installed before placing ABC or Class IV subgrade stabilization. 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 installing geotextiles, wire staples and anchor pins.

Class IV Subgrade Stabilization will be measured and paid in accordance with Article 505-4 of the *Standard Specifications*. No measurement will be made for any undercut excavation of fill materials from subbases.

Payment will be made under:

Pay Item

Geotextile for Pavement Stabilization

Pay Unit

Square Yard



DocuSigned by:

Scott A. Hidden

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06/14/2022

GEOTEXTILE FOR EMBANKMENT STABILIZATION**(SPECIAL)****Description:**

This work consists of furnishing and installing synthetic geotextile for stabilizing embankment in accordance with this provision or as directed by the Engineer. The work shall include maintaining the geotextile in the required configuration until completion and acceptance of overlying work items. The geotextile shall be placed at the locations shown in the plans or as directed by the Engineer.

Materials

Refer to the *Standard Specifications*.

Item	Section
Select Granular Materials	265
Geotextile, Type 5	1056

Use select granular material for embankment stabilization. Provide Type 5 geotextile for geotextile for embankment stabilization.

Construction methods:

The geotextile for embankment stabilization shall be placed at locations shown in the plans or as directed by the Engineer. The locations should be cleared and free of obstructions, debris and pockets. Stumps shall be cut smooth at the ground elevation with the root system left intact. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage.

The geotextile for embankment stabilization shall be placed with the machine directions as shown on the plans or as directed by the engineer. The machine direction is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextile in the machine direction so splices or overlaps are perpendicular to the toe of slope, unless shown otherwise in the plans. Geotextile shall be laid smooth and free from tension, stress fold, wrinkles or creases. All geotextile which is damaged as a result of installation will be required to be replaced or repaired at the discretion of the Engineer with no additional cost to the Department. Compaction equipment must be operated such that it will not damage the geotextile.

Any geotextile which is damaged as a result of installation or which is left uncovered for longer than one week after placement shall be replaced at no additional cost to the Department.

Method of measurement

The quantity of geotextile to be paid for will be the number of square yards of “Geotextile for Embankment Stabilization” measured along the surface of the ground which has been acceptably placed. No separate measurement will be made of overlapping geotextile.

Select Granular Material will be measured and paid in accordance with Article 265 of the Standard Specifications.

Basis of payment:

The quantity of geotextile, measured as provided above, will be paid for at the contract unit price per square yard for “Geotextile for Embankment Stabilization”. Such price and payment will be full compensation for furnishing, hauling, placing, seaming, compaction, and all incidentals necessary to complete the work.


Pay Item

Pay Unit

Geotextile for Embankment Stabilization, Type 5
Select Granular Material

Square Yard
Cubic Yard



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MECHANICALLY STABILIZED EARTH RETAINING WALLS**(10-19-21)****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 and pile sleeves 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 MSE wall terms as follows:

Geosynthetic Reinforcement – Polyester Type (PET), HDPE or Polypropylene (PP) geosynthetic grids, i.e., geogrid reinforcement or polymer straps, i.e., geostrip reinforcement,

Geogrid – PET, HDPE or PP geogrid,

Reinforcement – Steel or geosynthetic reinforcement,

Aggregate – Coarse or fine aggregate,

Panel – Precast concrete panel,

Coping – Precast or CIP concrete coping,

Design Height (H) – Wall height + wall embedment as shown in the plans,

MSE Wall – Mechanically stabilized earth retaining wall,

MSE Wall Vendor – Vendor supplying the chosen MSE wall system,

MSE Panel Wall – MSE wall with panels,

MSE Segmental Wall – MSE wall with segmental retaining wall (SRW) units and

Abutment Wall – 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).

For bridge approach fills behind end bents with MSE abutment walls, design reinforcement connected to end bent caps in accordance with the plans and this provision. Construct Type III Reinforced Bridge Approach Fills in accordance with the *Bridge Approach Fills* provision and Roadway Detail Drawing No. 422D10.

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 MSE 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
Asphalt Concrete Base Course, Type B25.0C	620
Corrugated Steel Pipe	1032-3
Epoxy, Type 3A	1081
Geosynthetics	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
Select Material, Class V	1016
Shoulder Drain Materials	816-2
Steel Pipe	1036-4(A)

Use galvanized corrugated steel pipe with a zinc coating weight of 2 oz/sf (G200) for pile sleeves. Provide Type 2 geotextile for filtration and separation geotextiles. Use Class A concrete for CIP coping, leveling concrete and pads. Use galvanized steel pipe, threaded rods and nuts for the PET geogrid reinforcement vertical obstruction detail. Provide galvanized Grade 36 anchor rods and Grade A hex nuts that meet AASHTO M 314 for threaded rods and nuts.

Use panels and SRW units from producers approved by the Department and licensed by the MSE Wall Vendor. Provide steel strip connectors embedded in panels fabricated from structural steel that meets the requirements for steel strip reinforcement. 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 and 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 chemical properties that meet the following requirements:

AGGREGATE pH REQUIREMENTS		
Aggregate Type (in reinforced zone)	Reinforcement or Connector Material	pH
Coarse or Fine	Steel	5 – 10
Coarse or Fine	Geosynthetic	4.5 – 9

AGGREGATE ELECTROCHEMICAL REQUIREMENTS (Steel Reinforcement/Connector Materials Only)			
Aggregate Type (in reinforced zone)	Resistivity	Chlorides	Sulfates
Coarse	$\geq 5,000 \Omega \cdot \text{cm}$	$\leq 100 \text{ ppm}$	$\leq 200 \text{ ppm}$
Fine	$\geq 3,000 \Omega \cdot \text{cm}$		

Use aggregate from sources participating in the Department's Aggregate QC/QA Program as described in Section 1006 of the *Standard Specifications*. Sample and test aggregate in accordance with the *Mechanically Stabilized Earth Wall Aggregate Sampling and Testing Procedures*.

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 steel strip reinforcement ("straps") that meet ASTM A572, A1011 or A463. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip reinforcement. Galvanize steel reinforcement in accordance with Section 1076 of the *Standard Specifications* or provide aluminized steel strip reinforcement that meet ASTM A463, Type 2-100.

2. Geosynthetic Reinforcement

Provide Type 1 material certifications and identify geosynthetic reinforcement in accordance with Article 1056-3 of the *Standard Specifications*. Define machine direction (MD) and cross-machine direction (CD) for geogrids per Article 1056-3 of the *Standard Specifications*.

Use HDPE or PP geogrid for geogrid reinforcement cast into backwalls of end bent caps. Use PET or HDPE geogrid for geogrid reinforcement connected directly to SRW units and only HDPE geogrid for geogrid reinforcement cast into panels.

Provide extruded geogrids produced in the United States and manufactured from punched and drawn polypropylene sheets for PP geogrids that meet the following:

PP GEOGRID REQUIREMENTS		
Property	Requirement¹	Test Method
Aperture Dimensions ²	1" x 1.2"	N/A
Minimum Rib Thickness ²	0.07" x 0.07"	N/A
Tensile Strength @ 2% Strain ²	580 lb/ft x 690 lb/ft	ASTM D6637, Method B
Tensile Strength @ 5% Strain ²	1,200 lb/ft x 1,370 lb/ft	
Ultimate Tensile Strength ²	1,850 lb/ft x 2,050 lb/ft	
Junction Efficiency ³ (MD)	93%	ASTM D7737
Flexural Rigidity ⁴	2,000,000 mg-cm	ASTM D7748
Aperture Stability Modulus ⁵	0.55 lb-ft/degrees	ASTM D7864
UV Stability (Retained Strength)	100% (after 500 hr of exposure)	ASTM D4355

1. MARV per Article 1056-3 of the *Standard Specifications* except dimensions and thickness are nominal.
2. Requirement for MD x CD.
3. Junction Efficiency (%) = (Average Junction Strength ($X_{j_{ave}}$) / Ultimate Tensile Strength in the MD from ASTM D6637, Method A) \times 100.
4. Test specimens two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and sufficiently long to enable measurement of the overhang dimension.
5. Applied moment of 17.7 lb-inch (torque increment).

C. Bearing Pads

For MSE panel walls, use preformed ethylene propylene diene monomer rubber bearing pads that meet ASTM D2000 Grade 2, Type A, Class A with a durometer hardness of 60 or 80 \pm 5. 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. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip panel anchors and connectors. 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 PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Segmental Wall Design Consultant to design MSE segmental walls. Provide MSE segmental wall designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Segmental Wall Design Consultant. Provide MSE panel wall designs sealed by a Design Engineer licensed in the state of North Carolina and employed or contracted by the MSE Wall Vendor.

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. For abutment walls only, design MSE walls for seismic if wall sites meet either or both of the following:

- Wall site is in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*,
- Wall site is classified as AASHTO Site Class E, as noted in the plans, and is in or west of Pender, Duplin, Wayne, Johnston, Wake, Durham or Person County.

Connect reinforcement to panels or SRW units with methods or devices approved for the chosen system. Use a uniform reinforcement length throughout the height of the

wall of at least 0.7H 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. If an MSE wall system with geosynthetic reinforcement includes any steel parts for obstructions, bin walls, connections or other components, design steel exposed to aggregate for the design life noted in the plans and aggregate type in the reinforced zone. Use "loss of galvanizing" metal loss rates for nonaggressive backfill in accordance with the AASHTO LRFD specifications for galvanized and aluminized steel and metal loss rates for carbon steel in accordance with the following:

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

For PET or HDPE geogrid and geostrip reinforcement and geosynthetic connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone. For geogrid reinforcement connected to end bent caps, embed reinforcement or connectors in caps as shown in the plans. For PP geogrid reinforcement connected to end bent caps, use the following design parameters for the aggregate type in the reinforced approach fill.

PP GEOGRID REINFORCEMENT DESIGN PARAMETERS				
Aggregate Type (in reinforced zone)	T_{al} (MD)	F*	α	ρ
Coarse	400 lb/ft	0.70	0.8	32.0°
Fine	428 lb/ft	0.54	0.8	28.35°

Where,

T_{al} = long-term design strength (LTDS),
 F* = pullout resistance factor,
 α = scale effect correction factor and
 ρ = soil-geogrid friction angle.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 psf 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 *FHWA Design and Construction of Mechanically Stabilized Earth Walls and*

Reinforced Soil Slopes – Volume I (Publication No. FHWA-NHI-10-024) 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.

When shown in the plans for abutment walls, use pile sleeves to segregate piles from aggregate in the reinforced zone. 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. Design reinforcement for obstructions and locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations. Modify PET geogrid reinforcement for obstructions as shown in the plans.

Use 6" thick CIP 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:

WALL 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. H is the maximum design height per wall.

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 Roadway Standard Drawing No. 816.02.

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 Height of Wall 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 sections. 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. When placing pavement sections directly on the reinforced zone, cap aggregate with 4" of asphalt concrete base course. 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 CIP concrete for MSE panel walls unless CIP coping is required as shown in the plans,
3. CIP concrete coping for MSE segmental walls and
4. At the Contractor's option and when shown in the plans, CIP 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 CIP 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, pile sleeves, 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, curved MSE walls with tight (short) radii 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 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, Area 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, an MSE Wall Vendor representative is required 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 and if required, pile sleeves 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 CIP 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. Before placing aggregate, pull geosynthetic reinforcement taut so it is in tension and 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*. If pile sleeves are required, fill sleeves with loose uncompacted sand before constructing end bent caps.

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 CIP concrete coping in accordance with Subarticle 452-4(B) 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. If the gap between a single faced barrier and wall face is wider than 2", fill gap with Class V select material (standard size No. 78M stone). Otherwise, fill gap with backer rod and seal joint between barrier and MSE wall with silicone sealant.

When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold 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, hauling and removing excavated materials, placing and compacting aggregate and backfill material and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, aggregate concrete base course, 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 and connector design for reinforcement connected to end

bent caps, wall modifications for obstructions, pile sleeves filled with sand, joints sealed with silicone sealant and gaps between barriers and MSE walls filled with backer rod or No. 78M stone, 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. The contract unit price for *MSE Retaining Wall No. ____* also does not include the cost for constructing bridge approach fills behind end bents with MSE abutment walls. See *Bridge Approach Fills* provision for measurement and payment of Type III Reinforced Bridge Approach Fills.

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



DocuSigned by:

Scott A. Hidden

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06/14/2022

SOIL NAIL RETAINING WALLS**(10-19-21)****1.0 GENERAL**

Construct soil nail retaining walls consisting of soil nails spaced at a regular pattern and connected to a CIP reinforced concrete face. A soil nail consists of a solid 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 CIP reinforced concrete face. An abutment wall is defined as a soil nail wall with nails that extend under a bridge end bent or a soil nail wall connected to an abutment wall. Even if only one nail extends under a bridge end bent, the entire soil nail wall is considered an abutment wall.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Geosynthetics	1056
Joint Materials	1028
Masonry	1040
Portland Cement	1024-1
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
Water	1024-4
Welded Stud Shear Connectors	1072-6

Provide Class VI select material (standard size No. 57 stone) for leveling pads. Use neat cement grout that only contains cement and water with a water cement ratio of 0.4 to 0.5 which is approximately 5.5 gallons of water per 94 lb of Portland cement. Provide grout with a compressive strength at 3 and 28 days of at least 1,500 psi and 4,000 psi, respectively.

Provide soil nails consisting of grouted steel bars and nail head assemblies. Use deformed solid steel bars that meet AASHTO M 275 or M 31, Grade 60, 75 or 80. 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*. Provide Class A corrosion protection (encapsulated bar) or Class B corrosion protection (epoxy coated bar only, no galvanized bar) for soil nails in accordance with Article 34.3.3 of the *AASHTO LRFD Bridge Construction Specifications*. Use centralizers that meet Article

34.3.4 of the AASHTO LRFD specifications.

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 PDF files of working drawings and design calculations 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 the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. For abutment walls only, design soil nail walls for seismic if wall sites meet either or both of the following:

- Wall site is in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*,
- Wall site is classified as AASHTO Site Class E, as noted in the plans, and is in or west of Pender, Duplin, Wayne, Johnston, Wake, Durham or Person County.

Design soil nails that meet the following unless otherwise approved:

1. Horizontal and vertical spacing of at least 3 ft,

2. Inclination of at least 12° below horizontal,
3. Clearance between ends of bars and drill holes of at least 6",
4. Grout cover between epoxy coated bars and drill hole walls of at least 1" or in accordance with Article 11.12.8 of the AASHTO LRFD specifications for encapsulated bars 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 psf. For steel beam guardrail with 8 ft posts above soil nail walls, analyze facing and top row of nails for a nominal horizontal load (P_{H1}) of 300 lb/ft of wall in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications. For concrete barrier rail above soil nail walls, analyze facing and top row of nails for a nominal P_{H1} of 500 lb/ft of wall in accordance with Figure 3.11.6.3-2(a).

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

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.

Design shotcrete and concrete facing in accordance with the plans and Article 11.12.6.2 of the *AASHTO LRFD Bridge Design Specifications*. Use shotcrete and 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. Include analysis

of temporary conditions in design calculations. At least one analysis is required for each wall section with different nail lengths. Analyze internal and compound stability with a computer software program that uses limit equilibrium methods and submit all PDF output files from the program with the design calculations. See Article C11.12.2 of the AASHTO LRFD specifications for determining the maximum soil nail force, $T_{\max sn}$. Once $T_{\max sn}$ and pullout length behind slip surface, L_P , are determined from limit equilibrium methods at the target soil failure resistance factor (1 over factor of safety output from computer software), use these values for soil nail (pullout and tensile resistance) and wall facing (flexure, punching shear and headed-stud tensile resistance) design in accordance with Articles 11.12.5.2, 11.12.6.1 and 11.12.6.2 of the AASHTO LRFD specifications.

When designing soil nail walls with computer software Snail manufactured by the California Department of Transportation (CALTRANS), use Snail, version 2.2.0 or later, to calculate factors of safety and $T_{\max sn}$ and L_P values in accordance with the following:

1. Allowable Stress Design for Analysis Method with no load factors applied except those applied to factored surcharge loads from structures or traffic,
2. Perform Below Toe Search option selected when any soil layer has a friction angle less than 30° and
3. Default value of 0.33 for Interface Friction Reduction Factor.

When designing soil nail walls with computer software other than Snail, use bi-linear (or tri-linear, as applicable) search surfaces intended to reproduce Snail results. Factors of safety and $T_{\max sn}$ and L_P values are acceptable if they are within 5% of the factors of safety and $T_{\max sn}$ and L_P values calculated by the Engineer using the computer software Slide2 manufactured by Rocscience, Inc.

C. Soil Nail Wall Construction Plan

Submit a PDF file 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 records to be provided that meet Section 4.0(F) and test nail records to be used in accordance with Section 5.0(D) of this provision;
8. Grout mix design with acceptable ranges for grout flow and density;
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, Area 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. Rocky ground such as colluvium, boulder fills and weathered rock may be difficult to excavate without leaving voids.

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

Mix and place grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. 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 sheet drains with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, sheet drains may be placed after shotcreting over weep holes through the shotcrete. Hold sheet drains in place with anchor pins so drains are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous sheet drains are not allowed. If splices are needed, overlap sheet drains at least 12" so flow is not impeded. Connect sheet drains to aggregate leveling pads by embedding drain 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 in accordance with Subarticle 453-4 of the *Standard Specifications*. 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 file 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 may be 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. Nail Tests

Install verification test nails with the same equipment, installation methods and drill hole diameter and inclination as production nails. Test verification and proof test nails in accordance with the accepted submittals and Articles 34.5.5.2 and 34.5.5.3, respectively of the *AASHTO LRFD Bridge Construction Specifications* except correct Eq. 34.5.5.2-2 to $VTL = L_{BVT} \times r_{po}$ (kips/ft).

D. 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 acceptance criteria in Article 34.5.5.4 of the *AASHTO LRFD Bridge Construction Specifications*.

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 file 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, hauling and removing excavated materials, 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. 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.

Payment will be made under:

Pay Item

Soil Nail Retaining Walls
Soil Nail Verification Tests

Pay Unit

Square Foot
Each

U-2579AA

GT-5.12

Forsyth County

Soil Nail Proof Tests

Each



DocuSigned by:
Scott A. Hidden
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00/14/2022

STANDARD SHORING:**(10-19-21)****Description**

Standard shoring includes standard temporary shoring and standard temporary mechanically stabilized earth (MSE) walls. At the Contractor's option, use standard shoring as noted in the plans or as directed. When using standard shoring, a temporary shoring design submittal is not required. Construct standard shoring based on actual elevations and shoring dimensions in accordance with the contract and Geotechnical Standard Detail No. 1801.01 or 1801.02.

Define "standard temporary shoring" as cantilever shoring that meets the standard temporary shoring detail (Geotechnical Standard Detail No. 1801.01). Define "standard temporary wall" as a temporary MSE wall with geotextile or geogrid reinforcement that meets the standard temporary wall detail (Geotechnical Standard Detail No. 1801.02). Define "standard temporary geotextile wall" as a standard temporary wall with geotextile reinforcement and "standard temporary geogrid wall" as a standard temporary wall with geogrid reinforcement.

Provide positive protection for standard shoring at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to the *Standard Specifications*.

Item	Section
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Grout, Type 1	1003
Portland Cement Concrete, Class A	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3

Provide Type 6 material certifications for shoring materials. Use Class IV select material for temporary guardrail. Use Class A concrete that meets Article 450-2 of the *Standard Specifications* or Type 1 grout for drilled-in piles.

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, use sheet piles with the minimum required section modulus or H-piles with the sizes shown in Geotechnical Standard Detail No. 1801.01. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use the following:

- (1) A-2-4 soil for backfill around culverts,

- (2) A-2-4 soil in the reinforced zone of standard temporary walls with a back slope and
- (3) Class VI select material in the reinforced zone of standard temporary geotextile walls.

(B) Standard Temporary Walls

Use welded wire reinforcement for welded wire facing, struts and wires with the dimensions and minimum wire sizes shown in Geotechnical Standard Detail No. 1801.02. Provide Type 2 geotextile for separation and retention geotextiles. Do not use more than 4 different reinforcement strengths for each standard temporary wall.

(1) Geotextile Reinforcement

Provide Type 5 geotextile for geotextile reinforcement with a mass per unit area of at least 8 oz/sy in accordance with ASTM D5261. Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geotextile wall location, provide geotextiles with ultimate tensile strengths as shown in Geotechnical Standard Detail No. 1801.02.

(2) Geogrid Reinforcement

Use geogrids for geogrid reinforcement with a roll width of at least 4 ft and an “approved” status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids is available from:

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

Based on actual wall height, groundwater or flood elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geogrid wall location, provide geogrids for geogrid reinforcement with short-term design strengths as shown in Geotechnical Standard Detail No. 1801.02. Geogrids are approved for short-term design strengths (3-year design life) in the machine direction (MD) and cross-machine direction (CD) based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

Preconstruction Requirements

(A) Concrete Barrier

Define “clear distance” behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor’s option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of standard shoring except for barrier above standard temporary walls. Concrete barrier with the minimum required clear distance is required above standard temporary walls.

(B) Temporary Guardrail

Define “clear distance” behind temporary guardrail as the horizontal distance between guardrail posts and standard shoring. At the Contractor’s option or if clear distance for standard temporary shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above standard temporary walls.

(C) Standard Shoring Selection Forms

Before beginning standard shoring construction, survey existing ground elevations in the vicinity of standard shoring locations to determine actual shoring or wall heights (H). Submit a standard shoring selection form for each location at least 7 days before starting standard shoring construction. Standard shoring selection forms are available from:

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

Construction Methods

Construct standard shoring in accordance with the *Temporary Shoring* provision.

(A) Standard Temporary Shoring Installation

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, install piles with the minimum required embedment and extension for each shoring section in accordance with Geotechnical Standard Detail No. 1801.01. For concrete barrier above and next to standard temporary shoring and temporary guardrail above and attached to standard temporary shoring, use “surcharge case with traffic impact” in accordance with Geotechnical Standard Detail No. 1801.01. Otherwise, use “slope or surcharge case with no traffic impact” in accordance with Geotechnical Standard Detail No. 1801.01. If refusal is reached before driven piles attain the minimum required embedment, use drilled-in H-piles with timber lagging for standard temporary shoring.

(B) Standard Temporary Walls Installation

Based on actual wall height, groundwater elevation, slope or surcharge case, geotextile or geogrid reinforcement and shoring backfill in the reinforced zone at each standard temporary wall location, construct walls with the minimum required reinforcement length and number of reinforcement layers for each wall section in accordance with Geotechnical Standard Detail No. 1801.02. For standard temporary walls with pile foundations in the reinforced zone, drive piles through reinforcement after constructing temporary walls.

For standard temporary walls with interior angles less than 90°, wrap geosynthetics at acute corners as directed by the Engineer. Place geosynthetics as shown in Geotechnical Standard Detail No. 1801.02. Place separation geotextiles between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, place separation geotextiles between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Measurement and Payment

Standard shoring will be measured and paid in accordance with the *Temporary Shoring* provision.



DocuSigned by:
Scott A. Hidden
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TEMPORARY SOIL NAIL WALLS:**(10-19-21)****Description**

Construct temporary soil nail walls consisting of soil nails spaced at a regular pattern and connected to a reinforced shotcrete face. A soil nail consists of a solid or hollow steel bar grouted in a drilled hole inclined at an angle below horizontal. At the Contractor's option, use temporary soil nail walls instead of temporary shoring for full cut sections. Design and construct temporary soil nail walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Anchored Wall Contractor to construct temporary soil nail walls. Define "soil nail wall" as a temporary soil nail wall and "Soil Nail Wall Contractor" as the Anchored Wall Contractor installing soil nails and applying shotcrete. Define "nail" as a soil nail.

Provide positive protection for soil nail walls at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geocomposites	1056
Portland Cement	1024-1
Reinforcing Steel	1070
Shotcrete	1002
Select Material, Class IV	1016
Steel Plates	1072-2
Water	1024-4

Use neat cement grout that only contains cement and water with a water cement ratio of 0.4 to 0.5 which is approximately 5.5 gallons of water per 94 lb of Portland cement. Provide grout with a compressive strength at 3 and 28 days of at least 1,500 psi and 4,000 psi, respectively.

Use Class IV select material for temporary guardrail. Provide soil nails consisting of grouted steel bars and nail head assemblies. Use deformed solid steel bars that meet AASHTO M 275 or M 31, Grade 60, 75 or 80. Splice solid bars in accordance with Article 1070-9 of the *Standard Specifications*. Use hollow steel bars manufactured by DYWIDAG-Systems International USA Inc., Nucor Skyline, Williams Form Engineering Corp. or an approved equal.

Use centralizers that meet Article 34.3.4 of the *AASHTO LRFD Bridge Construction Specifications*. Provide nail head assemblies consisting of nuts, washers and bearing plates. Use steel plates for bearing plates and steel washers and hex nuts recommended by the Soil Nail Manufacturer.

Provide Type 6 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. Bent, damaged or defective materials will be rejected.

Preconstruction Requirements

(A) Concrete Barrier

Define “clear distance” behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor’s option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of soil nail walls except for barrier above walls. Concrete barrier with the minimum required clear distance is required above soil nail walls.

(B) Temporary Guardrail

Define “clear distance” behind temporary guardrail as the horizontal distance between guardrail posts and soil nail walls. At the Contractor’s option or if clear distance for soil nail walls is less than 4 ft, use temporary guardrail with 8 ft posts and a clear distance of at least 2.5 ft. Place ABC in clear distance and around guardrail posts instead of pavement.

(C) Soil Nail Wall Designs

Before beginning soil nail wall design, survey existing ground elevations in the vicinity of wall locations to determine actual design heights (H). 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 the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Design soil nails that meet the following unless otherwise approved:

- (1) Horizontal and vertical spacing of at least 3 ft,
- (2) Inclination of at least 12° below horizontal and
- (3) Diameter of 4" to 10".

Do not extend nails beyond right-of-way or easement limits. If existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with nails, maintain a clearance of at least 6" between obstructions and nails.

Design soil nail walls for a traffic surcharge of 250 psf if traffic will be above and within H of walls. This traffic surcharge does not apply to construction traffic. Design soil nail walls for any construction surcharge if construction traffic will be above and within H of walls. For temporary guardrail with 8 ft posts above soil nail walls, analyze shotcrete and top row of nails for a nominal horizontal load of 300 lb/ft of wall with a load factor of 1.0.

Place geocomposite sheet drains with a horizontal spacing of no more than 10 ft and center drains between adjacent nails. Attach sheet drains to excavation faces. Design shotcrete in accordance with Article 11.12.6.2 of the *AASHTO LRFD Bridge Design Specifications*.

Submit PDF files of working drawings and design calculations for soil nail wall designs in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles, typical sections and details of soil nail wall

design and construction sequence. Include details in working drawings of soil nail locations, unit grout/ground bond strengths, shotcrete reinforcement and if necessary, obstructions extending through walls or interfering with nails. Include details in construction sequence of excavation, grouting, installing reinforcement, nail testing and shotcreting with mix designs and shotcrete nozzleman certifications. Do not begin soil nail wall construction until a design submittal is accepted.

Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. Include analysis of temporary conditions during construction in design calculations. At least one analysis is required for each wall section with different nail lengths. Analyze internal and compound stability with a computer software program that uses limit equilibrium methods and submit all PDF output files from the program with the design calculations. See Article C11.12.2 of the AASHTO LRFD specifications for determining the maximum soil nail force, T_{maxsn} . Once T_{maxsn} and pullout length behind slip surface, L_p , are determined from limit equilibrium methods at the target soil failure resistance factor (1 over factor of safety output from computer software), use these values for soil nail (pullout and tensile resistance) and wall facing (flexure, punching shear and headed-stud tensile resistance) design in accordance with Articles 11.12.5.2, 11.12.6.1 and 11.12.6.2 of the AASHTO LRFD specifications.

- (1) When designing soil nail walls with computer software Snail manufactured by the California Department of Transportation (CALTRANS), use Snail version 2.2.0 or later, to calculate factors of safety and T_{maxsn} and L_p values in accordance with the following: Allowable Stress Design for Analysis Method with no load factors applied except those applied to factored surcharge loads from structures or traffic,
- (2) Perform Below Toe Search option selected when any soil layer has a friction angle less than 30° and
- (3) Default value of 0.33 for Interface Friction Reduction Factor.

When designing soil nail walls with computer software other than Snail, use bi-linear (or tri-linear, as applicable) search surfaces intended to reproduce Snail results. Factors of safety and T_{maxsn} and L_p values are acceptable if they are within 5% of the factors of safety and T_{maxsn} and L_p values calculated by the Engineer using the computer software Slide2 manufactured by Rocscience, Inc.

(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, District or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Soil Nail Wall Contractor Superintendent will attend preconstruction meetings.

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.

Install foundations located behind soil nail walls before beginning wall construction. Do not excavate behind soil nail walls. If overexcavation occurs, repair walls with an approved method and a revised soil nail wall design may be required.

Install positive protection in accordance with the contract and accepted submittals. Use PCB in accordance with Section 1170 of the *Standard Specifications* and Roadway Standard Drawing No. 1170.01. Use temporary guardrail in accordance with Section 862 of the *Standard Specifications* and Roadway Standard Drawing No. 862.01, 862.02 and 862.03.

(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 6" 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. Rocky ground such as colluvium, boulder fills and weathered rock may be difficult to excavate without leaving voids.

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 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

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 may be required.

The drilling, steel bar and grouting requirements below are for solid bar nails and may not apply to hollow bar nails. Hollow bar nails are typically installed by simultaneously drilling and grouting as a sacrificial drill bit is advanced and grout is pumped through the bar. For hollow bar nails, submit drilling and grouting procedures for approval before

installing soil nails.

(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 solid 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 solid 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

Mix and place grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. 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

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) Sheet Drains

Install geocomposite sheet drains as shown in the accepted submittals. Before installing shotcrete reinforcement, place sheet drains with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, sheet drains may be placed after shotcreting over weep holes through the shotcrete. Hold sheet drains in place with anchor pins so drains are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous sheet drains are not allowed. If splices are needed, overlap sheet drains at least 12" so flow is not impeded. Cut off excess sheet drain length and expose drain ends below shotcrete when soil nail wall construction is complete.

(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) 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 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 file of all corresponding construction records.

Nail Testing

“Proof tests” are performed on nails incorporated into walls, i.e., production nails. Define “test nail” as a nail tested with a proof test. 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 proof tests required. Do not test nails until grout and shotcrete attain the required 3-day compressive strength.

(A) Test Equipment

Use the following equipment to test nails:

- (1) Two dial gauges with rigid supports,
- (2) Hydraulic jack and pressure gauge and
- (3) Jacking block or reaction frame.

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 design. 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) Proof Tests

Test proof test nails in accordance with the accepted submittals and Article 34.5.5.3, respectively of the *AASHTO LRFD Bridge Construction Specifications*.

(D) 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 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 acceptance criteria in Article 34.5.5.4 of the *AASHTO LRFD Bridge Construction Specifications*.

Maintain stability of unbonded lengths for subsequent grouting. If a test nail is accepted but the unbonded length cannot be satisfactorily grouted, do not incorporate the test nail into the soil nail wall and add another production nail to replace the test nail.

If the Engineer determines a 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 test nail as determined by the Engineer. Submit a revised soil nail wall design for acceptance, provide an acceptable test nail with the revised design or installation methods and install additional production nails for the nails represented by the unacceptable test nail.

After completing nail testing for each soil nail wall or stage of a wall, provide a PDF file of all corresponding test nail records.

Measurement and Payment

Temporary soil nail walls will be measured and paid in square feet. Temporary soil nail walls will be paid for at the contract unit price for *Temporary Shoring*. Temporary soil nail walls will be measured as the square feet of exposed wall face area. No measurement will be made for any embedment or pavement thickness above soil nail walls.

The contract unit price for *Temporary Shoring* will be full compensation for providing soil nail wall designs, submittals, labor, tools, equipment and soil nail wall materials, excavating, hauling and removing excavated materials, installing and testing soil nails, grouting, shotcreting and supplying sheet drains and any incidentals necessary to construct soil nail walls. 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.

No payment will be made for temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience. No value engineering proposals will be accepted based solely on revising or eliminating shoring locations shown in the plans or estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

PCB will be measured and paid in accordance with Section 1170 of the *Standard Specifications*. No additional payment will be made for anchoring PCB for soil nail walls. Costs for anchoring PCB will be incidental to soil nail walls.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *Standard Specifications*.



DocuSigned by:
Scott A. Hidden
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07/25/2022

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WORK ZONE TRAFFIC CONTROL Project Special Provisions Table of Contents

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SEQUENTIAL FLASHING WARNING LIGHTS

(10/08/2016) (Rev. 5/10/2021)

Description

Furnish and install Sequential Flashing Warning Lights on drums used for the merging tapers of nightly lane closures on all multilane roadways with speed limits of 55 mph or greater.

Materials

The Sequential Flashing Warning Lights shall meet all of the requirements for warning lights within the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

Each light unit shall be capable of operating fully and continuously for a minimum of 200 hours when equipped with a standard battery set.

Each light in the sequence shall be flashed at a rate of not less than 55 times per minute and not more than 75 times per minute. The flash rate and flash duration shall be consistent throughout the sequence.

Supply a Type 3 Certification (Independent Test Lab results) documenting all actual test results for the specified parameters contained in the Institute of Transportation Engineer's (ITE's) *Purchase Specification for Flashing and Steady Burn Warning Lights*. The laboratory shall also identify all manufacturer codes and part numbers for the incandescent lamp or LED clusters, lenses, battery, and circuitry, and the total width of the light with the battery in place. The complete assembly shall be certified as crashworthy when firmly affixed to the channelizing device.

All Sequential Flashing Warning Lights shall be on the NCDOT Approved Products List.

Construction Methods

These lights shall flash sequentially beginning with the first light and continuing until the final light.

The Sequential Flashing Warning Lights shall automatically flash in sequence when placed on the drums that form the merging taper.

The number of lights used in the drum taper shall equal the number of drums used in the taper.

Drums are the only channelizing device allowed to mount sequential flashing warning lights.

The Sequential Flashing Warning Lights shall be weather independent and visual obstructions shall not interfere with the operation of the lights.

The Sequential Flashing Warning Lights shall automatically sequence when placed in line in an open area with a distance between lights of 10 to 100 feet.

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If one light fails, the flashing sequence shall continue. If more than 1 light fails, all of the lights are to be automatically turned to the “off” mode. Non-sequential flashing is prohibited.

When lane closures are not in effect, the Sequential Flashing Warning Lights shall be deactivated.

Measurement and Payment

Sequential Flashing Warning Lights will be measured and paid as the maximum number of sequential flashing warning lights satisfactorily installed and properly functioning at any one time during the life of the project.

This includes all materials and labor to install, maintain and remove all the Sequential Flashing Warning Lights.

Pay Item

Sequential Flashing Warning Lights

Pay Unit

Each

WORK ZONE PRESENCE LIGHTING

(10/14/19) (Rev. 5/10/2021)

Description

Furnish and install Work Zone Presence Lighting during nightly lane closures on multilane roadways with speed limits of 55 mph or greater.

Materials

Anti-glare lighting systems are required. Work Zone Presence Lighting shall be installed in accordance with the attached detail and the Manufacturer’s recommendations.

Supply a power source for each light to provide the light output as described in the chart below.

Each light unit shall be capable of providing a minimum of 14,000 lumens illuminating a minimum area of approximately 3,000 square feet. The light shall be capable of being elevated to a height of 14 feet above the pavement.

Each light unit support base or mounting stand shall have the capability of being leveled such that the light mast is plumb.

Provide Work Zone Presence Lighting listed on the NCDOT Approved Products List.

Construction Methods

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Work Zone Presence Lighting is permitted to be prestaged (up to 1 hour prior for single lane closures and up to 2 hours prior for double or triple lane closures) along with other traffic control devices or installed within 1 hour after the necessary traffic control has been installed for the lane closure(s). At the end of the work night, the Work Zone Presence Lighting shall be removed within 1 hour before or after the lane closure(s) is removed.

Whenever possible, each light unit shall be placed on the outside paved shoulder, a minimum of 4 feet from the travel lane and spaced according to the chart below based on the amount of light output for each unit.

Work Zone Presence Lighting is permitted to supplement the Portable Construction Lighting inside the lane closure. At no time shall Work Zone Presence Lighting be used in lieu of Portable Construction Lighting when required.

If there is sufficient existing overhead lighting, Work Zone Presence Lighting may be eliminated as directed by the Engineer.

Lighting Unit Installation Requirements

The lighting units shall be installed in advance of the lane closure as shown on the attached detail and spaced according to the chart below:

Light Output (Lumens)	Illuminated Fixture Area (Sq. Ft.)	AREA 1		AREA 2	
		# of Lights	Spacing*	# of Lights	Spacing*
14,000 - 35,000	4	6	640' (16 skips)	8	480' (12 skips)
35,001 - 59,999	5	5	800' (20 skips)	6	640' (16 skips)
60,000+	6+	4	1,000' (25 skips)	5	800' (20 skips)

*Skips refer to traditional 10' pavement marking lines with 30' gaps.

Area 1: Begins 2,640' downstream from CMS; Extends to just past 1st Lane Closure Sign

Area 2: Begins just past the 1st Lane Closure Sign; Extends to just past the last Lane Closure Sign

MEASUREMENT AND PAYMENT

Work Zone Presence Lighting will be measured and paid as the maximum number of lighting units satisfactorily placed, accepted by the Engineer, and in use at any one time during the life of the project.

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Relocation, replacement, repair, removal, and maintenance of Work Zone Presence Lighting units will be incidental to the work of this section. No measurement or separate payment will be made for power generators, batteries, or other power supply devices.

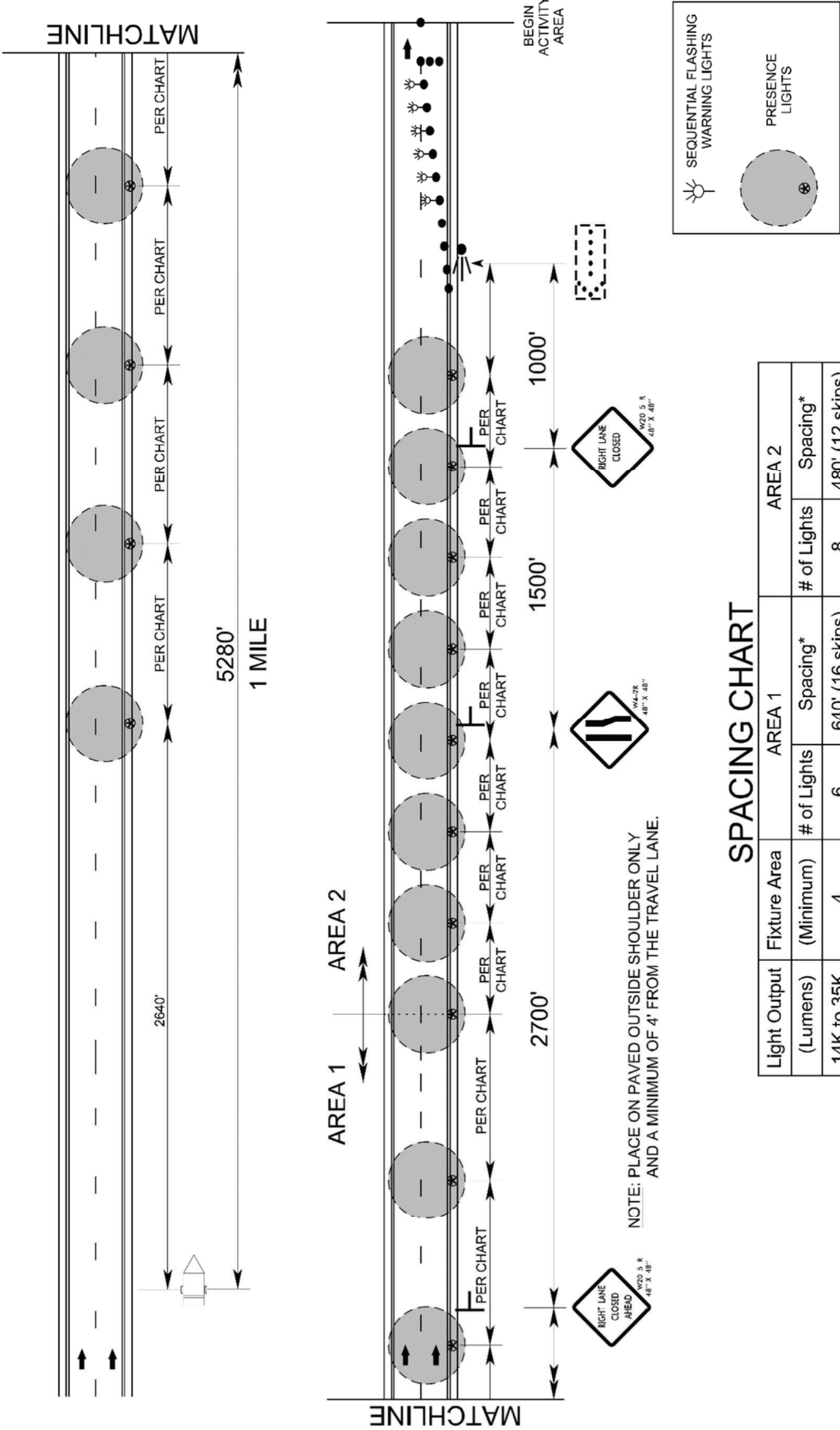
Pay Item
Work Zone Presence Lighting

Pay Unit
Each

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SPACING CHART

Light Output (Lumens)	Fixture Area (Minimum)	AREA 1		AREA 2	
		# of Lights	Spacing*	# of Lights	Spacing*
14K to 35K	4	6	640' (16 skips)	8	480' (12 skips)
35.1K to 60K	5	5	800' (20 skips)	6	640' (16 skips)
60K +	6+	4	1000' (25 skips)	5	800' (20 skips)

*SKIPS REFER TO TRADITIONAL 10' PAVEMENT MARKING LINES WITH 30' GAPS.

AREA 1: BEGINS 2,640' DOWNSTREAM FROM CMS; EXTENDS TO JUST PAST 1ST LANE CLOSURE SIGN

AREA 2: BEGINS JUST PAST THE 1ST LANE CLOSURE SIGN; EXTENDS TO JUST PAST THE LAST LANE CLOSURE SIGN

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Forsyth County

WORK ZONE DIGITAL SPEED LIMIT SIGNS

(5/10/2021)

Description

Furnish and install Work Zone Digital Speed Limit Signs on interstates and freeways with speed limits of 55 mph or greater. These signs are regulatory speed limit signs with LED displays for the speed limit numbers.

Materials

Digital Speed Limit Signs shall be a minimum 36" wide x 48" high. The speed limit sign (R2-1) shall be black on white with high intensity white prismatic sheeting.

The Digital Speed Limit Sign shall be mounted such that the bottom of the sign is 7' above roadway.

The LED panel shall be a minimum of 28" wide x 18" high. The display on the LED panel shall be amber or white.

The LED numbers shall have a minimum 5 wide by 7 high pixel array with a minimum height of 18".

The LED panel shall have auto brightness/dimming capability.

The black on orange "WORK ZONE" sign shall be mounted above the speed limit sign. It shall be 36" wide x 24" high with high intensity prismatic orange sheeting.

The black on white "\$250 FINE" sign shall be mounted below the speed limit sign. It shall be 36" wide x 24" high with high intensity prismatic white sheeting.

All digital speed limit systems shall have operational software and wireless communications that allows for remote operation and data monitoring. It shall be configured to allow access by the Engineer or their designee to change each sign independently or change the speed limit on all signs at once from a PC, tablet or cellular phone application.

Radar equipment to detect approaching speeds on the digital speed limit systems is optional. However, if the systems have radar, they will be equipped to store the detected speed data, this information should be available in a spreadsheet format and accessed remotely from a secure cloud location.

The Work Zone Digital Speed Limit systems shall have flashing beacons. The beacons are to be a minimum of 8" diameter LED circular yellow. They shall be mounted above and below the sign assemblies and are to be centered. The beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.

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In addition, the flashing beacons shall be mounted in such a manner that the \$250 FINE sign is not obscured when in operation.

Digital Speed Limit Signs may be trailer mounted or stationary mounted. The unit shall be solar powered and have the ability to operate continuously. It shall be supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

All Work Zone Digital Speed Limit Sign equipment shall be on the NCDOT Approved Products List.

Digital Speed Limit Displays

The speed limit shall be continuously displayed on the signs. All other stationary speed limit signs shall be covered when Digital Speed Limit systems are in operation.

Reduced Speed Limit Displays

The Digital Speed Limit systems shall have beacons activated when the work zone speed limit is reduced. Otherwise, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The Digital Speed Limit Signs shall display the reduced work zone speed limit without flashing the LED speed limit number unless approaching speeds are detected to be 6 MPH or higher than the displayed speed limit. If speeds are detected 6 MPH or above the displayed Speed Limit, then the LED shall flash the speed limit until the speeds are within the 6 MPH tolerance.

Existing Speed Limit Displays

When the existing speed limit is displayed on the Digital Speed Limit Signs, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The speed limit number is not to flash unless the approaching speeds are detected to be 6 MPH or higher than the displayed speed limit.

Other Construction Methods

The speed limits are the sole authority of the NCDOT. An ordinance by the State Traffic Engineer is required for all speed limits in order to have a lawfully enforceable speed limit.

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The Regional Traffic Engineering Office and the Division Construction Engineer in coordination with the Work Zone Traffic Control Section will provide all work zone speed limit recommendations based on activities and conditions.

The Contractor will be responsible for coordinating with the Engineer when the work zone speed limits are to be changed and will have to seek approval by the Engineer or their designee before the speed limit is changed.

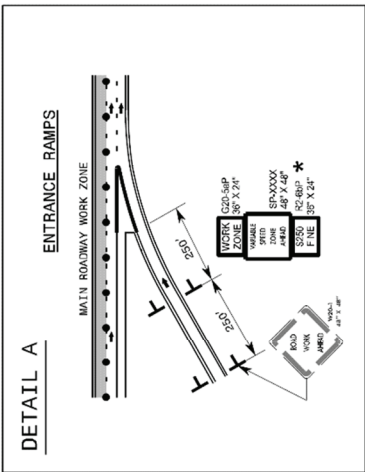
Whenever possible, each trailer mounted unit shall be placed on the paved shoulder and shall have the capability of being leveled.

Measurement and Payment

Work Zone Digital Speed Limit Signs will be measured and paid as the maximum number of Work Zone Digital Speed Limit Signs satisfactorily installed according to the attached detail and properly functioning at any one time during the life of the project.

This includes all materials and labor to install, maintain and remove all the Work Zone Digital Speed Limit Signs.

Pay Item	Pay Unit
Work Zone Digital Speed Limit Signs	Each



NOTES

1. THE DIGITAL SPEED LIMITS WILL BE INSTALLED (TRAILER MOUNTED OR STATIONARY MOUNTED) IN ADVANCE OF AND SPACED APPROXIMATELY 1.5 MILES THROUGHOUT THE PROJECT LIMITS, UNLESS DIRECTED OTHERWISE.
2. BOTH $\frac{1}{4}$ TO $\frac{3}{4}$ MILE UPSTREAM OF CONDITION WARRANTING A SPEED REDUCTION, PLACE A DIGITAL SPEED LIMIT SIGN ON BOTH THE INSIDE AND OUTSIDE SHOULDERS, UNLESS DIRECTED OTHERWISE BY THE ENGINEER. AT ALL OTHER LOCATIONS DOWNSTREAM, PLACE A SINGLE DIGITAL SPEED LIMIT SIGN ON THE OUTSIDE SHOULDER.
- IF SIGNS ARE NOT HIGHLY VISIBLE TO ALL MOTORISTS, SUPPLEMENTAL DIGITAL SPEED LIMIT SIGNS ARE PERMITTED ON THE MEDIAN SHOULDER.
3. THE DIGITAL SPEED LIMIT SIGNS TAKE PRECEDENCE OVER EXISTING SPEED LIMIT SIGNS AND SHOULD REMAIN UPRIGHT AND VISIBLE AT ALL TIMES; ALL EXISTING SPEED LIMIT SIGNS SHALL BE COVERED OR REMOVED FOR DURATION OF THE PROJECT.
4. NCDOT HAS SOLE AUTHORITY OF THE SPEED LIMITS DISPLAYED ON THE DIGITAL SPEED LIMIT SIGNS.
5. THE WORK ZONE VARIABLE SPEED LIMIT AND THE \$250 SPEEDING PENALTY ARE SEPARATE ORDINANCES THAT MUST BE SIGNED BY THE STATE TRAFFIC ENGINEER TO BE VALID AND ENFORCEABLE. WITHOUT SIGNED ORDINANCES, THE SPEED LIMIT ON A FACILITY SHALL REMAIN UNCHANGED AND/OR HIGHER FINES SIGNS SHALL NOT BE USED.
6. THE REDUCED SPEED SHALL BE DISPLAYED A MINIMUM OF $\frac{1}{4}$ MILE AND A MAXIMUM OF $\frac{3}{4}$ MILE IN ADVANCE OF AND THROUGHOUT THE AREA MEETING CONDITIONS LISTED IN THE CHART. THE EXISTING SPEED LIMIT SHALL BE DISPLAYED ON ALL OTHER DIGITAL SPEED LIMIT SIGNS.
7. THE SPEED DISPLAYED SHALL BE THE LOWER OF THE EXISTING SPEED LIMIT OR THE SPEED IN THE WORK ZONE CONDITION CHART.
8. THE BEACONS ON THE DIGITAL SPEED LIMIT SIGNS SHALL ONLY FLASH DURING TIMES THE SPEED IS REDUCED, AND REMAIN OFF AT ALL OTHER TIMES.

WORK ZONE CONDITIONS	SPEED TO DISPLAY (SEE NOTE 6 & 7)
2 LANES REDUCED TO 1 LANE	55
3 LANES REDUCED TO 1 LANE	55
3 LANES REDUCED TO 2 LANES	60
4 LANES REDUCED TO 1 LANE	55
4 LANES REDUCED TO 2 LANES	60
4 LANES REDUCED TO 3 LANES	65
1 OPEN LANE WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	55
1 OPEN LANE WITH CONTINUOUS BARRIER ON 1 SHOULDER	60
3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	60
3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON 1 SHOULDER	65
4 OPEN LANES WITH BARRIER CONTINUOUS ON BOTH SHOULDERS	65
4 OPEN LANES WITH BARRIER CONTINUOUS ON 1 SHOULDER	EXISTING
UNEVEN LANES	60

SIGN NUMBER: WZTC	BACKG COLOR: Fluorescent Orange	DESIGN BY: J.Navarrete	CHECKED BY:	May 13, 2019																														
TYPE: STATIONARY	COPY COLOR: Black	PROJECT ID:	LOCATION:	DIV: DIV																														
QUANTITY: SEE PLANS																																		
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SYMBOL	X	Y	WID	HT																														
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NO. Z BARS: 2 LENGTH: 40.0																																		
USE NOTES: 1,2 1. Legend and border shall be direct applied black non-reflective sheeting. 2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.																																		

BORDER 5.4" 37.3" 5.3"

R=1.5"

TH=0.63"

IN=0.47"

[illegible]

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WORK ZONE PERFORMANCE PAVEMENT MARKINGS:

(10/08/2016)

(Rev. 10/9/18)

Description

Furnish and install Work Zone Performance pavement markings that delineate the travel way for work zone traffic patterns on interstates and freeways along with the ramps and loops. They may also be used on roadways with significant alterations of traffic patterns. The purpose of Work Zone Performance pavement marking is to provide a more durable work zone pavement marking that lasts the full duration of a traffic pattern without requiring replacement or reapplication for a period of up to 12 months. Work Zone Performance pavement markings shall also provide a higher performance level in terms of retroreflectivity throughout the required 12 month duration than standard traffic paints to improve nighttime work zone visibility.

Materials**A) General**

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and a minimum retroreflectivity as described elsewhere in this RFP for a period of at least 12 months.

The Work Zone Performance pavement markings shall be manufactured to bond successfully to both concrete and asphalt pavements. The following are approved materials to be used for Work Zone Performance pavement markings:

- Polyurea
- Thermoplastic (Extruded and Sprayed)
- Epoxy
- Polymer (Single System)
- Cold Applied Plastic (Type IV)

B) Material Qualifications/Certifications

Use Work Zone Performance pavement marking materials, as listed above, which are on the NCDOT Approved Products List at the time of installation.

In accordance with Article 106-3, and Section 1087-4 of the 2018 NCDOT Standard Specifications for Roads and Structures, provide a Type 3 Material Certification for all materials and a Type 3 and Type 4 certification for all reflective media.

(C) Performance

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Poor performance of a Work Zone Performance pavement marking material at any site, whether or not related to a specific contract, may be grounds for removing the material from any project under contract and the NCDOT Approved Products List.

Construction Methods

Do not use hand applied methods or any other non-truck mounted application equipment /device to install Work Zone Performance pavement markings for applications longer than 1000 feet.

All Work Zone Performance pavement markings are to be installed in a single application. Multiple passes are not allowed.
“No track” dry times shall be 10 minutes or less. Traffic shall not be placed on any material until it’s sufficiently dry/cured to eliminate wheel tracking.

A) Testing Procedures

All Work Zone Performance pavement marking installations will be tested by the Department through an independent Mobile Retroreflective Contractor. The Work Zone Performance pavement markings will be scanned to ensure the retroreflectivity requirements in Section C below are met.

B) Application Equipment

Application equipment shall be in accordance with Section 1205 of the 2018 NCDOT Standard Specifications for Roads and Structures.

C) Material Application

The Work Zone Performance pavement marking material shall be applied at the following minimum thicknesses:

Polyurea =	20 mils wet
Epoxy =	20 mils wet
Thermoplastic =	50 mils (Extruded or Sprayed)
Polymer =	20 mils wet
Cold Applied Plastic (IV) =	Manufacturer’s recommendation

The Work Zone Performance pavement marking line widths for interstates and freeways shall be as follows:

Edge lines, Solid Lane Lines, Skip and Mini-Skip Lines =	6”
Gorelines =	12”

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All other facilities shall utilize 4" line widths.

D) Retroreflectivity Requirements

Retroreflectivity Requirements for Work Zone Performance Pavement Markings

Color	Initial	6 Months	12 Months
White	375 mcd/lux/m2	275 mcd/lux/m2	150 mcd/lux/m2
Yellow	250 mcd/lux/m2	150 mcd/lux/m2	100 mcd/lux/m2

The minimum level of retroreflectivity for any Work Zone Performance pavement marking system selected shall meet the initial requirements in the chart above. In addition, the Work Zone Performance pavement markings shall maintain the corresponding retroreflectivity requirements for a period of up to 12 months.

The Contractor shall notify the Engineer a minimum of 7-10 days prior to the installation of Work Zone Performance pavement markings.

The Department will measure initial retroreflectivity within 30 days after placement to ensure compliance with the initial retroreflectivity levels in the chart above.

If the markings appear to be non-performing, the Engineer may request additional retroreflectivity readings. If measured and found to be noncompliant, the Contractor shall replace the Work Zone Performance pavement markings at no cost to the Department. Non-compliant retroreflectivity occurs when the average readings for the project are more than 15% below the requirements in the chart. Pay deductions are appropriate for deficiencies up to the 15% level.

If the Work Zone Performance pavement markings need to remain in place longer than 12 months, the markings are to be scanned by the Mobile Retroreflective Contractor to determine if they are meeting the minimum retroreflectivity levels. If they remain at or above these levels, the Work Zone Performance pavement markings may remain in place. If not, they shall be replaced by the Contractor within 15 days of the 12 month duration and compensation will be made at the contract unit price.

If and when this becomes necessary, the same notification procedure as described above shall be used to have the Work Zone Performance pavement markings scanned for the required retroreflectivity.

E) Snowplow Damage

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All Work Zone Performance pavement markings shall be durable enough to withstand a single snow event requiring snow plowing without showing excessive fatigue in either bonding or retroreflectivity.

The Contractor shall replace the Work Zone Performance pavement markings if a single snowplow occurrence results in more than 25% of the pavement marking edgelines or skips being physically removed and/or the Work Zone Performance pavement markings do not meet the following minimum retroreflectivity values:

Retroreflective Requirements for Work Zone Performance Pavement Markings after a Single Snowplow Occurrence

Color	MINIMUM
White	150 mcd/lux/m2
Yellow	100 mcd/lux/m2

Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all non-compliant Work Zone Performance pavement markings within 30 days of determining they are non-compliant.

If the work zone experiences more than one snow event requiring snow plowing, the retroreflectivity values in the chart above will no longer apply. The Engineer will determine if the pavement markings are performing adequately and/or if replacement is necessary due to excessive damage caused solely by snowplow activities.

If the Work Zone Performance pavement markings are found to be deficient, they shall be replaced. In such case, compensation will be made at the contract unit price. Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all Work Zone Performance pavement markings damaged due to multiple snowplow events within 30 days.

F) Surface Preparation

Prior to installation, all pavement surfaces to receive Work Zone Performance pavement markings shall be swept clean and prepared in accordance with the Manufacturer's recommendation.

G) Temperature and Weather Limitations

Work Zone Performance pavement markings shall only be applied unless the ambient air temperature and the pavement temperature is 50°F or higher for thermoplastic and is 40°F or higher for all other materials. Do not install unless the pavement surface is completely dry and

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not within 4 hours of a heavy rain event such as a thunderstorm with rainfall intensities greater than 1 inch/per hour.

In the event a traffic shift has to take place when the air and pavement temperatures are below the required minimums or if a rain event occurs prior to or during a planned traffic shift, upon approval by the Engineer, an acceptable alternative is to install temporary pavement markings. Use 1 application of standard traffic paint to produce a 4" line at 15 mils (wet). Beads shall also be applied to provide proper retroreflectivity until the performance material can be installed. NCDOT will provide compensation for the 4",15 mil temporary paint. The Work Zone Performance pavement markings shall be applied within 90 days of installation of the temporary pavement markings.

Maintenance

Replace any Work Zone Performance pavement material that prematurely fails due to debonding or excessive wearing where it doesn't maintain its retroreflectivity for the required 12 month duration. Any traffic control and Work Zone Performance pavement marking costs due to replacement is at no cost to the Department unless it's due to excessive damage caused by snowplow damage.

Measurement and Payment

Work Zone Performance pavement marking lines will be measured and paid by the linear foot that's satisfactorily placed and accepted by the Engineer. The quantity of Work Zone Performance pavement marking-solid lines, will be the summation of the linear feet of solid line measured end-to-end of the line. The quantity of skip or broken lines will be the summation of the linear feet derived by multiplying the nominal length of a line by the number of broken lines satisfactorily placed.

Work Zone Performance Pavement Marking *Symbols* will be measured as the actual number of pavement marking symbols satisfactorily placed and accepted by the Engineer. Payment for Work Zone Performance Pavement Marking *Symbols* will be made at the same contract unit price used for the Pavement Marking Symbol pay items used on the final wearing surface.

Work Zone Performance Pavement Marking *Characters* will be measured as the actual number of pavement marking characters satisfactorily placed and accepted by the Engineer. A character is considered to be one letter or one number of a word message. Payment for Work Zone Performance Pavement Marking *Characters* will be made at the same contract unit price used for the Pavement Marking Character pay item used on the final wearing surface.

Payment will be made under:

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Pay Item

Work Zone Performance Pavement Marking Lines, 4”
 Work Zone Performance Pavement Marking Lines, 6”
 Work Zone Performance Pavement Marking Lines, 12”

Pay Unit

Linear Foot
 Linear Foot
 Linear Foot

HIGH VISIBILITY DEVICES

(10/25/2019) (Rev. 5/10/2021)

Description

Furnish and install High Visibility Devices for projects on interstates and freeways. High Visibility Devices include drums, skinny drums, stationary work zone signs and rigid portable work zone signs. All of these devices shall be new. Used devices are not acceptable.

Materials**A) General**

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and retroreflectivity as described elsewhere in this specification for a period of at least 36 months.

The following are required High Visibility Devices to be used for work zone performance applications.

- Drums
- Skinny Drums (Daytime use only)
- Stationary Work Zone Signs
- Rigid Portable Work Zone Signs

All drums and skinny drums shall be new and meet the existing requirements of Section 1089-5 of the NCDOT Standard Specifications for Roads and Structures and shall have Grade B flexible, fluorescent orange sheeting that meets the retroreflective requirements of Section 1092-2 of the NCDOT Standard Specifications for Roads and Structures.

All stationary work zone signs shall be new and meet the existing requirements of Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures. Legend overlays are prohibited and shall not be accepted on the interstate/freeway or associated intersecting roadways. Vertical sign post reflector strips shall be added to all stationary sign supports. Use Grade B fluorescent orange for work zone signs and Grade B fluorescent yellow for exit sign supports. Install strips a minimum of 6' in length on sign supports with one sign mounted and a minimum of 4.5' in length for sign supports with two or more signs mounted vertically.

All portable work zone signs shall be new and have composite substrates as described in Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures. Roll-up signs do not

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meet the requirements of this provision. The remainder of the existing requirements of Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures remain. Used sign stands are acceptable.

B) Material Qualifications/Certifications

Only use materials as listed above that are on the NCDOT Approved Products List. In addition, provide a Type 3 Material Certification for all materials in accordance with Section 106-3 and Section 1087-4.

(C) Performance

Poor performance of any device or sign at any site, whether or not related to a specific contract may be grounds for removing the material from the NCDOT Approved Products List and/or removing from any project under contract.

Construction Methods

All requirements of Section 1110-3 and Section 1130-3 of the NCDOT Standard Specifications for Roads and Structures shall apply except roll up signs are not permitted for use.

The use of skinny drums is prohibited for any nighttime lane closures on interstates/freeways.

Maintenance

Replace any sign or drum that prematurely fails due to any damage or defect that causes it to perform unsatisfactorily with an “in kind” device of similar quality and age according to the guidelines set forth in the American Traffic Safety Service Association’s (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices. An “in kind” replacement sign or drum is not required to be new, however, it shall be less than 1 year old and have 100% of its original sheeting area and at least 85% of the retroreflective qualities of a new device, so that it is undetectable adjacent to the original devices and signs placed on the project.

Measurement and Payment

High Visibility Drums will be measured and paid as the maximum number of drums placed and in use at any one time during the life of the project.

High Visibility Skinny Drums will be measured and paid as the maximum number of skinny drums placed and in use at any one time during the life of the project.

High Visibility Stationary Signs will be measured as the actual number of square feet satisfactorily installed at each location and accepted by the Engineer. Where a particular sign is used at more than one location, measurement will be made at each location.

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High Visibility Portable Signs will be measured and paid as the actual number of square feet satisfactorily installed and accepted by the Engineer. Payment will be made for the initial installation only. Relocation of signs will be incidental to the measurement of the quantity of High Visibility Portable Signs.

No direct payment will be made for stationary work zone sign supports or portable work zone sign stands. All stationary work zone sign support or portable work zone sign stands will be incidental to the work of providing work zone signs.

Payment will be made under:

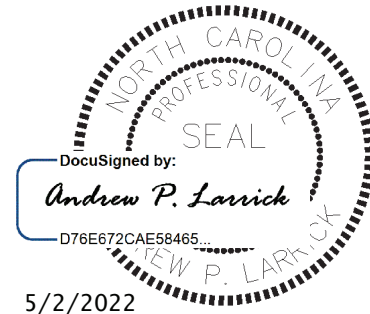
Pay Item:	Pay Unit
High Visibility Drums	Each
High Visibility Skinny Drums	Each
High Visibility Stationary Signs	Square Foot
High Visibility Portable Signs	Square Foot

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PROJECT SPECIAL PROVISIONS
Utility Construction



**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

General Note:

In these Project Special Provisions, where manufacturers are listed for certain products, the cited examples are used only to denote the quality standard of the products desired, and they do not restrict bidders to a specific brand, make, manufacturer or specific name; they are used only to set forth and convey to bidders the general style, type, character and quality of products desired; and equivalent products will be acceptable, subject to review and approval by the utility system owner.

Revise the 2018 Standard Specifications as follows:**Page 2-1, Subarticle 200-3, Construction Methods (D)**

Delete the following:

Cut off and plug at the right-of-way or construction limits any private water or sewer line intercepted during the construction of the project.

Replace with the following:

Locate and do not damage any private water or sewer line intercepted during the construction of the project. Immediately repair any water or sewer line damaged during construction of the project.

Page 2-8, Article 220-3, Construction Methods

Add the following:

All blasting operations will be conducted in strict conformance with the existing ordinances of the City of Winston-Salem (or any other governing authority) and accepted safe practices relative to the storage and use of explosives.

Page 3-2, Article 300-4 Preparation of Pipe Foundation

Delete the last 2 sentences of the second paragraph.

Page 3-3, Article 300-7 Backfilling

Add the following to line 39:

Flowable fill, if approved, must not come in contact with the pipe.

Page 8-37, Article 858-3 Construction Methods

Add the following paragraph after the first paragraph:

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The use of cast iron or steel fittings in the adjustment of manholes will not be permitted on this project except where it is considered by the Engineer to be in the best interest of the Department to allow rings to be used. When rings are permitted for the adjustment of manholes, the rings shall have satisfactory bearing on the existing manhole frames and 50 percent of the circumference shall be tack welded at four equally spaced locations as directed by the Engineer. If the existing covers do not fit the rings, furnish and install new covers at no additional expense to the Department.

Page 10-61, Article 1034-2, Plastic Pipe

Delete in its entirety. City does not allow PVC pipe in its gravity sewer system and there is no force main replacement included in this project.

Page 10-61, Article 1034-3, Concrete Pipe

Delete in its entirety. City does not allow new concrete pipe in its sewer system.

Page 10-61, Subarticle 1034-4 (A), Gravity Flow Sewer Pipe

Add the following sentences after the third paragraph:

Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). Pipe design laying condition will be Type 2, flat-bottom trench with backfill lightly consolidated to centerline of pipe. Pipe for sanitary sewer shall be minimum thickness Class 50.

The interior of ductile iron pipe for sanitary sewer will be lined with 40 mils of ceramic epoxy. All bells and spigots for ductile iron sanitary sewer pipe must be lined with a minimum of 8 mils of joint compound. The exterior of all ductile iron pipe shall be coated with a bituminous coating.

For fittings, all glands shall be ductile iron, not gray iron. Fittings shall have a minimum pressure rating of 250 psi. Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). "DI" or "Ductile" shall be cast on each fitting.

The interior of ductile iron fittings for sanitary sewer will be lined with 40 mils of ceramic epoxy. All bells and spigots for sanitary sewer ductile iron fittings must be lined with a minimum of 8 mils of joint compound. The exterior of all ductile iron fittings shall be coated with a bituminous coating. Ductile iron fittings coated on the interior and exterior with 8 mils of fusion-bonded epoxy in accordance with ANSI/AWWA C116 and ANSI/AWWA C550 are acceptable.

Restrained joint ductile iron pipe and fittings with a gripping gasket as the only means of restraint will not be allowed.

Page 10-61, Subarticle 1034-4 (B), Force Main Sewer Pipe

Delete in its entirety. There is no force main replacement in this project.

Page 10-62, Section 1034 Sanitary Sewer Pipe and Fittings

Add the following Article:

1034-5 Cast Iron Soil Pipe

All cast iron soil pipe and fittings will conform to ASTM A74 and be classified as SV (service weight). Single or double hub is acceptable. No-hub pipe shall not be used. All pipe and

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fittings shall be uniformly coated with bituminous coating. Joints will be rubber gasket. Rubber gaskets shall conform to ASTM C564. 4" x 4" combination wye and eighth bends shall be short pattern -Fig. No. SV-32 by Charlotte Pipe and Foundry (or approved equal). 4" cleanouts shall consist of a 4" service weight cast iron ferrule (with 3" iron pipe size tap) and a 3" brass plug. The plug shall have a low raised square head (Southern Code). Cleanouts shall be Part Number 184 by Jumbo Manufacturing Company (or approved equal).

Page 10-62, Article 1036-2, Copper Pipe

In Paragraph 2, delete: "Use flared or"

Page 10-62, Article 1036-3, Plastic Pipe

Delete in its entirety.

Replace with: POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS (2 INCH ONLY): Pipe and fittings shall be manufactured and tested in the U.S.A. All two (2) inch PVC pipe shall have a hydrostatic minimum working pressure of 250 psi (SDR 17 or SDR 13.5) and pipe shall conform to ASTM D-2241 or the latest revision. PVC pipe shall have the National Sanitation Foundation (NSF) seal of approval. Pipe jointing shall be push on integral bell type with elastomeric joints and shall conform to ASTM D-3139. PVC pipe shall be furnished in standard lay lengths of twenty feet with one or both ends tapered for use with the integral bell. Any lubrication used shall conform to AWWA and the pipe manufacturer. Fittings shall be push on joint PVC with elastomeric joints and shall conform to ASTM D-3139. Fittings shall have a hydrostatic minimum working pressure of 200 psi (SDR 21). If, for any reason, the Engineer finds any or all PVC pipe unacceptable, the Contractor shall be responsible for obtaining acceptable pipe. The Engineer's acceptance or rejection of all pipe will be final.

Page 10-62, Article 1036-4, Steel Pipe

Delete Subarticle (A) **Water Pipe** in its entirety. City does not allow new steel pipe in its water system.

(B) Encasement Pipe

Add the following paragraph after the first paragraph:

Steel encasement pipe shall be smooth wall pipe with welded joints. The encasement pipe must be capable of withstanding highway loadings and must have an inside diameter which will allow the carrier pipe to be removed subsequently without disturbing the encasement pipe. Minimum wall thicknesses for steel encasement pipe are as follows: ENCASEMENT PIPE SIZE (Outside Diameter) WALL THICKNESS (NCDOT) 16" 0.250", 18" 0.250", 20" 0.250", 24" 0.250", 30" 0.312", 36" 0.375", 48" 0.500". Pipe diameter shall be as shown on the Engineer's drawings.

Page 10-63, Article 1036-5, Ductile Iron Pipe and Fittings

Add the following after the second paragraph:

Rubber gasket joints for pipe shall conform to ANSI A21.11 (AWWA C111). Pipe design laying condition will be Type 2, flat-bottom trench with backfill lightly consolidated to centerline of pipe. Ductile iron pipe for water shall be Pressure Class 350 for 3" – 16" and Pressure Class 250 for 18" and above.

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The exterior of all ductile iron pipe and fittings shall be coated with a bituminous coating.

For fittings, all glands shall be ductile iron, not gray iron. Fittings shall have a minimum pressure rating of 250 psi. Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). "DI" or "Ductile" shall be cast on each fitting.

Page 10-63, Article 1036-5, Ductile Iron Pipe and Fittings

Add the following sentences to the third paragraph:

All retainer glands shall be wedge-action glands with torque-limiting twist off nuts. Glands shall be Megalug Series 1100 by EBAA Iron, Inc., Uni-Flange Series 1400 by Ford Meter Box Company, Inc., RomaGrip by Romac Industries, Inc., One-Lok Series SLDE by Sigma Corp., Stargrip Series 3000 by Star Pipe Products, Cam-Lock Series 111 by Smith-Blair, Inc., EZ Grip by SIP Industries, Tufgrip by Tyler Union, or approved equal.

Page 10-63, Article 1036-6, Fire Hydrants

Delete the following:

"Outlets shall have national standard fire hose coupling threads. Use fire hydrants with a minimum bury length of 36 inches."

Add the following:

All fire hydrants shall be dry-barrel fire hydrants which comply with ANSI/AWWA C502. All hydrants will have a dry top with O-ring seals which permanently seal off the stem operating threads from water and keep the lubricant in. All hydrants shall be opened by turning the operating nut on top of the hydrant counterclockwise. The operating nut and cap nuts shall be pentagon-shaped, 1 ½" measured point to flat. The main valve shall be a compression type valve with a valve opening of 5 ¼". Each hydrant will have two hose nozzles and one steamer nozzle. The 2 ½" hose nozzles shall have national standard threads. The steamer nozzle shall have a 5" integral Storz connection. The nozzle shall be fastened into the hydrant barrel by mechanical means, but shall not be leaded into the barrel. Nozzle caps shall be chained to the barrel. All hydrants will be furnished with a breakable traffic feature that will break upon impact. The feature shall consist of a breakable safety flange on the barrel and a breakable safety coupling in the main valve stem. Hydrants must have a bronze main valve seat ring that threads into a bronze drain ring. Each hydrant shall have at least two bronze drain outlets. All hydrants will have 6" mechanical joint base connections or the Alpha connection by American Flow Control unless otherwise specified by the Engineer. Hydrants shall be designed for a minimum working pressure of 250 psi. Assembled hydrants shall be subjected to hydrostatic tests of twice the rated working pressure in accordance with ANSI/AWWA C502. All exterior iron surfaces below ground level shall be covered with two coats of asphaltic varnish or fusion bonded epoxy. All exterior iron surfaces above ground level shall be painted yellow to the satisfaction of the Engineer. Yellow paint shall be Rust-Oleum 7446, Rust-Oleum V2148, Kimball Midwest 80-942, or manufacturer's standard equivalent. All interior iron surfaces of the hydrant shoe which are in contact with water (including the lower valve plate and nut) shall be coated with a minimum of 8 mils of fusion bonded epoxy or liquid epoxy in accordance with ANSI/AWWA C550. All hydrants shall have a thrust or anti-friction washer in the operating area of the hydrant bonnet. A weather cap around the operating nut on top of the hydrant is required.

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Hydrants accepted by the City of Winston- Salem are as follows:

- (1) Super Centurion 250, manufactured by Mueller Company
- (2) B-84-B-5, manufactured by American Flow Control
- (3) K-81D Guardian, manufactured by Kennedy Valve Company
- (4) Medallion, manufactured by Clow Valve Company

Page 10-63, Article 1036-7, Water Valves**(A) Gate Valves:**

Delete in its entirety, and replace with the following:

All gate valves shall be resilient-seated gate valves which meet the specifications of ANSI/AWWA C509 or ANSI/AWWA C515. The valve body, bonnet and seal plate shall be coated on all exterior and interior surfaces with a minimum of 8-10 mils of fusion-bonded epoxy in accordance with ANSI/AWWA C550. The valve shall incorporate a guide system with guide lugs on the wedge or on the body. The wedge shall be gray or ductile iron, fully encapsulated with rubber (including guide lugs and stem nut holder). Non-rising stem valves shall have two O-ring seals above the stem thrust collar that can be replaced with the valve under pressure. Non-rising stem valves shall also have a thrust washer on the stem thrust collar. Valves used for buried service will have a non-rising stem, mechanical joint end connections, and a 2" square operating nut. The word "OPEN" and an arrow to indicate the direction of opening the valve shall be cast on the flanged base of the operating nut. Above ground valves, unless otherwise specified, will have an outside screw and yoke rising stem or a non-rising stem, flanged end connections, and a handwheel to operate the valve. The word "OPEN" and an arrow to indicate the direction of opening the valve shall be cast on the rim of the handwheel. All valves will open by turning the nut or handwheel counterclockwise. Valves installed in manholes will normally be considered to be buried service valves and valves installed in vaults will normally be considered to be above ground valves.

Resilient-seated gate valves shall be designed for a minimum working pressure of 250 psi. Each valve shall be seat tested at the rated working pressure and shell tested at twice the rated working pressure in accordance with ANSI/AWWA C509 - Section 5 or ANSI/AWWA C515 - Section 5. All valves shall be warranted for 10 years from date of purchase against defective materials and workmanship.

Gate valves furnished under these specifications must be manufactured by one of the following or approved equal:

- (1) Clow Valve Company
- (2) M & H Valve Company
- (3) American Flow Control
- (4) U.S. Pipe and Foundry Company
- (5) Mueller Company
- (6) Kennedy Valve Company

(B) Bronze Gate Valves:

Delete in its entirety, and replace with the following:

The use of bronze gate valves shall not be permitted.

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(C) Tapping Valves:

Delete in its entirety and replace with the following:

Use tapping valves conforming to the special provision above for gate valves. The valve shall have an inlet flange (with centering ring) for connection to the flanged sleeve outlet.

Tapping valves furnished under these specifications must be manufactured by one of the following or approved equal:

- (1) Clow Valve Company
- (2) M & H Valve Company
- (3) American Flow Control
- (4) U.S. Pipe and Foundry Company
- (5) Mueller Company
- (6) Kennedy Valve Company

Page 10-63, Article 1036-8 Sleeves, Couplings and Miscellaneous

(A) Tapping Sleeves - Add the following after the first paragraph:

Tapping sleeves and valves shall be used for “wet” taps into existing water mains as indicated on the Engineer’s drawings. The Contractor shall verify the type of material, size, etc., of the existing main prior to ordering the sleeve. The sleeve shall be a split sleeve with mechanical joint end connections and a flanged outlet.

All tapping sleeves and valves shall be water tested before the tap is made. Test pressure shall be 200 psi. All tapping sleeves and valves shall be installed level. The Engineer must be present during the entire tapping and testing process.

Tapping sleeves furnished under these specifications must be manufactured by one of the following or approved equal:

- (1) Mueller Company
- (2) American Flow Control
- (3) Tyler Pipe Company
- (4) U.S. Pipe and Foundry Company
- (5) Kennedy Valve Company

Page 10-64, Article 1036-9, Service Line Valves and Fittings

Add the following to the first paragraph:

All corporation stops shall be made of brass. All brass fittings shall be manufactured in accordance with AWWA C800 and ASTM B-584. All brass components in contact with potable water must be made from CDA/UNS Brass Alloy C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. All fittings shall be UL classified to NSF/ANSI 61 and NSF/ANSI 372 standards and stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified. All corporation stops shall be of the ball valve type with AWWA inlet threads.

Page 10-64, Article 1036-9 Service Line Valves and Fittings

Add the following to the second paragraph:

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Service saddles shall be used as follows:

Pipe Size	Maximum Size Direct Tap without Saddle
4"	3/4"
6"	1"
8"	1"
12"	1-1/2"

The saddle body shall be ductile iron with corrosion-resistant paint. The body shall have a CC threaded outlet. Attached to the body shall be double U-bolt straps. Straps, washers and nuts shall be Type 305 or Type 316 stainless steel. Saddles shall be F202-SSB by Ford, or 202SSU by Romac Industries, Inc.

Page 10-64, Article 1036-9 Service Line Valves and Fittings

Add the following paragraph after the third paragraph:

Use brass fittings manufactured in accordance with AWWA C800 and ASTM B-584. All brass components in contact with potable water must be made from CDA/UNS Brass Alloy C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. All fittings shall be UL classified to NSF/ANSI 61 and NSF/ANSI 372 standards and stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified.

Page 10-64, Section 1036 Water Pipe and Fittings

Add the following Articles:

1036-10 Retainer Glands

All retainer glands shall be wedge-action glands with torque-limiting twist off nuts. Glands shall be Megalug Series 1100 by EBAA Iron, Inc., Uni-Flange Series 1400 by Ford Meter Box Company, Inc., RomaGrip by Romac Industries, Inc., One-Lok Series SLDE by Sigma Corp., Stargrip Series 3000 by Star Pipe Products, Cam-Lock Series 111 by Smith-Blair, Inc., EZ Grip by SIP Industries, Tufgrip by Tyler Union, or approved equal.

1036-11 Casing Spacers

Casing spacers shall be made of Type 304 stainless steel (including risers and hardware). Each shell shall be PVC lined and shall have bolted flanges. Casing spacer runners shall be constructed of ultra-high molecular weight polymer (minimum 1-1/2" wide) with a friction coefficient of not more than 0.12. Risers shall be 10 gauge. Risers and runners for top and bottom shells shall be of equal height. With approval of the Engineer, unequal height risers and runners may be used to obtain proper grade for sanitary sewer mains. Casing spacers must be designed to ensure that only the runners of the spacer are in contact with the steel encasement pipe. The bell of the carrier pipe will not be allowed to be in contact with the encasement.

Casing spacers shall be manufactured by one of the following or approved equal:

(1) Cascade Waterworks Manufacturing Company

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- (2) Advance Products and Systems, Inc.
- (3) BWM Company
- (4) Black Widow by Spider Manufacturing, Inc.

Page 10-119, Article 1074-8 Steps

Replace with the following:

All manhole steps shall conform to current OSHA standards and ASTM C478. The approved step shall conform to the City of Winston-Salem detail drawing for “Polypropylene Manhole Step”. All other steps must be approved by the Engineer prior to being installed.

Page 15-1, Article 1500-2 Cooperation with the Utility Owner

Add the following after the second paragraph:

The water and sewer utility owner is the City of Winston-Salem City/County Utilities Division (City). The contact person is Todd Lewis, PE, Senior Civil Engineer. He can be reached by phone at (336) 747-6842. All coordination with shutdowns and tie-ins to existing water and sewer facilities are to be coordinated through CCUC’s main point of contact.

Page 15-2, Article 1500-7, Submittals and Records

Add the following after the third paragraph:

As a final measure required for acceptance, the Contractor shall clean and televise all sanitary sewer mains prior to requesting final inspection. The Contractor shall televise the entire sewer main and all service connections using standardized NASSCO (PACP, MACP, & LACP) practices, unless otherwise specified.

Two copies of the entire video inspection along with a properly formatted PACP standard exchange database shall be submitted to the Engineer on a data disc (DVD or flash drive).

Page 15-2, Article 1500-9 Placing Pipelines into Service

Add the following after the second paragraph:

Obtain approval from City 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. A representative from City will witness all tests performed on their water facilities.

Obtain approval from City prior to placing a new sewer line into service. A representative from City will witness all tests performed on their sewer facilities.

Page 15-3, Article 1505-2 Materials:

Replace Line 12 with the following:

Use Class VI select material for foundation conditioning and bedding.

Page 15-4, Subarticle 1505-3 (C), Bedding:

Replace the first three (3) sentences with the following:

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Stone bedding shall have a minimum thickness beneath the pipe of four inches (4") or one-eighth of the outside diameter of the pipe, whichever is greater. The required thickness shall be determined by the Engineer.

Page 15-4, Subarticle 1505-3 (E), Thrust Restraint:

Replace the fourth paragraph with the following:

Concrete thrust blocks shall be constructed as directed by the Engineer at all bends, tees, tapping sleeves, tapping saddles, reducers, plugs, etc. to provide restraint against thrust resulting from internal pressure. Any exceptions to this such as restrained joints or mechanical joints with retainer glands will be noted on the Engineer's drawings or otherwise specified. Thrust blocks will not be required for restrained joint pipe (exception - blocking will be required when connecting restrained pipe to existing pipe).

All thrust blocks will be constructed of a minimum of Class A concrete. Thrust blocks for bends, fire hydrants, tees and stub-outs shall be constructed in accordance with the City of Winston-Salem thrust block detail drawings.

Polyethylene shall be placed over all fittings before the concrete is poured. All nuts and bolts shall be clear of concrete so that the joint will be accessible. Plywood shall be used as forms for blocking. Concrete is to be poured only against stable undisturbed soil and should be allowed to set prior to any backfilling. Thrust blocks should be allowed to cure two days prior to pressure testing the water main. Higher strength concrete may be required when it is necessary to pressure test prior to the end of the two-day curing time.

Page 15-6, Subarticle 1510-3 (A), General

Replace the words "36" to 42" of cover" with "a minimum of 36" of cover".

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization

Add the following to second paragraph:

The backflow preventer must be approved by the City.

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization

Add the following to the fifth paragraph:

Prior to pressure testing and disinfection, the Contractor shall flush all water mains with a polyurethane foam pipe pig (minimum 5 pounds per cubic foot density) by Knapp Poly Pig, Inc. or approved equal. The pipe pig shall be propelled hydraulically through the mains at a rate sufficient to remove all foreign matter. Valves shall be operated in a manner which will direct the pipe pig toward the end of the main or a selected discharge point. The pig shall be removed through an open end of the main, a fitting, or through a fire hydrant which has the main valve seat ring removed. Flushing shall continue until the Engineer determines that the mains are free from all foreign matter. The Engineer must be present during the entire flushing process. Any work done without the Engineer's supervision will not be accepted.

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Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization

Add the following to the sixth paragraph:

The Engineer must be present during the entire sterilization process. Any work done without his supervision will not be accepted. Pounds of calcium hypochlorite for sterilization shall be as follows:

Pounds of Calcium Hypochlorite Required to Sterilize Water Mains with
100 Parts Per Million of Chlorine

Main Size	Pounds Per 1,000 Feet of Pipe
2"	0.2
4"	0.8
6"	1.8
8"	3.1
12"	7.0
16"	12.4
20"	19.4
24"	28.0
30"	43.9
36"	63.0

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization

Add the following to tenth paragraph:

The City must be notified prior to flushing. De-chlorination shall be accomplished using equipment by Pollard or approved equal. While the main is being flushed, all service connections shall be thoroughly flushed in order to disinfect each connection.

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization

Add the following before the last paragraph:

After final flushing and before the main is placed in service, a sample or samples shall be collected by City personnel from the line and tested for bacteriological quality. The City, upon 24 hours advance notice, will furnish the personnel and laboratory facilities to conduct the required bacteriological tests. No samples will be taken on Friday, the day before a holiday or on a holiday. The City will sample water from the pipes and test the water in their laboratory. Do not place the water lines into service until tests performed by the City are satisfactory.

Page 15-8, Subarticle 1515-3 (A), Valves

Add the following paragraph:

All existing valves larger than 12" that must be operated shall be operated by the City.

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Page 15-8, Subarticle 1515-3 (B), Meters

Add the following paragraphs after the second paragraph:

For existing service connections being replaced:

Prior to connecting the dwelling or business to the new meter, the Contractor shall expose a portion of the water line from the dwelling or business to determine the material and have proper fittings for reconnection to the new meter box. After the new water line and connections have been pressure tested & disinfected & approved by the Engineer, the Contractor shall remove the existing meter and install it in the new yoke. The Contractor shall reconnect the dwelling or business side water line to the new meter box. This reconnection shall be directed by the Engineer and performed in a timely manner so that the dwelling or business is without water for a minimal time.

For relocated meters (with change to horizontal location):

The Contractor shall install a new meter box, angle valves, yoke, tee and ball valve as directed by the Engineer. The Contractor shall expose a portion of the water line from the dwelling or business to determine the material and have proper fittings for reconnection to the new meter box. At the approval of the Engineer, the Contractor shall remove the existing meter and install it in the new yoke. The Contractor shall reconnect the property side water line from the existing meter box to the new meter box. This reconnection shall be directed by the Engineer and performed in a timely manner so that the property is without water for a minimal amount of time. The Contractor shall remove and dispose of the existing meter box and yoke and backfill as shown on the plans or as directed by the Engineer.

For new and relocated 3/4" & 1" water connections, the Contractor shall install connection per the City of Winston-Salem detail drawing for "3/4" & 1" Water Connection (Without Curb & Gutter / Single Family)".

Page 15-8, Article 1515-3 Construction Methods

Add the following Subarticle:

(H) Tapping Sleeves

Tapping sleeves and valves shall be used for "wet" taps into existing water mains as indicated on the Engineer's drawings. The Contractor shall verify the type of material, size, etc., of the existing main prior to ordering the sleeve. For taps on larger mains (24" and above), a saddle may be used in lieu of a sleeve, but only if the tap is less than or equal to half the size of the line to be tapped. All tapping sleeves and valves shall be water tested before the tap is made. Test pressure shall be 200 psi for 15 minutes without any drop in pressure. All tapping sleeves and valves shall be installed level. The Engineer must be present during the entire tapping and testing process.

Page 15-10, Article 1520-2, Materials

Delete the following sentence: "Use screw type plastic or brass cleanouts."

Replace with the following: "Cleanouts shall be constructed of cast iron soil pipe with brass plug."

Page 15-11, Article 1520-3, Construction Methods

Delete the third paragraph in its entirety. No PVC pipe is allowed on this project.

Add the following to the third sentence of the fifth paragraph: "or within fenced areas."

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Page 15-11, Article 1520-3, Construction Methods

Delete the following: “10%”

Replace with the following “18%-22%”

Page 15-11, Article 1520-3, Construction Methods

Delete the seventh paragraph in its entirety.

Replace with the following: The standard fall through manhole is 1” (0.08’) including 6” connections into a manhole.

Page 15-10, Article 1520-3 Construction Methods

Add the following:

Sewer connections shall be installed as shown on the appropriate City of Winston-Salem detail drawing. Wyes or taps will not be allowed within 5 feet of a manhole. Only one bend will be allowed for connecting the sewer connection to the sewer main. If more than one bend is needed (Ex: bored sewer connection), the road shall be open cut and the connection installed properly. Sewer connections shall be a maximum of 75 feet from the sewer main to the cleanout. Cleanouts shall be installed between property corners of the lot for which the connection is intended. Connections into manholes will require a flexible sleeve at the manhole. If approved by the Engineer, four-inch (4") connections will be allowed to spill into deep manholes. For connections which spill, the 4" pipe shall protrude a minimum of 4" and a maximum of 6" beyond the inside wall of the manhole. Connections into manholes must be at least 6" from the nearest manhole step. Six-inch (6") connections must connect into a manhole.

When installing new sewer connections intended to replace existing ones, the new sewer connection shall be of like size to the existing. Reconnection of the old connection to the new shall be performed by a qualified utility contractor or by a licensed plumbing contractor. The Contractor shall be responsible for all permits and inspections required for the reconnection.

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer

Add the following to the first paragraph:

“and City of Winston-Salem, North Carolina Department of Public Works Engineering Division.”

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer

Under “(1) Pipe Installation”, after the second paragraph, add the following:

Contractor shall provide labor, materials, and supervision to temporarily provide bypass pumping around the Contractor’s work in accordance with the specific needs of the work. No interruption of sewage flow shall be permitted. Bypass operation shall be 24 hours per day during the period of Work. The bypassed flow shall be continuously monitored. The bypassing system shall not be shut down between shifts, on holidays or weekends, or during work stoppages.

Prior to the start of temporary bypass pumping, the Contractor will submit a Bypass Pumping Plan prepared, signed and sealed by a Professional Engineer licensed in the State of North Carolina that includes, at a minimum, the following:

- Staging areas for pumps.

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- Sewer plugging method and types of plugs.
- Size and location of manholes or access points for suction and discharge hose or piping.
- Size of pipeline or conveyance system to be bypassed.
- Number, size, material, location and method of installation of suction and discharge piping.
- Bypass pump sizes, capacities, and number of each size to be provided on-site including all primary, secondary, and spare pumping units.
- Calculations of static lift, friction losses, and flow velocity (pump curves showing pump, operating range shall be submitted).
- System pressure for calculation of hydrostatic testing requirements.
- Downstream discharge plan.
- Method of protecting discharge manholes or structures from erosion and damage.
- Thrust and restraint block sizes and locations. Provide the details necessary to demonstrate the integrity of all suction and discharge piping including piping and fittings associated with all primary and secondary pumping units.
- Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
- Method of noise control for each pump and any additional equipment that is included in the Bypass Pumping Plan (pumps and generators shall keep the noise level below 70 dBA at 30 feet).
- Any temporary pipe supports and anchoring requirements.
- Access plans to all bypass pumping locations indicated on the drawings.
- Calculations for selection of bypass pumping pipe size.
- Schedule for installation of and maintenance of bypass pumping lines.
- Plan indicating location of bypass pumping pipe locations.
- Emergency plan for adverse weather and flooding for various phases of the Work.
- Contractor's plan for providing continuous monitoring of the bypass pumping operation as well as the monitoring persons' qualifications.
- Emergency Contact List: Provide list of three emergency contacts who are able to respond and be on site within two hours of contact. Provide name, cell phone, and email addresses. List shall be posted in a conspicuous location at the bypass pump location.

The Bypass Pumping Plan must be approved prior to the start of the work. The Contractor shall notify the City at least 48 hours prior to any bypassing or diverting of flow.

Contractor shall maintain on site, sufficient equipment and materials to ensure continuous and successful operation of the bypass systems. The Contractor shall maintain on site a sufficient number of valves, spare pumps, tees, elbows, connections, tools, sewer plugs, piping, fuel and/or back-up generator, and other parts or system hardware to ensure immediate repair or modification of any part of the system as necessary.

The Contractor shall be responsible for all bypass flows installed. The Contractor shall inspect the entire bypass pumping and piping system for leaks or spills on an hourly basis. No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in soil or groundwater contamination or any potential health hazards shall be permitted. In the event of any sewage spill, the Contractor shall notify Owner immediately and be responsible for the prompt cleanup and disinfecting of the spill per local and state requirements. The Contractor shall

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compensate the Owner for the cost of any fines levied as the result of a spill or unauthorized discharge.

Prior to operation, test each section of discharge piping with maximum pressure equal to 2.0 times the maximum operating pressure of system or 50 psi, whichever is greater. Notify Engineer at least 24 hours prior to testing. The line shall be sealed on the discharge end. The Contractor shall fill the line with water. The test shall run for a period of two hours. The line may be put in service if, after the two-hour period, the pressure has been maintained with no observable leaks.

The Contractor shall inspect the entire bypass pumping and piping system at a minimum of every hour. Keep written inspection log at each pumping location. The bypass system shall have a trained and qualified attendant on site 24 hours per day, 7 days per week to maintain the bypass pumping system from the start of bypass until the bypassing of the specific pipeline is no longer required. A float and dialer monitoring system is acceptable in place of a trained and qualified attendant. If used, the float and dialer system shall have a dual power source and a redundant system to send alarms. Bypass system shall be physically checked at least on a daily basis with float and dialer system. Contractor shall provide an on-site response from an alarm of less than two hours.

The bypass pumping system shall be cleaned and drained prior to being dismantled and moved to the next location. Upon completion of the bypass pumping operation, clean disturbed areas, restoring to original condition, including pavement restoration, at least equal to existing condition prior to start of work.

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer

Under “(2) Testing”, delete in its entirety and replace with the following:

A low-pressure air test shall be performed by the Contractor after the pipeline is completely backfilled and before being placed into service. The Engineer must be present during the entire testing process. Any work done without their supervision will not be accepted.

(a) Low Pressure Air Testing Requirements:

The Contractor shall use an approved pressure gauge and perform the test in accordance with ASTM C-828. Each section of pipeline (including connections) between manholes will be tested by plugging the upstream manhole and the downstream manhole. By using mirrors, lights, etc., the Contractor must show the Engineer that the 2 plugs are at the proper location and that the line is clear between the plugs. Air is added to the line until the pressure is between 3.0 psi and 4.0 psi. If the pressure drops more than 1.0 psi during the time shown on the chart below, the line is presumed to have failed the test. An obvious leak in any section will be corrected even if the section passes testing. The Contractor will be responsible for the complete removal of all plugs.

Air test time shall be as follows:

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Minimum Air Test Time

Main Size	Time (minutes per 100 feet of pipe)
8"	1.5
10"	1.8
12"	2.1
15"	2.4
18"	2.7
21"	3.3
24"	3.9
27"	4.5
30"	5.1
36"	6.3
42"	7.6

No direct payment will be made for acceptance testing, as such work will be incidental to the installation of the pipe and/or service connections.

(b) Video Inspection:

As a final measure required for acceptance, the Contractor shall clean and televise all sanitary sewer mains prior to requesting final inspection. The Contractor shall televise the entire sewer main and all service connections using standardized NASSCO (PACP, MACP, & LACP) practices, unless otherwise specified below. The process shall begin at the upstream manhole for each segment, and proceed to the downstream manhole for that same segment. Connections shall be televised from the cleanout to the main. Video inspection may occur only after Record Drawings are accepted and approved by the City of Winston-Salem. Prior to beginning the process, a 24 hour notice must be given by the Contractor to the Engineer. Prior to video inspection in paved areas, structures must be raised to final grade and 2" of asphalt must be in place. The City will not accept video that is more than 180 days old unless approved by the Engineer.

The cameras used for inspection shall be ones specifically designed and constructed for sanitary sewer pipeline inspection. Lighting for the cameras shall be suitable to provide a clear color picture of the entire periphery of the pipe. The cameras used for mains must be able to pan, tilt and zoom in order to allow for 360-degree viewing. The television system shall be equipped to indicate the camera travel distance in feet by display on the video viewing screen. All television equipment (camera, monitor, etc.) must be capable of producing picture quality which is satisfactory to the Engineer.

Within 2 hours of the video inspection, the Contractor shall clean the sewer mains and service connections with a high velocity water jet. All debris shall be collected in the downstream manhole and removed by the Contractor. Debris shall not be released into the existing sewer system. During the entire video process, the distance counter must be set at zero at each upstream manhole for each segment (set the counter at zero at the ground for each service connection). The Contractor will be required to pan and tilt at each manhole and at each service connection. The interior of each manhole must be marked with the manhole station (or manhole number) with paint or some other legible identifier (6" - 12" high letters or numbers). Each cleanout stack must be marked with

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the house number or the lot number. For mains, the Contractor will also be required to pan, tilt and zoom at all couplings, at all dates for ceramic-epoxy lined ductile iron pipe, and when any potential problems or abnormalities are noticed or suspected. Travel speed for the camera will be 15 - 30 feet per minute. The following video screen data will be required:

- Project name and project number
- Date of inspection
- Travel distance and time
- Station of start and end manholes
- Depth of start and end manholes
- Size of main
- Type of pipe

All above data shall be shown at the start and end manholes of each segment. While the camera is moving through the main and service connections, distance shall be the only data shown on the screen (top left or top right of screen).

For mains, a stream of water approximately 1" in width must be flowing during the entire video process. For service connections, a minimum of 5 gallons of water must be introduced into each cleanout stack just prior to the video process. In all cases, the flow must be shown on the bottom of the video screen.

Two copies of the entire video inspection along with a properly formatted PACP standard exchange database shall be submitted to the Engineer on a data disc (DVD or flash drive). A "properly formatted PACP standard exchange database" includes properly PACP coded defects (NASSCO version 6.x), proper media paths to associated video files, and all asset IDs used in the inspection must match what the submitted record drawings indicate for each asset. The video file shall be formatted to MPEG-4 (MP4) with software compatible and readable by the City of Winston-Salem. The City of Winston-Salem shall not be responsible for purchasing additional software necessary to view the video file. Each inspection (manhole to manhole or cleanout to main) shall be separated into its own chapter or file. In the event of a main inspection, the chapter or file shall be named to indicate the upstream manhole station or number and then the downstream manhole station or number (e.g. MH1-MH2). In the event of a service connection inspection, the chapter or file shall be named to indicate the house number or lot number associated with the inspection. All file naming should match the identification numbers (manhole station or number, house number, or lot number) shown on the Record Drawings. The submitted video must have the ability to be viewed using fast forward and rewind.

Any video that does not clearly show the pipe and service connections will be rejected. In the event that repairs are made, the segment receiving the repairs shall be flushed and televised again. The Engineer must oversee the entire cleaning and televising process. Final approval of the video inspection will only be after the Engineer has reviewed the video in the office (videos will not be field approved).

No direct payment will be made for cleaning and video inspection, as such work will be incidental to the installation of the pipe and/or service connections.

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Page 15-13, Article 1520-4, Measurement and Payment:

Add the following:

All materials, permits, and work performed to reconnect existing sewer services to new cleanouts will be considered incidental to the installation of Sanitary Sewer Clean-Out.

Page 15-14, Article 1525-2, Materials

In the first paragraph, add the following after the second sentence:

All manhole joints shall be sealed on the outside of the manhole with butyl adhesive tape (minimum 6" wide). When unstable subgrade is encountered, manholes shall be bedded on stabilization stone. Manholes on outfalls shall be built 24" above existing ground unless a Type "B" manhole is used or the manhole is in a yard. Precast reinforced concrete manholes used on right-of-way maintained by the North Carolina Department of Transportation must be approved the North Carolina Department of Transportation before being installed.

Page 15-14, Article 1525-2, Materials

First paragraph, delete the third sentence in its entirety.

Replace with the following: "Flexible manhole connectors shall conform to ASTM C923."

Page 15-14, Article 1525-2, Materials

On Line 10, add the following:

Connectors shall be manufactured by Press-Seal Gasket Corporation, Hamilton Kent, NPC Inc. or approved equal.

Page 15-14, Article 1525-2, Materials

Replace the second paragraph (Lines 12 – 16) with the following:

Type 1 manhole rings and covers will be made of cast iron and will conform to ASTM A48, Class 35B. In addition, all manhole rings and covers shall be designed to support an H-20 wheel load. All castings will conform to the shape and dimensions shown on the City of Winston- Salem detail drawing for "Manhole Ring and Cover (Type 1)" and will be free from holes, cracks or any other defects. Rings and covers will have machined seats so that the cover will not rattle. Rings will weigh a minimum of 190 pounds and covers a minimum of 120 pounds. The name of the manufacturer and the part number shall be cast permanently on the ring and the cover. Castings that do not meet specifications shall be rejected. Type 2 manhole rings and covers shall meet all specifications for Type 1 rings and covers and shall conform to the City of Winston-Salem detail drawing for "Manhole Ring and Cover (Type 2)". Type 3 manhole rings and covers shall meet all specifications for Type 1 rings and covers, except that rings will weigh a minimum of 136 pounds and covers a minimum of 120 pounds. All rings and covers shall conform to the City of Winston-Salem detail drawing for "Manhole Ring and Cover (Type 3)".

Page 15-14, Article 1525-3, Construction Methods

In the second paragraph, first sentence, delete "resilient" and replace with "flexible".

Delete the second and third sentences in their entirety.

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Page 15-14, Article 1525-3, Construction Methods

In the fifth paragraph, fourth sentence, delete “recommended but not required”, and replace with “required, except for horseshoe (doghouse) manholes”.

Page 15-15, Sub-Article 1525-3 (D), Testing

Replace with the following:

Each manhole constructed by the Contractor shall be vacuum tested by the Contractor after assembly of the manhole. Prior to testing, and as directed by the Engineer, the Contractor shall clean out each manhole without foreign material being discharged into the existing sanitary sewer system. The test shall be conducted in accordance with ASTM C-1244. The test shall be performed after all grade rings and rings and covers have been installed. After the testing equipment is in place, a vacuum of 10 inches of mercury shall be drawn on the manhole. The time for the vacuum to drop to 9 inches of mercury must be greater than the minimum time listed below:

Minimum Vacuum Test Time (Seconds)

Manhole Depth	Diameter of Manhole		
	4'	5'	6'
0' - 10'	60 sec.	75 sec.	90 sec.
10' - 15'	75 sec.	90 sec.	105 sec.
15' - 25'	90 sec.	105 sec.	120 sec.
25' - 30'	105 sec.	120 sec.	135 sec.

The Engineer shall be present during the entire testing process. Any subsequent repairs to manholes which fail the vacuum test must be made on the inside and outside of each manhole. The Contractor will be responsible for the complete removal of all plugs.

No direct payment will be made for vacuum testing of manholes, as such work will be incidental to the installation of the manhole.

Page 15-16, Subarticle 1530-3 (A), Abandoning Pipe

Add the following paragraph:

When abandoning water mains up to a main that is to remain in service, any valve or tee associated with the main to be abandoned shall be removed. A sleeve and any necessary piping shall be installed to reconnect the water main to remain in service. All other main line valves on abandoned water mains that are plugged and left in place shall be abandoned by removing the valve box. Hydrants connected to abandoned mains that are plugged and left in place shall also be abandoned by removing the hydrant and valve box. The work covered in this paragraph shall be considered incidental to the abandonment.

Page 15-17, Subarticle 1530-3 (C), Remove Water Meter

Replace the first sentence with the following:

Remove water meter by closing the corporation cock at the main and removing the lateral including the angle valve, setter and meter box.

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Page 15-17, Subarticle 1530-3 (D), Remove Fire Hydrant

Replace the first paragraph with the following: “The work performed to remove a hydrant from a main to be left in service shall include removing the hydrant, valve box and hydrant tee. A sleeve and any necessary piping shall be installed to reconnect the water main to be left in service.”

Replace the second paragraph with the following: “Removed hydrants shall be provided to the City.”

Page 15-17, Article 1530-3 Construction Methods

Add the following Subarticle:

(E) Abandoning Sewer Connections

Sewer connections shall be abandoned by removing the cleanout stack (if one exists) and plugging the lateral at the base of the stack. If no cleanout exists, the Contractor shall plug the lateral at the right-of-way line.

Page 15-17, Article 1530-4 Measurement and Payment

After the fourth paragraph, add the following paragraph: “*Abandon Sewer Connections* will not be measured and paid.”

Page 15-18, Article 1540-2, Materials

Add the following:

<u>Item</u>	<u>Section</u>
Casing Spacers	1036-11

Page 15-18, Subarticle 1540-3 (D), Carrier Pipe Installation

Replace the first paragraph with the following:

Carrier pipe installed through encasement shall be ductile iron flexible restrained joint pipe. Casing spacers are required and shall be placed at 10-foot intervals within the encasement. One spacer shall be placed not more than 2 feet from each end of the encasement. Only the runners of the casing spacer shall be in contact with the encasement. The bell of the carrier pipe will not be allowed to be in contact with the encasement. The Engineer must be present to observe the entire installation of the carrier pipe.

Page 15-20, Subarticle 1550-4 (A), Bore and Jack

Add the following paragraphs after Line 44:

As the boring operation progresses, each new section of encasement pipe shall be butt-welded to the previously installed section. Voids are to be filled with a Portland cement grout consisting of one (1) part Portland cement grout to three (3) parts sand at sufficient pressure to insure there will be no settlement of the highway or railroad. In the event that an obstruction is encountered during the dry boring operation, the auger is to be withdrawn, the excess pipe cut off and capped, and the pipe abandoned by completely filling the void with Portland cement grout as described above.

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Encasement pipe installed either trenchless or by open-cut shall be installed prior to laying the carrier pipe within 50 feet of either end of the encasement. The Contractor is responsible for using the methods and equipment needed to attain the alignment, grade and elevation shown on the Engineer's drawings. Any deviations shall be corrected at the Contractor's expense.

Additional attempts may be required at alternate locations as directed by the Engineer. The option to install the encasement by open-cutting shall not be permitted unless approved by the Engineer and, when applicable, the North Carolina Department of Transportation. If approved, open-cut encasement shall be installed per Section 1505 for excavation, trenching, pipe laying and backfill.

City of Winston-Salem Acceptable Product List:

Hydrants accepted by the City of Winston-Salem are as follows:

- (1) Super Centurion 250, manufactured by Mueller Company
- (2) B-84-B-5, manufactured by American Flow Control
- (3) K -81D Guardian, manufactured by Kennedy Valve Company
- (4) Medallion , Manufactured by Clow Valve Company

Gate valves furnished under these specifications must be manufactured by one of the following:

- (1) Clow Valve Company
- (2) M & H Valve Company
- (3) American Flow Control
- (4) U.S. Pipe and Foundry Company
- (5) Mueller Company
- (6) Kennedy Valve Company

Approved tapping saddles are as follows:

- (1) American Flow Control
- (2) U.S. Pipe and Foundry Company

Approved tapping sleeves are as follows:

- (1) Mueller Company
- (2) American Flow Control
- (3) Tyler Pipe Company
- (4) U.S. Pipe and Foundry Company
- (5) Kennedy Valve Company

Approved tapping valves are as follows:

- (1) Clow Valve Company
- (2) M & H Valve Company
- (3) American Flow Control
- (4) U.S. Pipe and Foundry Company
- (5) Mueller Company
- (6) Kennedy Valve Company

All corporation cocks shall be: 3/4", 1", 1 1/2" and 2"- FB1000-G by Ford or 74701BT by McDonald.

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Saddles shall be Model 202SSU by Romac Industries, Inc. or Model F202-SSB by Ford.

A. 3/4" Water Connection

1. Meter yoke- Y501 by Ford, H-5010 by Mueller or 14-1 by McDonald.
2. Angle ball valve with padlock wings- BA94-313W-G-NL by Ford (City side).
3. Angle ball valve without padlock wings- BA94-313-G-NL by Ford (property side).

B. 1" Water Connection

1. Meter Yoke - Y504 by Ford.
2. Angle ball valve with padlock wings- BA94-444W-G-NL by Ford- two required.

C. 1-1/2" Water Connection

Custom-setter with ball valve bypass and ball valves on inlet and outlet. (VBB76-12B-11-66-NL by Ford) as per City detail drawing.

D. 2" Water Connection

Custom-setter with ball valve bypass and ball valves on inlet and outlet (VBB77-12B-11-77-NL by Ford) as per City detail drawing.

METER BOXES (CAST IRON - 5/ 8" AND 1" METERS): Cast iron meter boxes furnished under these specifications shall be manufactured by one of the following:

- (1) Sigma Corp.
- (2) SIP Industries
- (3) DSI International
- (4) Star pipe Products
- (5) Tri Cast Inc.

METER BOXES (POLYMER CONCRETE- 1 1/2" AND 2" METERS): Part numbers are as follows:

Box: PG2436B500

Cover: PG2436WAP1-50

Approved ductile iron flexible restrained joint pipe and fittings are as follows:

- (1) Flex Ring by American
- (2) TR-Flex by US Pipe
- (3) TR-Flex by McWane

Approved flexible manhole connectors are as follows:

- (1) Press-Seal Gasket Corporation
- (2) Hamilton Kent

Approved manhole rings and covers are as follows:

- (1) East Jordan Iron Works
- (2) U.S. Foundry & Manufacturing Corp.

All interior linings for a sewer ductile iron pipe and fittings shall be Protecto 401™.

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All butyl adhesive tape used for joint sealant on the exterior of manholes shall be EZ Wrap by Press-Seal Gasket Corporation.

All interior linings for ductile iron flexible restrained joint pipe and fittings shall be Protecto 401™.



General:

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

- A. Duke Energy – Power (Distribution)
- B. AT&T Distribution
- C. Charter
- D. Piedmont Natural Gas
- E. ATT Long Line
- F. Cell Tower
- G. Duke Transmission

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 Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utility by Others Plans.

A) Duke Energy – Power (Distribution)

Contact Information: Patrick Sizemore
336-917-2522
Patrick.sizemore@duke-energy.com

- 1) See Utilities by Others Plans.

B) AT&T Distribution

Contact Information: Mike Felts
Telics
336-391-4843
Mike.felts@att.com

- 1. See Utilities by Others Plans.

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C) Charter

Contact Information: David Hardy
336-451-6818
David.hardy1@charter.com

1. See Utilities by Others Plans.

D) Piedmont Natural Gas (PNG)

Contact Information: Kenneth State
2300 lowery Street
Winston Salem, NC 27101
339-726-7769
kenneth.state@duke-energy.com

1. See Utilities by Others Plans.

E) ATT Long Line

Contact Information: Levi Kendrick
DH Communications
levi_kendrick@windstream.net

1. See Utilities by Others Plans.

F) Cell Tower

Contact Information: Bryce Pickens
704-405-6541
Bryce.pickens@crowncastle.com

G) Duke Transmission

Contact Information: Will Metcalfe, PMP
704-620-9170
Will.metcalfe@duke-energy.com

1. See Utility by Others Plans
2. Duke Transmission will need 18 months to complete relocations and should be completed by February 2024.
3. Coordination with Duke Transmission will allow contractor to work within Transmission limits without delays.

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**Project Special Provisions
Erosion Control**

STABILIZATION REQUIREMENTS:

(4-30-2019)

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

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

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

SEEDING AND MULCHING:**(West)**

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

Shoulder and Median Areas

August 1 - June 1

20#	Kentucky Bluegrass
75#	Hard Fescue
25#	Rye Grain
500#	Fertilizer
4000#	Limestone

May 1 - September 1

20#	Kentucky Bluegrass
75#	Hard Fescue
10#	German or Browntop Millet
500#	Fertilizer
4000#	Limestone

**Project Special Provisions
Erosion Control**

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 - June 1

100#	Tall Fescue
15#	Kentucky Bluegrass
30#	Hard Fescue
25#	Rye Grain
500#	Fertilizer
4000#	Limestone

May 1 - September 1

100#	Tall Fescue
15#	Kentucky Bluegrass
30#	Hard Fescue
10#	German or Browntop Millet
500#	Fertilizer
4000#	Limestone

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

**Project Special Provisions
Erosion Control**

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	

Approved Kentucky Bluegrass Cultivars:

4-Season	Blue Velvet	Gladstone	Quantum Leap
Alexa II	Blueberry	Granite	Rambo
America	Boomerang	Hampton	Rhapsody
Apollo	Brilliant	Harmonie	Rhythm
Arcadia	Cabernet	Impact	Rita
Aries	Champagne	Jefferson	Royce
Armada	Champlain	Juliet	Rubicon
Arrow	Chicago II	Jump Start	Rugby II
Arrowhead	Corsair	Keeneland	Shiraz
Aura	Courtyard	Langara	Showcase
Avid	Delight	Liberator	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mercury	Sonoma
Bandera	Eagleton	Midnight	Sorbonne
Barduke	Emblem	Midnight II	Starburst
Barnique	Empire	Moon Shadow	Sudden Impact
Baroness	Envicta	Moonlight SLT	Total Eclipse
Barrister	Everest	Mystere	Touche
Barvette HGT	Everglade	Nu Destiny	Tsunami
Bedazzled	Excursion	NuChicago	Unique
Belissimo	Freedom II	NuGlade	Valor
Bewitched	Freedom III	Odyssey	Voyager II
Beyond	Front Page	Perfection	Washington
Blacksburg II	Futurity	Pinot	Zinfandel

**Project Special Provisions
Erosion Control**

Blackstone	Gaelic	Princeton 105
Blue Note	Ginney II	Prosperity

Approved Hard Fescue Cultivars:

Aurora II	Eureka II	Oxford	Scaldis II
Aurora Gold	Firefly	Reliant II	Spartan II
Berkshire	Granite	Reliant IV	Stonehenge
Bighorn GT	Heron	Rescue 911	
Chariot	Nordic	Rhino	

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

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

TEMPORARY SEEDING:

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

FERTILIZER TOPDRESSING:

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

SUPPLEMENTAL SEEDING:

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

**Project Special Provisions
Erosion Control**

MOWING:

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

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

18#	Creeping Red Fescue
8#	Big Bluestem
6#	Indiangrass
4#	Switchgrass
35#	Rye Grain
500#	Fertilizer
4000#	Limestone

May 1 – September 1

18#	Creeping Red Fescue
8#	Big Bluestem
6#	Indiangrass
4#	Switchgrass
25#	German or Browntop Millet
500#	Fertilizer
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.

**Project Special Provisions
Erosion Control**

Measurement and Payment

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

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
SP	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
SP	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

**Project Special Provisions
Erosion Control**

Construction Methods

Provide an approved subcontractor who performs an erosion control action as described in Form 1675. 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

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.

**Project Special Provisions
Erosion Control**

Construction Materials Management

(3-19-19) (rev. 04-24-19)

Description

The requirements set forth shall be adhered to in order to meet the applicable materials handling requirements of the NCG010000 permit. Structural controls installed to manage construction materials stored or used on site shall be shown on the E&SC Plan. Requirements for handling materials on construction sites shall be as follows:

Polyacrylamides (PAMS) and Flocculants

Polyacrylamides (PAMS) and flocculants shall be stored in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures designed to protect adjacent surface waters. PAMS or other flocculants used shall be selected from the NC DWR List of Approved PAMS/Flocculants. The concentration of PAMS and other flocculants used shall not exceed those specified in the NC DWR List of Approved PAMS/Flocculants and in accordance with the manufacturer's instructions. The NC DWR List of Approved PAMS/Flocculants is available at:

https://files.nc.gov/ncdeq/Water%20Quality/Environmental%20Sciences/ATU/ApprovedPAMS4_1_2017.pdf

Equipment Fluids

Fuels, lubricants, coolants, and hydraulic fluids, and other petroleum products shall be handled and disposed of in a manner so as not to enter surface or ground waters and in accordance with applicable state and federal regulations. Equipment used on the site must be operated and maintained properly to prevent discharge of fluids. Equipment, vehicle, and other wash waters shall not be discharged into E&SC basins or other E&SC devices. Alternative controls should be provided such that there is no discharge of soaps, solvents, or detergents.

Waste Materials

Construction materials and land clearing waste shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (15A NCAC 13B). Areas dedicated for managing construction material and land clearing waste shall be at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. Paint

**Project Special Provisions
Erosion Control**

and other liquid construction material waste shall not be dumped into storm drains. Paint and other liquid construction waste washouts should be located at least 50 feet away from storm drain inlets unless there is no alternative. Other options are to install lined washouts or use portable, removable bags or bins. Hazardous or toxic waste shall be managed in accordance with the federal Resource Conservation and Recovery Act (RCRA) and NC Hazardous Waste Rules at 15A NCAC, Subchapter 13A. Litter and sanitary waste shall be managed in a manner to prevent it from entering jurisdictional waters and shall be disposed of offsite.

Herbicide, Pesticide, and Rodenticides

Herbicide, pesticide, and rodenticides shall be stored and applied in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, North Carolina Pesticide Law of 1971 and labeling restrictions.

Concrete Materials

Concrete materials onsite, including excess concrete, must be controlled and managed to avoid contact with surface waters, wetlands or buffers. No concrete or cement slurry shall be discharged from the site. (Note that discharges from onsite concrete plants require coverage under a separate NPDES permit – NCG140000.) Concrete wash water shall be managed in accordance with the *Concrete Washout Structure* provision. Concrete slurry shall be managed and disposed of in accordance with *NCDOT DGS and HOS DCAR Distribution of Class A Residuals Statewide* (Permit No. WQ0035749). Any hardened concrete residue will be disposed of, or recycled on site, in accordance with state solid waste regulations.

Earthen Material Stock Piles

Earthen material stock piles shall be located at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available.

Measurement and Payment

Conditions set within the *Construction Materials Management* provision are incidental to the project for which no direct compensation will be made.

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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*.

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.

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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

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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:

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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

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compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item

Permanent Soil Reinforcement Mat

Pay Unit

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

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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

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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.

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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 and ___" *Skimmer* 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 16206 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

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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

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.

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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

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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*.

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___" *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 and no separate payment will be made. No separate payment shall be made if 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 16206 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

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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

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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.

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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:

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 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 in.
Minimum Length	10 ft.
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:

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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.

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

A trench shall be excavated the entire length of the coir fiber wattle with a depth of 1 to 2 inches for the wattle to be placed. Silt Fence Coir Fiber Wattle Breaks shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each wattle. A minimum of 4 stakes shall be installed on the downslope side of the wattle with a maximum spacing of 2 linear feet, and according to the detail. Install a minimum of 2 stakes on the upslope side of the Silt Fence Coir Fiber Wattle Break 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.

Install Temporary Silt Fence in accordance with section 1605 of the Standard Specifications and overlap each downslope side of silt fence wattle break by 6 in.

The Contractor shall 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 shall remove and dispose of silt accumulations at the Silt Fence Coir Fiber Wattle Breaks when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Silt Fence Coir Fiber Wattle Break will be measured and paid for by the actual number of linear feet of Silt Fence Coir Fiber Wattle Breaks 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 *Silt Fence Coir Fiber Wattle Break*.

Payment will be made under:

Pay Item
Coir Fiber Wattle

Pay Unit
Linear Foot

**Project Special Provisions
Erosion Control**

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. \pm 10%
Net Material	Coir (Coconut) or Synthetic
Net Openings	2" x 2"
Net Strength	90 lb.
Minimum Weight	10 lb./ft. \pm 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

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Erosion Control**

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.

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Erosion Control**

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.

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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

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:

**Project Special Provisions
Erosion Control**

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

**Project Special Provisions
Erosion Control**

CONCRETE WASHOUT STRUCTURE:

(12-10-20)

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 wash 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. Install safety fence as directed for visibility to construction traffic.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

**Project Special Provisions
Erosion Control**

<https://connect.ncdot.gov/resources/roadside/SoilWaterDocuments/ConcreteWashoutStructuredetail.pdf>

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 or commercially available devices are approved, then those devices 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*.

Safety Fence shall be measured and paid for as provided elsewhere in this contract.

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

FABRIC INSERT INLET PROTECTION DEVICE (HIGH FLOW)

(6-29-17)

**Project Special Provisions
Erosion Control**

Description

This work shall consist of installing, maintaining, and removing *Fabric Insert Inlet Protection Device*, of the type specified, in inlet structures (catch basins, drop inlets, etc) in areas where asphalt or concrete may prevent the proper installation of a Rock Inlet Sediment Traps Type C, or as directed.

Materials

The product shall be a fabric inlet protection device composed of a fitted woven polypropylene geotextile double sewn with nylon thread suspended sack. The *Fabric Insert Inlet Protection Device* shall be manufactured to fit the opening of the catch basin or drop inlet or shall have a deflector to direct runoff from the curb opening into the fabric sack. The *Fabric Insert Inlet Protection Device* shall have a rigid frame or support system to support the loaded weight of the product. The product shall have lifting loops for removing the device from the basin and will have dump straps attached at the bottom to facilitate the emptying of the device. The *Fabric Insert Inlet Protection Device* shall have an overflow system to allow stormwater to enter the inlet structure and avoid ponding on the roadway when the device reaches capacity. The stitching shall meet the following physical properties:

Physical	Test Method	English
Average Wide Width Strength	ASTM D-4884	165 lb/in

The fitted filter assembly shall have the following physical properties:

Physical	Test Method	English
Grab Tensile	ASTM D-4632	255 x 275 lbs
Minimum Puncture Strength	ASTM D-4833	125 lbs
Mullen Burst	ASTM D-3786	420 PSI
Minimum UV Resistance	ASTM D-4355	70 %.
Flow Rate	ASTM D-4491	200 gal/min/ft ²
Apparent Opening	ASTM D-4751	20 US Sieve
Permittivity	ASTM D-4491	1.5 sec ⁻¹

Construction Methods

Strictly comply with manufacturer's installation instructions and recommendations. Maintenance shall include regular daily inspections and after each qualifying rain event. The *Fabric Insert Inlet Protection Device* shall be emptied, cleaned and placed back into the basin when it reaches 50% capacity or as directed.

**Project Special Provisions
Erosion Control**

Measurement and Payment

This work will be paid for at the contract unit price per *Fabric Insert Inlet Protection Device* of the type specified, complete in place and accepted. Such payment shall be full compensation for furnishing and installing the *Fabric Insert Inlet Protection Device* in accordance with this specification and for all required maintenance.

Maintenance of the device, cleanout and disposal of accumulated sediments shall be paid for by *Fabric Insert Inlet Protection Device Cleanout*.

Payment will be made under:

Pay Item	Pay Unit
Fabric Insert Inlet Protection Device	Each
Fabric Insert Inlet Protection Device Cleanout	Each

CULVERT DIVERSION CHANNEL:**Description**

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

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

Grade channel according to the plans with channel surface free of obstructions, debris, and pockets of low-density material. Utilize suitable material and provide disposal area for unsuitable material.

Line channel with 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

**Project Special Provisions
Erosion Control**

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

Culvert Diversion Channel will be measured and paid for as the actual number of cubic yards excavated, as calculated from the typical section throughout the length of the diversion channel 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*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of *Culvert Diversion Channel*.

Payment will be made under:

Pay Item	Pay Unit
Culvert Diversion Channel	Cubic Yard

Litter Removal (Mowing Areas Only):

(07-19-22)

Description

This work consists of the pickup, removal, and disposal of litter from roadsides within the construction project prior to mowing operations.

Construction Methods

Provide labor, equipment and materials necessary for the pickup and removal of litter from non-construction sources and the disposal of same into state approved landfills. The Contractor shall abide by all ordinances, laws and regulations regarding disposal of litter and recycling of eligible materials. Wastes generated from construction activities shall be managed as provided elsewhere in the contract. Litter items may consist of any item not considered normal to the right-of-way, including but not limited to, varied sizes of bottles, cans, paper, tires, tire pieces, lumber, vehicle parts, building supplies, metals, household furnishings, cardboard, plastics, ladders, brush and other items not considered normal to the right of way. Litter removal shall be performed in designated areas within five days prior to any mowing operations and as directed by the Engineer.

**Project Special Provisions
Erosion Control**

Designated areas shall include vegetated medians and shoulders within the project limits including all interchange ramps and other areas to be mown. Designated areas may be omitted for litter removal by the Engineer due to safety concerns.

The Contractor shall provide adequate personnel and materials to collect and remove litter. The Contractor shall be responsible for locating and utilizing approved local landfills and recycling facilities. Refer to Section 105-27 of the *Standard Specifications* for potential hazardous materials. All collected litter shall be containerized immediately and kept off the traveled portions of the roadway, shoulders, and rights-of-way (including paved shoulders). All collected litter that is small enough to be placed in a bag shall be bagged immediately. All collected litter that is too large for a bag shall be placed into a vehicle. Extended storage or stockpiling of collected litter and recyclables will not be permitted.

The Contractor's personnel shall dispose of any litter in a landfill approved by North Carolina Division of Waste Management. The Contractor will not be allowed to use NCDOT accounts at the landfills/recycling centers nor be allowed to dispose of the litter in NCDOT trash containers on any NCDOT property.

The Contractor shall report online the number of bags of litter and any recycling on the NCDOT Litter Management Website on the date of the pickup at the following website:

<https://apps.ncdot.gov/LM>

An access code ('Pickup Key') for the online reporting portal may be obtained via emailing the Roadside Environmental Unit Litter Management Section at ncdot.clr@ncdot.gov. The Contractor shall request access to the litter removal reporting website prior to starting initial litter collection operations.

Measurement and Payment

The quantity of litter removal to be performed will be affected by the actual conditions that occur during construction of the project. The quantity of litter removal may be increased, decreased, or eliminated entirely as directed by the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Manual Litter Removal will be measured and paid as the actual number of man hours each worker spends picking up litter. Such price and payment will be full compensation for all litter removal work covered by *Litter Removal*, including, but not limited to, furnishing all materials, labor, equipment, transport, reporting, and incidentals necessary to accomplish the work.

**Project Special Provisions
Erosion Control**

Litter Disposal will be measured and paid for by the actual number of tons of litter collected and properly disposed of at a state approved landfill. Such price and payment will be full compensation for all fees, labor, transport, and incidentals necessary to dispose of collected litter associated with *Litter Removal*.

All traffic control necessary to provide a safe work area for *Litter Removal* shall be paid for as specified elsewhere in the contract.

Payment will be made under:

Pay Item	Pay Unit
Manual Litter Removal	MHR
Litter Disposal	TON

TACK FOR MULCH FOR EROSION CONTROL:

(07-19-22)

Description

This work consists of supplying and installing of an approved material for binding mulch for erosion control in accordance with Section 1060-5, Section 1615 and Section 1660 of the *Standard Specifications*. This provision defines acceptable materials and rates for tacking material for holding mulch in place.

Materials

(a) Emulsified Asphalt

Asphalt emulsion tack shall conform to the requirements of AASHTO M 140, Specification for Emulsified Asphalt. The emulsified asphalt may be rapid setting, medium setting, or slow setting. Apply emulsified asphalt tackifier at a rate of 0.10 gallons per square yard (approximately 484 gallons per acre).

(b) Cellulose Hydromulch

Cellulose hydromulch products shall be non-toxic, weed-free, prepackaged cellulose fiber (pulp) material containing no more than 3% ash or other inert materials. Cellulose hydromulches may contain dyes or binders specifically formulated to enhance the adhesive qualities of the hydromulch. Apply cellulose hydromulches at a rate of 1000 pounds (dry weight) per acre.

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Erosion Control**

Wood fiber or wood fiber blend hydromulches may be substituted for cellulose hydromulch at the same application rate.

(c) Other tackifiers

Other approved materials, specifically designed and manufactured for application as a straw mulch tacking agent, may be used at the manufacturer's recommended rate.

Construction Methods

Apply the Tack for Mulch for Erosion Control uniformly across straw mulch per Section 1615 and Section 1660 of the *Standard Specifications*.

Payment

Tack for Mulch for Erosion Control is incidental to the application of *Temporary Mulching*, Section 1615-4, and *Seeding and Mulching*, Section 1660-8, and no additional payment will be made.

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.

**Project Special Provisions
Erosion Control**

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.

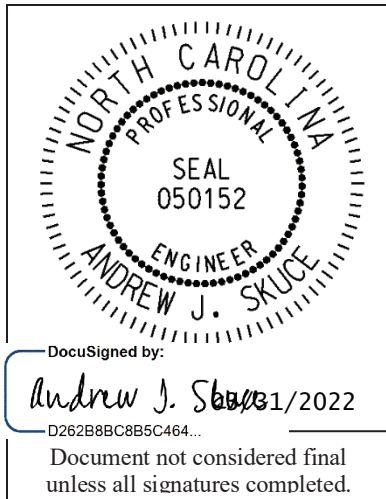
Payment will be made under:

Pay Item

Impervious Dike

Pay Unit

Linear Foot



Intelligent Transportation Systems Project Special Provisions

Prepared By: JCW
30-Mar-22

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1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read “Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications*, *Standard Drawings*, and the project plans.”

Page 17-4, revise sentence beginning on line 21 to read “Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications*, *Standard Drawings*, and test requirements.”

1.2. GENERAL REQUIREMENTS – Construction Methods (1700-3(M))

Page 17-4, Replace the sentence beginning on line 41 with “Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer.”

1.3. WOOD POLES – Construction Methods (1720-3)

Page 17-18, revise sentence starting on line 13 to read “On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole.”

2. METAL POLE SUPPORTS

2.1. METAL POLES

A. General:

Furnish and install metal poles, grounding systems, and all necessary hardware. Work covered under this special provision includes requirements for design, fabrication, and installation of standard and custom/site-specific designed metal pole supports and associated foundations.

Comply with applicable sections of the *2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications*. Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 (hereinafter 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.

For bid purposes, pole heights shown on plans are estimated from available data. Prior to furnishing metal poles, use field measurements and adjusted cross-sections to determine whether pole heights will meet required clearances. If pole heights do not meet required clearances, the Contractor should immediately notify the Engineer of the required revised pole heights.

Standard Drawings for Metal Poles are available that supplement these project special provisions. The drawings are located on the Department’s website:

<https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx>

Comply with article 1098-1B of the *Standard Specifications* for submittal requirements. Furnish shop drawings for approval. Provide copies of detailed shop drawings for each type of structure as summarized below. Ensure shop drawings include material specifications for each component. Ensure shop drawings 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.** Ensure shop drawings contain an itemized bill of materials for all structural components and associated connecting hardware.

Comply with article 1098-1A of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, signal or asset inventory number(s) and project number or work order number.

Summary of information required for metal pole review submittal:

Item	Electronic Submittal	Comments / Special Instructions
Sealed, Approved Signal or ITS Plan/Loading Diagram	1 set	All structure design information needs to reflect the latest approved Signal or ITS plans
Custom Pole Shop Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a <u>unique drawing number</u> for each project.
Standard Strain Pole Shop Drawings (from the QPL)	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a <u>unique drawing number</u> for each project.
Structure Calculations	1 set	Not required for Standard QPL Poles
Standard Strain Pole Foundation Drawings	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 M8.
Custom Foundation Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a <u>unique drawing number</u> for each project. If QPL Poles are used, include the corresponding QPL pole shop drawings with this submittal.
Foundation Calculations	1 set	Submit copies of LPILE input, output, and pile tip deflection graph per Section titled Drilled Pier Foundations for Metal Poles of this specification for each foundation. Not required for Standard Strain Poles (from the QPL)

Soil Boring Logs and Report	1 set	Report shall 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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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 signal or asset inventory number(s).

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 shall 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 from coil or plate steel that meet the requirements of ASTM A 595 Grade A tubes. For structural steel shapes, plates, and bars use, as a minimum, ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent. Provide pole shafts of round or near round (18 sides or more) cross-section, or multi-sided tubular cross-section with no less than six sides, having a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single-ply plate or coil. For anchor base fabrication, conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Use the submerged arc process, or other NCDOT previously approved process suitable for shafts, to continuously weld pole shafts along their entire length. Finish the longitudinal seam weld flush with the outside contour of the base metal. Ensure shaft has no circumferential welds except at the lower end joining the shaft to the pole 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*. No field welding on any part of the pole will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel poles and all assembly components in accordance with section 1076-3 of the *Standard Specifications*. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Galvanize hardware in accordance with section 1076-4 of the *Standard Specifications*. Ensure threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing in accordance with section 1076-7 of the *Standard Specifications*. Ensure all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring the Designer/Fabricator specifies connecting hardware and/or materials that prevent a dissimilar metal corrosive reaction.

Ensure each anchor rod is 2-inch minimum diameter and 60-inch length. Provide 10-inch minimum thread projection at the top of the rod, and 8-inch minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials complying with SP09_R005, hereinafter referred to as *Foundations and Anchor Rod Assemblies for Metal Poles*.

Ensure anchor bolt hole diameters are ¼-inch larger than the anchor bolt diameters in the base plate.

Provide a circular anchor bolt lock plate securing the anchor bolts at the embedded end with two (2) washers and two (2) nuts. Provide a base plate template matching the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼-inch minimum thick steel with a minimum width of 4 inches. Hot-dip galvanizing is not required for both plates.

Provide four (4) heavy hex nuts and four (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. Ensure anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

For each pole, provide a grounding lug with a ½-inch minimum thread diameter, coarse thread stud and nut that will accommodate #4 AWG ground wire. Ensure 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 cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy stainless-steel chain that is long enough to permit cap to hang clear of the pole-top opening when cap is removed.

Where required by the plans, furnish couplings 42 inches above bottom of the pole base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1½-inch internally threaded half-couplings complying with the NEC, mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required hot-dip galvanizing. Provide a threaded plug in each mounting point. Ensure the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed slot that will accommodate a ½ "drive standard socket wrench.

Metal poles may be erected and fully loaded after concrete has attained a minimum allowable compressive strength of 3,000 psi.

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

When field drilling is necessary for wire or cable entrances into the pole, comply with the following requirements:

- Do not drill holes within 2 inches of any welds.
- Do not drill any holes larger than 3 inches in diameter without checking with the ITS & Signals Structure Engineers.
- Avoid drilling multiple holes along the same cross section of tube shafts.
- Install rubber grommets in all field drilled holes that wire, or cable will directly enter unless holes are drilled for installation of weather heads or couplings.
- Treat the inside of the drilled holes and repair all galvanized surfaces in accordance with Section 1076-7 of the latest edition of the *Standard Specification prior to installing grommets, caps, or plugs*.
- Cap or plug any existing field drilled holes that are no longer used with rubber, aluminum, or stainless-steel hole plugs.

When street lighting is installed on metal signal structures, isolate the conductors feeding the luminaires inside the pole shaft using liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or

approved equivalent.. All conductors supplying power for luminaires must run through an external disconnect prior to entrance into the structure. Comply with applicable National Electrical Safety Codes (NESC). Refer to Article “G” Luminaire Arms.

Install a ¼-inch thick plate for a concrete foundation tag to include the following information: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation. Install galvanized wire mesh to cover gap between the base plate and top of foundation for debris and pest control. Refer to standard drawing M7 for further details.

Immediately notify the Engineer of any structural deficiency that becomes apparent in any assembly, or member of any assembly, because of the design requirements imposed by these specifications, the plans, or the typical drawings.

C. Design:

Unless otherwise specified, design all metal pole support structures using the following 6th Edition AASHTO specifications:

- Design for a 50-year service life as recommended by Table 3.8.3-2.
- Use wind pressure map developed from 3-second gust speeds, as provided in Section 3.8.
- Assume wind loads as shown in Figures 3.9.4.2-2 and 3.9.4.2-3 of the 6th Edition AASHTO for Group III loading with Ice.
- Ensure metal pole support structures include natural wind gust loading and truck-induced gust loading for fatigue design, as provided in Sections 11.7.1.2 and 11.7.1.3, respectively. Designs need not consider periodic galloping forces.
- Assume 11.2 mph natural wind gust speed in North Carolina. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) based on the yearly mean wind velocity of 11.2 mph.
- When selecting Fatigue Importance Factors, utilize Fatigue Importance Category II, as provided for in Table 11.6-1, unless otherwise specified.
- Calculate all stresses using applicable equations from Section 5. The Maximum allowable stress ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements. For CCTV support structures, ensure maximum deflection at top of pole does not exceed 2.0 percent of pole height.
- 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 the cable bundle is 1.3 inches.

Unless otherwise specified by special loading criteria, the following computed surface area for ice load on signal heads shall be used:

- 3-section, 12-inch, Surface area: 26.0 ft²
- 4-section, 12-inch, Surface area: 32.0 ft²
- 5-section, 12-inch, Surface area: 42.0 ft²

Design a base plate for 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, 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 (1) 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 (2) 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 (2) 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

D₂ = 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 (2) 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 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 all metal poles, 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 M3 or M4.

The Professional Engineer is wholly responsible for the design of all poles. Review and acceptance of these designs by the Department does not relieve the said Professional Engineer of his or her responsibility.

D. CCTV Poles:

Refer to Metal Pole Standard Drawing Sheets M2 and M3 for fabrication details.

Furnish hand hole covers attached to the pole by a sturdy chain or cable approved by the Engineer. Ensure chain or cable is long enough to permit cover to hang clear of the compartment opening when cover is removed and is strong enough to prevent vandalism. Ensure chain or cable will not interfere with service to cables in the pole shaft.

Furnish and Install the required Air Terminal & Lightning Protection System as described in the "Air Terminal & Lightning Protection System" Project Special Provisions and as referenced in the following Typical Details:

- CCTV Camera Installation for Metal Pole with Aerial Electrical Service
- CCTV Camera Installation for Metal Pole with Underground Electrical Service

Have poles permanently stamped above the hand holes with the identification tag details as shown on Metal Pole Standard Drawing Sheets M2 and M3.

Provide a 2-inch hole equipped with an associated coupling and weatherhead approximately 5 feet below top of pole to accommodate passage of CCTV cables from inside pole to CCTV camera.

Provide a 2-inch hole equipped with an associated coupling and conduit fittings/bodies approximately 18 inches above base of pole to accommodate passage of CCTV cables from CCTV cabinet to inside of pole. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Install CCTV metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Ensure the installed pole, when fully loaded, is within 0.5 degrees of vertical. Where required, use threaded leveling nuts to establish rake.

2.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI-318 code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. Design methods based on engineering publications or research papers must have prior approval from NCDOT. The Department reserves the right to accept or reject any method used for the analysis.

Use the following Safety Factors for the foundation design:

- 1.0 x Service (Unfactored) Loads for LPile Shaft Lateral Deflection
- 1.3 x Torsion (Unfactored) Load for Drilled Shaft Concrete and Steel Strength
- $(1.3 / 1.33)$ x Torsion (Unfactored) Load for Shaft Soil-to-Concrete Torsion Capacity
- $(2.0 / 1.33)$ x Axial (Unfactored) Load for Shaft Axial Capacity in Soil

Ensure deflection at top of foundation does not exceed 1 inch for worst-case lateral load.

Use LPILE Plus V6.0 or later for lateral analysis. Submit inputs, results and corresponding graphs with the design calculations.

Calculate skin friction 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 2.5 feet for cohesive soils when calculating skin friction.

Assume a hammer efficiency of 0.70 unless value is provided.

Design custom foundations to carry maximum capacity of each metal pole. For standard case strain poles with custom design, use actual shear, axial and moment reactions from the Standard Strain Pole 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 allow 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, the Contractor should have foundation designs 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 strain 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 strain 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 B4 (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 strain 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. Any additional cost 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 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.

2. Soil Test:

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

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

- A total of 100 blows have been applied in any two consecutive 6-inch intervals.
- A total of 50 blows have been applied with < 3-inch penetration.

Describe each pole location along the project corridor in a manner that is easily discernible to both the Contractor's Designer and NCDOT Reviewers. If the pole is at an intersection, label the boring the "Intersection of (Route or SR #), (Street Name) and (Route or SR #), (Street Name), _____ County, Signal or Asset Inventory No. _____". Label borings with "B- N, S, E, W, NE, NW, SE or SW" corresponding to the quadrant location within the intersection.

If the pole location is located between intersections, provide a coordinate location and offset, or milepost number and offset. 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.

Borings that cannot be easily correlated to their specific pole location will be returned to the Contractor for clarification; or if approved by the Engineer, the foundation may be designed using the worst-case soil condition obtained as part of this project.

3. Standard Foundation Determination:

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

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest \text{ Boring Depth}}}{\text{Total Number of } N \text{ values}}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest \text{ Boring Depth}})^2$$

$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest \text{ Boring Depth}}$$

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

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

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

OR

$$\text{Average of First Four (4) } N \text{ values} = \frac{N_{@1'} + N_{@2.5'} + N_{@5'} + N_{@7.5'}}{4}$$

Note: If less than four (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 (0) for weight of hammer or weight of rod. If N-value is greater than fifty (50), reduce N-value to fifty (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 Strain Pole Foundations Chart (sheet M8) 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) 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 four (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:

<https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx>

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). Design drilled piers for side resistance in accordance with Section 4.6 of the *2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition*. Use computer software LPILE version-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use 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 resulting in horizontal lateral movement less than 1 inch at top of the pier, and horizontal rotational movement less than 1 inch at the edge of pier. Contact the Engineer for pole loading diagrams of standard poles used for non-standard foundation designs. Submit 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 foundation and Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Standard Special Provision SP09-R005 located at:

<https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx>

2.3. POLE NUMBERING SYSTEM

A. New Poles

Attach an identification tag to each pole shaft section as shown on Metal Pole Standard Sheet M2 “Typical Fabrication Details for All Metal Poles.”

2.4. MEASUREMENT AND PAYMENT

Actual number of *CCTV Metal Poles*() 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.

No measurement will be made for foundation designs prepared with metal pole designs, as these will be considered incidental to designing CCTV support structures.

Payment will be made under:

CCTV Metal Pole (50').....Each
 Soil Test.....Each
 Drilled Pier Foundation.....Cubic Yards

3. ETHERNET EDGE SWITCH

Furnish and install a managed Ethernet edge switch as specified below that is fully compatible, interoperable, and completely interchangeable and functional within the existing City or Division traffic signal system communications network.

3.1. DESCRIPTION**A. Ethernet Edge Switch:**

Furnish and install a hardened, Ethernet Edge Switch (hereafter “edge switch”) for traffic signal controllers as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 100 megabits per second from each remote ITS device location to the routing switches.

Contact the Division to arrange for the programming of the new Ethernet Edge Switches with the necessary network configuration data, including but not limited to, the Project IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum five (5) days working notice to allow the Division to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the Division’s existing Network Management Software.

3.2. MATERIALS**A. General:**

Ensure that the edge switch is fully compatible and interoperable with the trunk Ethernet network interface and that the edge switch supports half and full duplex Ethernet communications.

Furnish an edge switch that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

B. Compatibility Acceptance

The Engineer has the authority to require the Contractor to submit a sample Field Ethernet Switch and Field Ethernet Transceiver along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch and Field Ethernet Transceiver for deployment. **The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City Signal System network, monitoring software and Traffic Operations**

Center network hardware. Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed

C. Standards:

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;
- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications;
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX;
- IEEE 802.3x standard regarding flow control with full duplex operation; and
- IFC 2236 regarding IGMP v2 compliance.
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3ad Ethernet Link Aggregation
- IEEE 802.3i for 10BASE-T (10 Mbit/s over Fiber-Optic)
- IEEE 802.3ab for 1000BASE-T (1Gbit/s over Ethernet)
- IEEE 802.3z for 1000BASE-X (1 Gbit/s Ethernet over Fiber-Optic)

D. Functional:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard.
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous).
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- A minimum 4-kilobit MAC address table.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP).
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.

- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of remote monitoring (RMON-1 & RMON-2) of the Ethernet agent.
- Support of the TFTP and SNMP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

E. Physical Features:

Ports: Provide 10/100/1000 Mbps auto-negotiating ports (RJ-45) copper Fast Ethernet ports for all edge switches. Provide auto-negotiation circuitry that will automatically negotiate the highest possible data rate and duplex operation possible with attached devices supporting the IEEE 802.3 Clause 28 auto-negotiation standard.

Optical Ports: Ensure that all fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide Type LC connectors for the optical ports, as specified in the Plans or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an edge switch having a minimum of two optical 100/1000 Base X ports capable of transmitting data at 100/1000 megabits per second. Ensure that each optical port consists of a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. Ensure that the optical ports have an optical power budget of at least 15 dB.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5E unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

Port Security: Ensure that the edge switch supports/complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access;
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward; and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

F. Management Capabilities:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;

- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and
- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

Network Capabilities: Provide an edge switch that supports/complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON-I groups, at a minimum:
 - Part 1: Statistics
 - Part 2: History
 - Part 3: Alarm
 - Part 9: Event
- Provide support for the following RMON-2 groups, at a minimum:
 - Part 13: Address Map
 - Part 16: Layer Host
 - Part 17: Layer Matrix
 - Part 18: User History
- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet/CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

Network Security: Provide an edge switch that supports/complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and

- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

G. Electrical Specifications:

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

H. Environmental Specifications:

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)
- IEC 61000-6-2 (generic industrial)
- EMF – FCC Part 15 CISPR (EN5502) Class A

I. Ethernet Patch Cable:

Furnish a factory pre-terminated/pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 5e or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB

- Return Loss: 10dB
- Propagation Delay: 548 nsec

3.3. CONSTRUCTION METHODS

A. General:

Ensure that the edge switch is UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 5E and Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the Signal Shop a minimum of 5 days prior to installation for the most current edge switch IP Address, VLAN, subnet mask, default gateway and configuration files.

B. Edge Switch:

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the upper end of the right rear vertical rail of the equipment rack using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware and fasteners.

Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that has connectors on both ends, primarily used for interconnecting termination or patching facilities and/or equipment.

3.4. MEASUREMENT AND PAYMENT

Ethernet edge switch will be measured and paid as the actual number of Ethernet edge switches furnished, installed, and accepted.

No separate measurement will be made for Ethernet patch cable, power cord, mounting hardware, nuts, bolts, brackets, or edge switch programming as these will be considered incidental to furnishing and installing the edge switch.

Payment will be made under:

Ethernet Edge Switch Each

4. DIGITAL CCTV CAMERA ASSEMBLY

4.1. DESCRIPTION

Furnish and install a Digital CCTV Camera Assembly as described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the video management software currently in use by the Region and the Statewide Traffic Operations Center (STOC). Provide a Pelco Spectra Enhanced low light 30X minimum zoom, Axis Dome Network Camera low light 30X minimum zoom or an approved equivalent that meets the requirements of these Project Special Provisions.

Materials

A. General

Furnish and install new CCTV camera assembly at the locations shown on the Plans and as approved by the Engineer. Each assembly consists of the following:

- One dome CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories in a single enclosed unit
- A NEMA-rated enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing.
- Motorized pan, tilt, and zoom
- Built-in video encoder capable of H.264/MPEG-4 compression for video-over IP transmission
- Pole-mount camera attachment assembly
- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components.
- All necessary cable, connectors and incidental hardware to make a complete and operable system.

B. Camera and Lens

1. Cameras

Furnish a new CCTV camera that utilizes charged-coupled device (CCD) technology or Complementary Metal-Oxide-Semiconductor (CMOS) technology. The camera must meet the following minimum requirements:

- Video Resolution: Minimum 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Wide Dynamic Range (WDR) operation
- Electronic Image Stabilization (EIS)
- Automatic focus with manual override

2. Zoom Lens

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

- 30X minimum optical zoom, and 12X minimum digital zoom
- Preset positioning: minimum of 128 presets

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

Communication Standards:

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

Networking Standards:

- Network Connection: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
 - Video 1: H.264 (Main Profile, at minimum)
 - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4, IPv6
- 130 db Wide Dynamic Range (WDR)

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

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

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

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

C. Camera Housing

Furnish new dome style enclosure for the CCTV assembly. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass. The pendant must meet NEMA Type 4X, IP66 rating and use 1-1/2-inch NPT thread. The sustained operating temperature must be -50 to 60C (-58 to 144F), condensing temperature 10 to 100% Relative Humidity (RH).

D. Pan and Tilt Unit

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

- Pan: continuous 360 Degrees rotation
- Tilt: up/down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: minimum of 128 presets
- Low latency for improved Pan and Tilt Control
- FCC, Class A; UL/cUL Listed

E. Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units must be built into the camera housing and require no additional equipment to transmit encoded video over IP networks.

Encoders must have the following minimum features:

- Network Interface: Ethernet 10/100Base-TX (RJ-45 connector)
- Protocols: IPv4, Ipv6, HTTP, UpnP, DNS, NTP, RTP, RTSP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface
- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps – 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

F. Control Receiver/Driver

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

- Zoom in/out
- Automatic focus with manual override
- Tilt up/down
- Automatic iris with manual override
- Pan right/left
- Minimum 128 preset positions for pan, tilt, and zoom, 16 Preset Tours, 256 Dome Presets
- Up to 32 Window Blanks.

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

G. Electrical

The camera assembly shall support Power-over-Ethernet (PoE) in compliance with IEEE 802.3. Provide any external power injector that is required for PoE with each CCTV assembly.

H. CCTV Camera Attachment to Pole

Furnish and install an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer.

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

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

I. Riser

Furnish material meeting the requirements of Section 1091-3 and 1098-4 of the 2018 Standard Specifications for Roads and Structures. Furnish a 1" riser with weatherhead for instances where the riser is only carrying an Ethernet cable. For installations where fiber optic cable is routed to the cabinet through a 2" riser with heat shrink tubing the Contractor may elect to install the Ethernet cable in the same riser with the fiber cable.

J. Data line Surge Suppression

Furnish data line surge protection devices (SPD) shall meet the following minimum requirements:

- UL497B
- Service Voltage: < 60 V
- Protection Modes: L-G (All), L-L (All)
- Response Time: <5 nanoseconds
- Port Type: Shielded RJ-45 IN/Out
- Clamping Level: 75 V
- Surge Current Rating: 20 kA/Pair
- Power Handling: 144 Watts
- Data Rate: up to 10 GbE
- Operating Temperature: -40° F to + 158° F
- Standards Compliance: Cat-5e, EIA/TIA 568A and EIA/TIA 568B
- Warranty: Minimum of 5-year limited warranty

The data line surge protector shall be designed to operate with Power Over Ethernet (POE) devices. The SPD shall be designed such that when used with shielded cabling, a separate earth ground is not required. It shall be compatible with Cat-5e, Cat 6, and Cat-6A cablings.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections.

K. POE Injector

Furnish POE Injectors meeting the following minimum performance requirements and that is compatible with the CCTV Camera and Ethernet Switch provided for the project.

- Working temp/humidity: 14° F to 131° F/maximum 90%, non-condensing

- Connectors: Shielded RJ-45, EIA 568A and EIA 568B
- Input Power: 100 to 240 VAC, 50 to 60 Hz
- Pass Through Data Rates: 10/100/1000 Mbps
- Regulatory: IEEE 802.3at (POE)
- Number of Ports: 1 In and 1 Out
- Safety Approvals: UL Listed

Ensure the POE Injector is designed for Plug-and-Play installation, requiring no configurations and supports automatic detection and protection of non-standard Ethernet Terminal configurations.

4.2. CONSTRUCTION METHODS

A. General

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

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

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

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

Install the data line surge protection device and POE Injector in accordance with the manufacturer's recommendations.

Install the riser in accordance with Section 1722-3 of the 2018 Standard Specifications for Roads and Structures. Install the Ethernet cable in the riser from the field cabinet to the CCTV camera.

B. Electrical and Mechanical Requirements

Install an "Air Terminal and Lightning Protections System" in accordance with the Air Terminal and Lightning Protection System Specification for the the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

4.3. GENERAL TEST PROCEDURE

Test the CCTV Camera and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

4.4. COMPATIBILITY TESTS

A. CCTV System

Compatibility Tests are applicable to CCTV cameras that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

4.5. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. CCTV System

Final CCTV locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the camera assembly field site in accordance with the test plans and in the presence of the Engineer. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera

assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the camera, PTZ, camera control receiver, and control cabinet.
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the camera control address.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.
- Ensure camera field of view is adjusted properly and there are no objects obstructing the view.
- Ensure camera lens is dust-free.
- Ensure risers are bonded and conduits entering cabinets are sealed properly.
- Lightning arrestor bonded correctly.

Central Operations Testing

- Interconnect the CCTV Camera's communication interface device with one of the following methods as depicted on the plans:
 - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- OR
 - to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.

- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

4.6. MEASUREMENT AND PAYMENT

Digital CCTV Camera Assembly will be measured and paid as the actual number of digital CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for electrical cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, PoE Injectors, PoE Cable, Air Terminal and Lightning Protection System, compatibility testing, operational testing or any other equipment or labor required to install the digital CCTV assembly.

Payment will be made under:

Digital CCTV Camera AssemblyEach

5. CCTV FIELD EQUIPMENT CABINET

5.1. DESCRIPTION

For standalone CCTV Camera installations, furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

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

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

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

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

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

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

5.2. MATERIALS

A. Shelf Drawer

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

B. Cabinet Light

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

C. Surge Protection for System Equipment

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

1. Main AC Power Input

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

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must be provided with the following terminals:
 - Main Line (AC Line first stage terminal).
 - Main Neutral (AC Neutral input terminal).
 - Equipment Line Out (AC line second state output terminal, 19 amps).
 - Equipment Neutral Out (Neutral terminal to protected equipment).
 - GND (Earth connection).
- The Main AC line in and the Equipment Line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.

- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid-state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must have an MOV similar solid-state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment.

2. Ground Bus

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

3. Uninterruptible Power Supply (UPS)

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

Output

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

Input

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

Input voltage adjustable range for mains operation 75 -154 V

Battery Type

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

Typical recharge time 2 hours

Communications & Management

Interface Port(s) DB-9 RS-232, USB

Control panel LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating 480 Joules

Environmental

Operating Environment -32 - 104 °F

Operating Relative Humidity 0 - 95%

Storage Temperature 5 - 113 °F

Storage Relative Humidity 0 - 95%

Conformance

Regulatory Approvals FCC Part 15 Class A, UL 1778

5.3. CONSTRUCTION METHODS

A. General

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

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

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

5.4. MEASUREMENT AND PAYMENT

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

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

Payment will be made under:

Field Equipment Cabinet.....Each

6. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

6.1. DESCRIPTION

Furnish an air terminal and lightning protection system that is comprised of items meeting UL 96 and UL 467 product standards for lightning protection and installed to be compliant with the National Fire Protection Association 780 Standards for Lightning Protection Systems. The lightning protection system shall consist of, as a minimum, an Air Terminal, vertical Air Terminal Base (wood pole) or Air Terminal Rod Clamps (metal pole), 28-Strand bare-copper lightning conductor, 4-point grounding systems (grounding electrodes), #4 AWG copper bonding conductors, marker tape and other miscellaneous hardware.

6.2. Materials

A. General

Reference the following Typical Details where applicable:

- CCTV Camera Installation for Metal Pole with Aerial Electrical Service
- CCTV Camera Installation for Metal Pole with Underground Electrical Service
- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

B. Wood Pole

Furnish a UL Listed Class II, copper clad minimum 48" long by ½" diameter air terminal. Ensure the air terminal has a tapered tip with a rounded point on one end and is threaded on the connection end with standard Unified Coarse (UNC) 13 threads per inch.

Furnish a copper vertical air terminal base that has internal threading to accept a ½" diameter air terminal with UNC 13 threads per inch. Provide a base that allows for a minimum ¼" mounting hole to secure the base to the vertical side of a wood pole. Ensure the air terminal base includes (2) 5/16" cap screws to secure the bare copper lightning conductor. Additionally, provide (2) ½" copper tube straps (conduit clamps) to secure the air terminal and bare copper lightning conductor to the pole.

C. Metal Pole

Furnish a UL Listed Class II, stainless steel minimum 48" long by ½" diameter air terminal with a tapered tip with a rounded point on one end. No threading is required on the opposing end.

Furnish an air terminal rod clamp manufactured out of 304 stainless steel. Ensure the air terminal rod clamp has two horizontal support arms that are 2" wide by 3/16" thick and design to offset the air terminal approximately 8" away from the metal pole. Ensure the support arms at the point where the air terminal is to be installed has an internal crease to secure the air terminal along with four (4) bolts to provide the clamping action between the two support arms. Provide two (2) stainless steel banding clamps to secure the air terminal rod clamp's base plate to the metal pole.

D. Copper Lightning Conductor and Ground Rods

Furnish a Class II rated copper lightning conductor which consists of 28 strands (minimum) of 15 AWG copper wires to form a rope-lay bare copper lightning conductor. Furnish 5/8" diameter, 10-foot-long copper-clad steel ground rods with a 10-mil thick copper cladding to serve as an integral part of the 4-point grounding system. Furnish irreversible mechanical clamps to secure the 28-strand lightning conductor, #4 AWG bare copper ground wires and grounding electrodes together to complete the grounding system.

6.3. Construction Methods

A. Wood Pole

Install the vertical air terminal base approximately 12" below the top of the wood pole and install the air terminal to the threaded connection on the base. Install a ½" copper tube strap (conduit clamp) over the air terminal, 6" from the top of the pole. Additionally, secure the copper lightning conductor under both 5/16" diameter cap screws located on the base. Install an additional ½" copper tube strap (conduit clamp) over the bare copper lightning conductor, 6" below the air terminal base. Locate the ¼" mounting hole on the vertical air terminal base and install a ¼" by 3" (minimum) long lag bolt through the base and into the wood pole to support the air terminal assembly.

Route the bare copper lightning conductor to maintain maximum horizontal separation from any risers that traverse up the pole. Secure the bare copper lightning conductor to the pole on 24" centers using copper cable clips. From the bottom of the pole (ground level) install a 2" by 10' long PVC U-Guard over the bare copper lightning conductor to protect the cable from vandalism.

B. Metal Pole

Install two (2) stainless steel air terminal rod clamps to the side of the metal pole structure starting at 6" below the top of the pole with the second air terminal clamp 12" from the top of the pole (approximately 6" of separation between the 2 clamps). Secure each air terminal rod clamp to the pole structure with two (2) stainless steel banding clamps. Install the air terminal between the horizontal support arms on each air terminal rod clamp and tighten the bolts to provide a secure connection.

C. Copper Lightning Conductor and Ground Rods

Install the 4-point grounding system by installing a central grounding electrode that is surrounded by a minimum of three (3) additional grounding electrodes spaced approximately 20 feet away from the central grounding electrode and approximately 120 degrees apart. Interconnect each grounding electrode using a #4 AWG bare copper conductor back to the central grounding electrode using irreversible mechanical crimps. Additionally, using an irreversible mechanical crimp, connect the bare copper lightning conductor to the central grounding electrode. Install each grounding electrode and its corresponding #4 AWG bare copper grounding wire and 28 strand copper lightning conductor such that the wires are 24" below grade. Install marker tape 12" below grade and above all grounding conductors.

In instances where right-of-way does not allow for ground rod spacing as required above, reference the 2018 Roadway Standard Drawings - Section 1700.02 "Electrical Service Grounding" for "Limited Shoulder" or "Restricted Space" installation alternatives.

Prior to connecting the lightning protection system to an electrical service, perform a grounding electrode test on the lightning protection system to obtain a maximum of 20 ohms or less. Install additional grounding electrodes as need to obtain the 20 ohms or less requirement. The grounding electrode resistance test shall be verified or witnessed by the Engineer or the Engineer's designated representative.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than one ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method. Submit a completed inductive Loop & Grounding Test Form available on the Department's website.

6.4. Measurement and Payment

No measurement will be made for furnishing and installing the “Air Terminal and Lightning Protection System” as this will be considered incidental to “CCTV Metal Pole” & “CCTV Wood Pole” installations.

7. DYNAMIC MESSAGE SIGN (DMS)

7.1. DESCRIPTION

To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 or latest version software (also referred to hereinafter as the “Control Software”). Contact the engineer to inquire about the current version being used.

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

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

Furnish operating Dynamic Message Signs, not limited to, the following types. Dimensions represent DMS sizes commonly used by the Department, other size DMS may be specified in the project plans.

DMS Naming Convention	
Type	Color
Type 1 – Front Access	A – Amber – 66mm
Type 2 – Walk-in	C – Full Color – 20mm
Type 3 – Embedded	
Type 4 – Lane Control	

- **DMS Type 1A** – Front Access Amber 66mm – 27 pixels high by 60 pixels wide
 - 3 lines, 10 characters per line, using 18” high characters.
- **DMS Type 1C** – Front Access Full Color 20mm – 96 pixels high by 208 pixels wide
 - 3 lines, 11 characters per line, using 18” high characters.
- **DMS Type 2A** – Walk-in Amber 66mm – 27 pixels high by 90 pixels wide
 - 3 lines, 15 characters per line, using 18” high characters.
- **DMS Type 2C** – Walk-in Full Color 20mm – 96 pixels high by 288 pixels wide
 - 3 lines, 15 characters per line, using 18” high characters.
- **DMS Type 3A** – Embedded Front Access Tri-color 66mm – 7 pixels high by 35 pixels wide

- 1 line, 7 characters per line, using 18" high characters.
- **DMS Type 3C** – Embedded Front Access Full Color 20mm – 24 pixels high by 160 pixels wide
 - 1 line, 8 characters per line, using 18" high characters.
- **DMS Type 4C** – Lane Control Sign Full Color 20mm – 48- or 64-pixels square
 - 48 pixels high by 48 pixels wide
 - 1 line, 2 characters per line using 18" high characters
 - 64 pixels high x 64 pixel wide
 - 2 lines, 3 characters per line using 18" high characters

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

Use only approved DMS models listed on the NCDOT Qualified Products List (QPL) at the time of construction. NCDOT Qualified Products List can be accessed via official website at <https://apps.ncdot.gov/products/qpl/>

7.2. MATERIALS

A. Environmental Requirements

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

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2016.

B. Viewing Requirements for all DMS

Each line of text should be clearly visible and legible to a person with 20/20 corrected vision from a distance of 900 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

Any line must display equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height (unless otherwise noted in the plans) and composed from a luminous dot matrix.

C. Housing Requirements for all DMS

Construct the external skin of the sign housing out of aluminum alloy 5052 H32 that is a minimum of 1/8 inches thick for all walk-in DMS and 0.090-inch-thick for all front access or embedded DMS. Ensure the interior structure is constructed of aluminum. Ensure that no internal frame connections or external skin attachments rely upon adhesive bonding or rivets. Ensure the sign housing meets the requirements of Section 3 of NEMA TS 4-2016.

Ensure that all drain holes and other openings in the sign housing are screened to prevent the entrance of insects. Design and construct the DMS unit for continuous usage of at least 20 years. Ensure that the top of the housing includes multiple steel lifting eyebolts or equivalent hoisting points. Ensure hoist points are positioned such that the sign remains level when lifted. Ensure that the hoist points and sign frame allow the sign to be shipped, handled, and installed without damage. Ensure all external assembly and mounting hardware, including but not limited to; nuts, bolts, screws, and locking washers are corrosion resistant galvanized steel and are sealed against water intrusion. Ensure all exterior housing surfaces, excluding the sign face, and all interior housing

surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum. Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist. Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet. Do not paint the stainless-steel bolts on the Z-bar assemblies used for mounting the enclosure.

D. Housing Requirements for Walk-in type DMS

Ensure the sign housing meets the requirements of Section 3.2.8 of NEMA TS 4-2016. Ensure that exterior seams and joints, except the finish coated face pieces, are continuously welded using an inert gas welding method. Stitch weld the exterior housing panel material to the internal structural members to form a unitized structure. Ensure that exterior mounting assemblies are fabricated from aluminum alloy 6061-T6 extrusions a minimum of 3/16 inches thick. Ensure housing access is provided through an access door at each end of the sign enclosure that meets the requirements of NEMA TS 4-2016, Section 3.2.8.1. Ensure the access doors include a keyed tumbler lock and a door handle with a hasp for a padlock. Ensure the doors include a closed-cell neoprene gasket and stainless-steel hinges. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.8.3 for service lighting. All service lighting should be LED, incandescent and fluorescent lamps are not permitted. Ensure that the sign housing includes LED emergency lighting that automatically illuminates the interior when the door is open in the event of a power outage. Emergency lighting must be capable of operation without power for at least 90 minutes. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.9 for convenience outlets.

E. Housing Requirements for Front Access DMS

Comply with the requirements of Section 3.2.5 and 3.2.6 of NEMA TS 4-2016 as it applies to front access enclosures. The following requirements complement TS 4-2016. Ensure access door does not require specialized tools or excessive force to open. Provide multiple access doors that allow maintenance personnel access to 2 or 3 sign modules at a time. Vertically hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend each door the full height of the display matrix. Provide a retaining latch mechanism for each door to hold the door open at a 90-degree angle. Each door will form the face panel for a section of the sign. Mount the LED modules to the door such that they can be removed from the door when in the open position. Other sign components can be located inside the sign enclosure and be accessible through the door opening. Provide for each door a minimum of two (2) screw-type captive latches to lock them in the closed position and pull the door tight and compress a gasket located around the perimeter of each door. Install the gasket around the doors to prevent water from entering the cabinet.

F. Housing Face Requirements for all DMS

Ensure the sign face meets the requirements of NEMA TS 4-2016, Section 3.1.3. Protect the DMS face with contiguous, weather-tight, removable panels. The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix. The panels shall be fabricated using aluminum sheeting on the exterior and

polycarbonate sheeting on the interior of the panel. These panels must be a polycarbonate material that is ultraviolet protected and have an antireflection coating. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade semi-gloss black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years. Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

G. Housing Face Requirements for Walk-in type DMS

The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix.

No exposed fasteners are allowed on the housing face. Ensure that display modules can be easily and rapidly removed from within the sign without disturbing adjacent display modules.

H. Housing Face Requirements for Front Access type DMS

The DMS front face shall be constructed with multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

I. Housing Face Requirements for Embedded Front Access type DMS

Front Face shall be constructed with a single, horizontally hinged rigid face panel which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

J. Sign Housing Ventilation System for all DMS

Install a minimum of one (1) temperature sensor that is mounted near the top of the DMS interior. The sensor(s) will measure the temperature of the air in the enclosure over a minimum range of -40°F to +176°F. Ensure the DMS controller will continuously monitor the internal temperature sensor output and report to the DMS control software upon request.

Design the DMS with systems for enclosure ventilation, face panel fog and frost prevention, and safe over-temperature shutdown.

Design the DMS ventilation system to be thermostatically controlled and to keep the internal DMS air temperature lower than +140°F, when the outdoor ambient temperature is +115°F or less.

The ventilation system will consist of two or more air intake ports located near the bottom of the DMS rear wall. Cover each intake port with a filter that removes airborne particles measuring 500 microns in diameter and larger. Mount one or more ball bearing-type ventilation fans at each intake port. These fans will positively pressure the DMS enclosure.

Design the ventilation fans and air filters to be removable and replaceable from inside the DMS housing. To ease serviceability, mount the ventilation fans no more than four (4) feet from the floor of the DMS enclosure. Position ventilation fans so they do not prevent removal of an LED pixel board or driver board.

Provide each ventilation fan with a sensor to monitor its rotational speed, measured in revolutions per minute and report this speed to the sign controller upon request.

The ventilation system will move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. Design the airflow system to move air from the bottom of the enclosure towards the top to work with natural convection to move heat away from the modules.

Install each exhaust port near the top of the rear DMS wall. Provide one exhaust port for each air intake port. Screen all exhaust port openings to prevent the entrance of insects and small animals.

Cover each air intake and exhaust port with an aluminum hood attached to the rear wall of the DMS. Thoroughly seal all intakes and exhaust hoods to prevent water from entering the DMS. Provide a thermostat near the top of the DMS interior to control the activation of the ventilation system.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal enclosure air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F. The DMS provide an output to the controller to notify the Vanguard client when the DMS shuts down due to high temperature.

K. Sign Housing Ventilation System for Walk-in DMS

Ensure the sign includes a fail-safe ventilation subsystem that includes a snap disk thermostat that is independent of the sign controller. Preset the thermostat at 140°F. If the sign housing's interior reaches 140°F, the thermostat must override the normal ventilation system, bypassing the sign controller and turning on all fans. The fans must remain on until the internal sign housing temperature falls below 115°F.

L. Sign Housing Photoelectric sensors

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

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

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

M. Display Modules

Manufacture each display module with a standard number of pixels which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

Design display modules that are interchangeable, self-addressable, and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module. Ensure that the sign has a full matrix display area as defined in NEMA TS 4-2016, Section 1.6.

Design each module to display:

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

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

Design Type 3A and 3C DMS with at least the following message displays:

- A static display, green in color, reading “OPEN”
- A static display, red in color, reading “CLOSED”
- A static display, amber in color, with the ability to display a toll rate in the following format “\$ XX.XX”

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

N. Discrete LEDs

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

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing AlInGaP technology for Red and InGaP technology for Green and Blue. No substitutions will be allowed. Provide LEDs that emit a full color.

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

Obtain the LEDs used in the display from a single LED manufacturer. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display.

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

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

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

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

O. LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 24 volts DC or less. Wire the power

supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the power supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

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

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

P. LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel with either 66mm or 20mm spacing depending on the type of DMS called for in the plans.

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

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

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

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel and does not lower the luminous intensity of the pixel more than 25% of the 40Cd requirement. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed.

Q. DMS Mini Controller

For Walk-In and Front Access DMS Types only, furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber-optic cable. The mini controller will enable a technician to perform all functions available from the main controller. Provide the mini controller with an LCD/keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

R. DMS Enclosure Structure Mounting

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

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

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

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

Design the DMS structure to conform to the applicable requirements of the most recent version of the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, currently in use by the department and the section titled "DMS Assemblies" of these Project Special Provisions.

S. DMS / DMS Controller Interconnect

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

T. DMS Controller and DMS Cabinet

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

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

For DMS Type 4C installations provide a single controller that can control up to eight (8) signs simultaneously.

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

- Power supply and distribution assemblies,
- Power line filtering hybrid surge protectors,
- Radio Interference Suppressor,
- Communications surge protection devices,
- Industrial-Grade UPS system and local disconnect,
- Microprocessor based controller,
- Display driver and control system (unless integral to the DMS),
- RJ45 Ethernet interface port for local laptop computer,
- Local user interface,
- Interior lighting and duplex receptacle,
- Adjustable shelves as required for components,

- Temperature control system,
- All interconnect harnesses, connectors, and terminal blocks,
- All necessary installation and mounting hardware.

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

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

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

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

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

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

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

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

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless-steel material. Key all locks on the project alike and provide 1 key per lock to the Engineer. In addition, design the handle to permit padlocking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

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

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

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

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

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

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

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

1. Wiring

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

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

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

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

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

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

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

Label all equipment and equipment controls clearly.

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

2. Power Supply and Circuit Protection

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

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

3. Circuit Breakers

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

Provide a subpanel in the sign enclosure with a main and branch circuit breakers sized appropriately per NEC.

Provide a detailed plan for power distribution within the cabinet and the sign. Label all breaker and conductor with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans for review and approval.

4. Surge Suppressor

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

Provide power line surge protector that meets the following requirements:

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

*Capable of handling the continuous current to the equipment

5. Transients and Emissions

DMS and DMS controller will be designed in such a way to meet the latest NEMA TS-4 for Transients and Emissions.

6. Transient Protection

The RS232 and Ethernet communication ports in the DMS sign controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

7. Lightning Arrester

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

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

8. Uninterruptible Power Supply (UPS)

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

Input Voltage Range	120VAC +12%, -25%
Power Rating	1000 VA, 700 Watts
Input Frequency	45 to 65 Hz
Input Current	7.2A
Output Voltage	120VAC +/- 3%
Output Frequency	50/60 +/-1 Hz
Output Current	8.3A
Output Crest Factor Ratio	@50% Load Up to 4.8:1 @75% Load Up to 3.2:1 @100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.

Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input/Output Short Circuit Input/Output Overload Excessive Battery Discharge
Specifications	UL1778, FCC Class A, IEE 587

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

9. Controller Communications Interface

Provide the controller with the following interface ports:

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

10. Controller Local User Interface

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

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

Protected access to the LUI with an alphanumeric and PIN passwords. Allow the user to select a preferred method of password protection. Default and hardcoded passwords are not allowed.

11. Controller Address

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

12. Controller Functions

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

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

13. DMS Controller Memory

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

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

U. Equipment List

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

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

V. Physical Description

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

W. Parts List

Provide a parts list that contains all information needed to describe the characteristics of the individual parts, as required for identification. Include a list of all equipment within a group and a list of all assemblies, sub-assemblies, and replacement parts of all units. Arrange this data in a table,

in alpha numerical order of the schematic reference symbols, which gives the associated description, manufacturer's name, and part number, as well as alternate manufacturers and part numbers. Provide a table of contents or other appropriate grouping to identify major components, assemblies, etc.

X. Character Set Submittal

Submit an engineering drawing of the DMS character set including at a minimum, 26 upper case and lower case letters, 10 numerals, 9 punctuation marks (. , ! ? - ' " ; :) 12 special characters (# & * + / () [] < > @) and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

Y. Wiring Diagrams

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

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

Z. Routine of Operation

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

AA. Maintenance Procedures

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

BB. Repair Procedures

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

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

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

CC. Warranty

Ensure that the DMS system and equipment has a manufacturer's warranty covering defects for a minimum of five (5) years from the date of final acceptance by the Engineer.

7.3. CONSTRUCTION METHODS**A. Description**

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

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between DMS equipment and DMS sign housing and electric utilities that conform to NEC standards.

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

B. Layout

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

C. Construction Submittal

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

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

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

D. Conduit

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

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

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

Attach the conduit system to and install along the structural components of the Sign structure assemblies with beam clamps or stainless-steel strapping or inside the structure if there is available

space. Install strapping according to the strapping manufacturer's recommendations and according to NEC requirements. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

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

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

E. Wiring Methods (Power)

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

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

Do not splice underground circuits unless specifically noted in the Project Plans.

F. Equipment and Cabinet Mounting

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

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

Provide cabinets with all strapping hardware and any other necessary mounting hardware in accordance with these Project Special Provisions and the Project Plans.

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

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

Install a level concrete technician pad measuring a minimum 4 inches thick, 36 inches wide and 36 inches long at the front door of the DMS equipment cabinet as shown on the Typical Details sheet within the Project Plans.

G. Work Site Clean-Up

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

7.4.GENERAL TEST PROCEDURE

Test the DMS and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will

reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

7.5. COMPATIBILITY TESTS

A. DMS System

Compatibility Tests are applicable to DMS that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

7.6. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)**A. DMS System**

Final DMS locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the DMS assembly field site in accordance with the test plans. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the DMS and control cabinet,
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the DMS assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the DMS control address.

Central Operations Testing

- Interconnect the DMS's communication interface device with one of the following methods as depicted on the plans:
 - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.
- OR
 - to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.
- Review DMS date and time and DMS controller information.
- Run DMS diagnostics and review results.
- Run DMS pixel test and review results.
- Run test message.
- Run test schedule.
- Program burn-in scenario.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

7.7. MEASUREMENT AND PAYMENT

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

Payment will be made under:

Dynamic Message Sign (Type 2C)Each

8. NTCIP REQUIREMENTS

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

8.1. References

A. Standards

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

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Abbreviated Number	Title
NTCIP 1201	<i>Global Object (GO) Definitions</i>
NTCIP 1203	<i>Object Definitions for Dynamic Message Signs</i>
NTCIP 2101	<i>SP-PMPP/232 Subnet Profile for PMPP over RS-232</i>
NTCIP 2104	<i>SP-Ethernet</i>

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

B. Features

Each DMS shall be required to support the following optional features, conformance groups and all functional requirements and objects that apply herein.

Feature	Reference
Time Management	NTCIP 1201 v3
Timebase Event Schedule	NTCIP 1201 v3
PMPP	NTCIP 1201 v3
Determine Sign Display Capabilities	NTCIP 1203 v03
Manage Fonts	NTCIP 1203 v03
Manage Graphics	NTCIP 1203 v03
Schedule Messages for Display	NTCIP 1203 v03
Change Message Display Based on and Internal Event	NTCIP 1203 v03
Control External Devices	NTCIP 1203 v03
Monitor Sign Environment	NTCIP 1203 v03
Monitor Door Status	NTCIP 1203 v03
Monitor Controller Software Operations	NTCIP 1203 v03
Monitor Automatic Blanking of Sign	NTCIP 1203 v03
Report	NTCIP 1103 v03

C. Objects

The following table represents objects that are considered optional in the NTCIP standards but are required by this specification. It also indicated modified objects value ranges for certain objects. Each DMS shall provide the full, standard object range support (FSORS) of all the objects required by these specifications unless otherwise stated below.

Object	Reference	Requirement
moduleTable	NTCIP 1201 – 2.2.3	Shall contain 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 moduleVersion indicates the model version number of the component.
maxTimeBaseScheduleEntries	NTCIP 1201 – 2.4.3.1.	Shall be at least 28
maxDayPlans	NTCIP 1201 – 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 – 2.4.4.2	Shall be at least 12
maxGroupAddresses	NTCIP 1201 – 2.7.1	Shall be at least 1
maxEventLogConfigs	NTCIP 1103 – A.7.4	Shall be at least 50
eventConfigMode	NTCIP 1103 – A.7.5.3	The DMS shall support the following Event Configurations: onChange, greaterThanValue, smallerThanValue
eventConfigLogOID	NTCIP 1103 – A.7.5.7	FSORS
eventConfigAction	NTCIP 1103 – A.7.5.8	FSORS
maxEventLogSize	NTCIP 1103 – A.7.6	Shall be at least 20
maxEventClasses	NCTIP 1103 – A.7.2	Shall be at least 16
eventClassDescription	NTCIP 1103 – A.7.3.4	FSORS
communityNamesMax	NTCIP 1103 – A.7.8	Shall be at least 3
numFonts	NTCIP 1203 – 5.4.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 – 5.4.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 – 5.5.3	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOnActive	NTCIP 1203 – 5.5.4	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 - 5.5.5	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlassOffActive	NTCIP 1203 – 5.5.6	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 – 5.5.2	The DMS shall support the black background color
defaultForegroundColor	NTCIP 1203 - 5.5.2	The DMS shall support the amber foreground color

defaultJustificationLine	NTCIP 1203 - 5.5.9	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 - 5.5.11	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 - 5.5.13	The DMS shall support page “on” times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 - 5.5.15	The DMS shall support page “off” times ranging from 0.0 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 - 5.5.21	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 - 5.6.3	Shall be at least 100.
dmsMessageMultiString	NTCIP 1203 - 5.6.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 - 5.7.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 - 5.7.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 - 5.7.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 - 5.7.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 - 5.7.9	FSORS
dmsShortPowerLossTime	NTCIP 1203 - 5.7.14	FSORS
dmsResetMessage	NTCIP 1203 - 5.7.11	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 - 5.7.12	FSORS
dmsTimeCommLoss	NTCIP 1203 - 5.7.13	FSORS
dmsEndDurationMessage	NTCIP 1203 - 5.7.15	FSORS
dmsMultiOtherErrorDescription	NTCIP 1203 - 5.7.20	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
dmsIllumControl	NTCIP 1203 - 5.8.1	The DMS shall support the following illumination control modes: Photocell, and Manual
dmsIllumNumBrightLevels	NTCIP 1203 - 5.8.4	Shall be at least 100

dmsIllumLightOutputStatus	NTCIP 1203 - 5.8.9	FSORS
numActionTableEntries	NTCIP 1203 - 5.9.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 - 5.11.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 - 5.11.1.6	FSORS
fanFailures	NTCIP 1203 - 5.11.2.3.1	FSORS
fanTestActivation	NTCIP 1203 - 5.11.2.3.2	FSORS
tempMinCtrlCabinet	NTCIP 1203 - 5.11.4.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 - 5.11.4.2	FSORS
tempMinSignHousing	NTCIP 1203 - 5.11.4.5	FSORS
tempMaxSignHousing	NTCIP 1203 - 5.11.4.6	FSORS

D. MULTI Tags

Each DMS shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer specific 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)

Code	Feature
pt	page times controllable in 0.5 second increments.

E. Documentation

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

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

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

F. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

8.2. Measurement and Payment

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

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for "Dynamic Message Sign ()" and will be full compensation for all work listed above.

9. DMS PEDESTAL STRUCTURE

9.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structure, platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structure in accordance with the requirements of these Project Special Provisions and the Project Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Project Plans.

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

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

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

The Standard Provisions SP09R005 and SP09R007 found at the link below apply to all work covered by this section.

<https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx>

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

9.2. MATERIALS

Use materials that meet the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations*.

9.3. CONSTRUCTION METHODS

A. General

Construct DMS structures and assemblies in accordance with the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations*.

B. DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid resistant surface and safety railing on the DMS assemblies for access to one of the DMS inspection doors as shown on the plans. Provide platforms with fixed safety railings along both sides from the

beginning of the platform to the inspection door. No gap is allowed between walkway and inspection door or along any part of the safety rails.

Ensure the design, fabrication and installation of the access platforms on new DMS structures complies with the following:

- A. The top of the platform grading surface is vertically aligned with the bottom of the DMS door,
- B. The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails,
- C. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections,
- D. Install a 4" x 4" safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform,
- E. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

C. DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Furnish the lock to operate with a Corbin #2 key and furnish two keys per lock. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the finished ground. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

D. CCTV Extension Pole

Provide a DMS assembly with provisions to allow for the attachment of a CCTV camera to the assembly. Design the CCTV extension pole to provide an attachment height for the camera of 45 feet above the finished grade. The maximum deflection at the top of the CCTV supporting member at 30 mph, non-gusting wind, shall be no more than 1 inch in any direction. The ultimate design load for the CCTV extension pole shall be AASHTO 2002 50 year wind speed for the area plus 50 lbs camera deadload. Design the CCTV extension pole as an integral part of the DMS assembly and submit the design along with the structural calculation for review and approval by the Engineer.

9.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure will be measured and paid as the actual number of dynamic message sign pedestal structure assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete relocated dynamic message sign assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

DMS Access Ladder will be measured and paid as the actual number of DMS access ladders, platform, walkway furnished, installed and accepted. Payment includes design, fabrication, transportation, attachment to the DMS assembly as described above, lock with two keys each, and concrete pad.

CCTV Extension Pole will be measured and paid as the actual number of CCTV Extension Poles furnished, installed and accepted. Payment includes design, fabrication, transportation, and attachment to the DMS assembly.

Overhead Footings will be measured and paid in cubic yards and will be full compensation for all materials and labor required in *Overhead and Dynamic Message Sign Foundations (SP09 R007) and Foundations and Anchor Rod Assemblies for Metal Poles (PS09 R005)* referred in the link above. Payment will be made according to PS09 R007

The contract unit price for Overhead Footings will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing 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 *2018 Standard Specifications for Roads and Structures*.

Payment will be made under:

DMS Pedestal Structure	Each
DMS Access Ladder	Each
CCTV Extension Pole.....	Each
Overhead Footings.....	Cubic Yards

10. OBSERVATION PERIOD

10.1. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be considered part of work to be completed by the project completion date.

Upon successful completion of all project work the 30-day Observation Period may commence. Examples of project work includes but is not limited to:

- Installation of all project devices and communications infrastructure.
- Field Acceptance Testing of all devices.
- Central System Testing of all devices and network communications.

- Correction of all deficiencies and punch list items. (including minor construction items)

This observation consists of a 30-day period of normal, day-to-day operations of the field equipment in operation with new or existing central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the Plans and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct any failures within forty-eight (48) hours (includes time of notification). Any failure that affects a major system component as defined below for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the Contractor is was notified that the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or a failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period for that system. The 30-day Observation Period will be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- CCTV Cameras and Central Operations
- Dynamic Message Sign (DMS) and Central equipment/Operations
- Portable Changeable Message Sign (PCMS)
- Communications infrastructure (examples: Fiber, Radios, Ethernet Switches, Core Switches, etc.)
- Any other ITS Devices not named above (examples: DSRC radios, Radar and Out-of-Street Detection, signals, etc.)

10.2. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The completed System will be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including as-built plans.

10.3. MEASUREMENT AND PAYMENT

There will be no payment for this item of work as it is incidental to the project as a whole and to the item of work in which it is associated.

11. HUB CABINET

11.1. DESCRIPTION

Furnish and install air-conditioned hub cabinets, hub cabinet base extenders, hub cabinet foundations and all necessary hardware as described herein. Size the cabinet appropriately to fit all the equipment and to allow for 25% free space available after all equipment is installed. Size the cabinet to ensure ease of access to equipment and provide proper ventilation in order to maintain an internal operating environment that does not exceed the environmental operating ranges for devices placed within the cabinet.

1.2 MATERIALS

A. Hub Cabinet

1. *Standards*

Ensure that the hub cabinets comply with the following standards:

- ANSI;
- ASTM;
- IMSA ;
- ISO 9001;
- NEC;
- NEMA TS-2; and
- UL listed.

2. *Functional*

Furnish Caltrans Type 340 base-mounted hub cabinets meeting the following minimum requirements:

- Side-by-side, double doors on both front and rear of cabinet.
- Fiber-optic interconnect centers (paid separately).
- Grounding bus bar.
- 19-inch rack system for mounting of all devices in the cabinet.
- Pull-out shelf for laptop and maintenance use.
- Maintenance access connections.
- LED lighting.
- Ventilation fans.
- 120VAC power supply.
- 120VAC ground fault circuit interrupter (GFCI)-protected duplex outlets for tools.
- 120VAC surge-protected duplex outlets for equipment.
- Sunshields constructed of light gauge aluminum that sit approximately one inch above the surface of the cabinet on all sides, including doors.
- Lightning and surge protection on incoming and outgoing electrical lines (power and data).
- Managed Ethernet switch (provided by DIT).
- Door status sensors compatible with provided Managed Ethernet switches
- Power strip along vertical rail.
- HVAC system to maintain optimal temperature and humidity for the Ethernet hub switches and other powered electronics in the cabinet.

- UPS with sufficient capacity to hold hub's electrical load (minus the HVAC) for 4 hours. Cabinet AC system will not be connected to the UPS.

3. *Physical Features*

Provide cabinets that are completely weatherproof to prevent the entry of water. Provide cabinet and door exterior seams that are continuously welded, and all exterior welds are smooth. Provide cabinets with four full-size doors with full-length stainless-steel piano hinges, with stainless steel pins spot-welded at the top. Provide hinges that utilize stainless steel hinge pins. Provide hinges that are mounted so that they cannot be removed from the door or cabinet without first opening the door. Provide door and hinges braced to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. Ensure that there is no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide cabinet door fitted with a #2 Corbin lock. Provide two keys for each cabinet. Provide cabinet doors that are also pad lockable. Provide door openings that are double flanged on all four sides.

Provide cabinets constructed of unpainted sheet aluminum alloy H5052-H32 with a minimum thickness of 0.125 inch.

Provide the hub cabinet with sunshields outside to deflect solar heat away from the cabinet. The sunshields must be offset a minimum of one inch from the exterior cabinet walls. Ensure that the sunshields are fabricated from 5052-H32 aluminum sheet that is 0.125-inch-thick, and that sunshield corners are rounded and smoothed for safety. Mount the sunshields on standoffs on the top and on each side of the cabinet including the doors.

Provide doorstops at 90 and 180-degree positions. Ensure that both the door and the doorstop mechanism are of sufficient strength to withstand a simulated wind load of five pounds per square foot of door area applied to the both inside and outside surfaces without failure, permanent deformation, or compromising of door position and normal operation. Do not provide auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Ensure that the gasket material is closed-cell neoprene and maintains its resiliency after exposure to the outdoor environment. Ensure that the gasket shows no sign of rolling or sagging and provide a uniform dust and weather-resistant seal around the entire door facing.

Provide door alarms for all 4 doors that are compatible with the hub switches to be provided and installed by DIT. Door alarms should send a network alert to the switch when a hub cabinet door is opened or if the door alarm fails or is tampered with. Coordinate with the Engineer and DIT for hub switch model information.

Provide cabinets that include predrilled holes of standard diameter and bolt pattern with four (4) anchor bolts with each cabinet unit as part of the unit price bid. Provide a panel with each cabinet that matches the rest of the cabinet; and is held in place by four bolts provided with the panel. Drill or punch the panel to accommodate the bolts; the drill holes shall match the bolt pattern of the base cabinet of the cabinet. Provide a panel designed to be fitted in the interior of the cabinet and fabricated of the same material and thickness as the cabinet bottom.

Provide rails to create a cage to mount hardware, wiring panels and miscellaneous mounting brackets. Provide rails constructed of .1345-inch steel or .105-inch stainless steel. Provide rails with a keyhole design with slots 2 inches on center with a top opening of 5/8 inch in diameter to allow the

insertion of a .625-inch by 1-inch carriage bolt. Ensure that the rails are 1.5 to 2 inches wide by .5 inches deep. Drill and tap the rails for 10-32 screws or rack screws with EIA universal spacing.

Provide rack assemblies that have a removable, standard 19-inch EIA compliant rack. The rack shall have a clearance between the rails of 17.5 inches.

Equip each cabinet with an aluminum storage compartment mounted in the rack assembly with the following dimensions (± 0.5 inch): 16 inches wide, 14 inches long, and 1.75 inches deep. Provide compartment with ball-bearing telescoping drawer guides to allow full extension from the rack assembly. Ensure that when extended, the storage compartment opens to provide storage space for cabinet documentation and other miscellaneous items. Ensure that the storage compartment is of adequate construction to support a weight of 20 pounds when extended without sagging. Provide a top to the storage compartment that is hinged aluminum. Provide two (2) removable metal shelves with each cabinet.

Furnish a cabinet base extender with each hub cabinet that complies with the requirements of the “Cabinet Base Adapter and Base Extender” section of these Project Special Provisions.

Install an external generator connection port on the side of the cabinet opposite the air conditioning unit. Port should be designed and sized for the appropriate electrical requirements of the cabinet.

4. *Lighting*

Provide the field cabinet with four LED lamps (one above each door) and clear shatterproof shield assemblies which are mounted on the inside front and rear top of the cabinet. Ensure that these lamps are unobstructed and able to cast light on the equipment. Equip the field cabinet with door-actuated switches so that the lamps automatically turn on when any cabinet door is opened and go off when all the doors are closed.

5. *Electrical*

Provide a service panel assembly to function as the entry point for AC power to the cabinet and the location for power filtering, transient suppression, and equipment grounding. Provide AC isolation within the cabinet. Configure cabinet to accept 120 VAC from the utility company.

Provide circuit breakers that meet the NEC requirements, are UL listed and have an interrupt capacity of 5,000 amperes and insulation resistance of 100 M Ω at 500 VDC. Provide the hub cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the electronics in the hub cabinet. Provide a dedicated branch circuit for each of the following items:

- HVAC
- Lighting
- Receptacles
- Ventilation fan
- One circuit per rack
- Others as needed.

Provide UL listed surge protection devices according to the UL 1449, 2nd edition standard that comply with the NEMA requirements as detailed in the NEMA LS 1 (1992) standard.

Provide branch circuits, surge protection devices, and grounding for the connected load served by the cabinet, including ventilation fans, internal lights, electrical receptacles, etc., as shown on the Plans.

Furnish a power distribution assembly that fits in the EIA 19-inch rack and provides for protection and distribution of 120VAC power.

Ensure that ground bus bars are fabricated from a copper alloy material compatible with copper wire. Use ground bus bars that have at least two positions where a #6 AWG stranded copper wire can be attached.

Mount the ground bus bar on the side of the cabinet wall adjacent to the service panel assembly for the connection of AC neutral wires and chassis ground wires. If more than one ground bus bar is used in a cabinet, use a minimum of a #10 AWG copper wire to interconnect them.

Provide a detailed plan for power distribution within the cabinet. Label all breakers and conductors with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans for review and approval.

6. Ventilation

Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the hub switches and other powered electronics in the cabinet.

Include two cooling fans with 100 CFM, minimum capacity. Provide thermostats to be incorporated into the ventilation system. Mount fans in the top of the cabinet.

Provide the cabinets with vent openings in the lower portion of the door to allow convection cooling of electronic components. Cover them fully on the inside with a commercially available disposable three-layer graded type filter. All air entering the cabinet must pass through the air filter.

7. Air Conditioner

Furnish each hub cabinet with a rack mounted air-cooled air conditioner that operates on 120VAC. The air conditioner shall be fit within a 19-inch EIA communications rack and shall not be external mounted on the cabinet. The air conditioner shall be mounted in the bottom of the cabinet to avoid damage to any communications equipment.

The air conditioners shall have a built-in condensate evaporator and condensate drain fitting and hose that is plumbed to the outside of the cabinet. The air conditioner shall be rated for a minimum of 3500 BTU. There shall be low temperature control to prevent overcooling.

Provide EMI/RFI transient spike protection. Equip the cabinet and air conditioner with remote monitoring of high temperature and low airflow conditions. Intake air shall enter through cabinet door vent and be exhausted through top cabinet vents. Air conditioners shall be CFC free or low ODP (R-22) refrigerant and shall use closed loop cooling. Insulate all cold components (coolant lines, compressor, evaporator, etc.) with high-performance insulation.

Blower motors shall be UL listed. Ensure the blower motors are equipped with automatic reset thermal overload protection. Provide double sealed and double shielded ball bearings.

The air conditioners shall have permanent corrugated aluminum or stainless steel air filters. The filters shall be removable and washable.

All grilles shall be stainless steel.

A. Hub Cabinet Base Extender

Fabricate hub cabinet base extenders from the same materials and with the same finish as the hub cabinet housing. Fabricate base extender in the same manner as hub cabinets, meeting all of the same applicable specifications called for in these project special provisions. Provide cabinet base extenders with a height of at least 8 inches.

B. Hub Cabinet Foundation

Furnish either poured concrete hub cabinet foundations or preformed hub cabinet foundations. Obtain approval of foundation type from the engineer.

Comply with Section 1000-4 of the *2018 Standard Specifications for Road and Structures*.

Provide hub cabinet foundations with a minimum pad area that extend 24 inches from the front and back of the hub cabinet and 3 inches from the sides of the cabinet.

On the same side as the cabinet generator hookup, cast a three inch inside width galvanized steel U-bolt into the cabinet foundation. A minimum of four inches of the U-bolt shall be cast into the concrete and a minimum of three inches of the U-bolt shall be exposed for securing a generator to the foundation.

Furnish hub cabinet foundations with chamfered top edges. Provide minimum class B concrete.

Provide preformed hub cabinet foundations with 7" (L) x 18" (W) minimum opening for the entrance of conduits. For precast hub cabinet foundations, include steel reinforcement to ensure structural integrity during shipment and placing of item. Include four ¾ inch coil thread inserts for lifting. Comply with Article 1077-16 of the *2018 Standard Specifications for Road and Structures*.

C. Hub Cabinet UPS

Furnish and install one rack mounted UPS in each new cabinet.

Furnish UPS with external temperature monitoring that will shut off when running on battery power and the maximum operating temperature for the hub switch is reached.

Install UPS with RJ-45 ethernet network monitoring ports that can be disabled via the UPS software/firmware.

UPS shall meet the following minimum specifications:

Output

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

Input

Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)

Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V

Battery Type

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

Typical recharge time	2 hours
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Communications & Management

Interface Port(s)	RJ, 45, DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating	480 Joules
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Environmental

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

Conformance

Regulatory Approvals	FCC Part 15 Class A, UL 1778
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11.2. CONSTRUCTION METHODS**A. Hub Cabinet**

Ensure all cabinet wiring is tagged and identified using insulated pre-printed sleeves and follows the project's cable identification scheme. Ensure that the wire markers identify usage in plain words with sufficient details without abbreviations or codes.

Use stranded copper for all conductors, including those in jacketed cables and solid copper for all grounding. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug, or connector. Do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks with permanent and waterproof tags. Provide strain relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the

panels. The components include, but are not limited to, terminal blocks; bus bars, panel and socket mounted TVSS, circuit breakers, accessory and equipment outlets, and DC power supply chassis.

Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. Ensure that all fastener heads and nuts (when used) are fully accessible within a complete cabinet assembly, and any component is removable without requiring removal of other components, panels or mounting rails. Do not use self-tapping or self-threading fasteners.

Mount the air conditioner in the bottom of the cabinet and do not obstruct any cable entry into the cabinet. Install condensate drains to drain condensation water out of the cabinet. Ensure the cabinet has provisions to route conduit to the existing cabinet as shown in the drawings.

Furnish and install a 48" 120 VAC power strip vertically along one of the rear rails of the communications rack. Provide a power strip that has at least eight outlets along its length.

Provide a cabinet that is ISO 9001 certified at the time of bid letting.

Locate cabinets as close to the edge of the controlled access as possible and protect hub cabinets with guardrail unless instructed otherwise by the engineer.

Install base mounted cabinets as shown on the Plans and as approved by the Engineer. Refer to the "Hub Cabinet Foundation" section of these Project Special Provisions for installation requirements for the hub cabinet foundations. Install only the required number of conduits as shown on the Plans plus one additional spare stub out conduit. Position the ends of conduits approximately 2 inches above the finished surface of the concrete base.

Mount the hub cabinets on cabinet base extenders in accordance with the "Hub Cabinet Base Extender" section of these Project Special Provisions.

Mount surge protection devices in the cabinet for the field devices that will be connected to that cabinet.

Terminate power service wire, video, and data cabling on the appropriate terminal strips, surge protection devices or jacks in the cabinet with insulated terminal lugs or connectors. Use a calibrated ratchet-type crimping tool to install the insulated terminal lugs onto the field wires.

Label spare circuits of the data cables and connect them to the cabinet ground bus bar.

Neatly bundle and identify all field wiring cables in the cabinet with permanent waterproof tags.

Ground all hub cabinets in accordance with NEC requirements and the Hub Cabinet Grounding Detail included in these Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

B. Hub Cabinet Base Extender

Install hub cabinet base extender at all hub cabinet locations.

Use permanent, flexible, waterproof sealing material to:

- (a) Seal between the hub cabinet base and hub cabinet base extender.
- (b) Seal 2-piece hub cabinet base extender seams.

- (c) Seal space between hub cabinet base extender and the hub cabinet foundation.

C. Hub Cabinet Foundation

Comply with Section 825 of the *2018 Standard Specifications for Road and Structures*.

When using poured concrete foundations and preformed concrete foundations, use procedures, equipment and hardware as follows:

- (d) Locate new hub cabinets in locations as shown on the plans and approved by the Engineer.
- (e) Do not install foundations over uncompacted fill or muck.
- (f) Do not install foundations in low areas or locations prone to standing water.
- (g) Hand tamp soil before placing concrete to ensure ground is level.
- (h) Use a minimum of four ½ inch diameter expanding type anchor bolts to secure cabinet to foundation.
- (i) Install minimum 4 inches above and 4 inches below finished grade.
- (j) Locate external stubbed out conduit at cabinet foundation so conduit is located on the side of the hub cabinet with the UPS, do not locate conduit under the air conditioning system. Install a minimum of 6 conduit stub-outs.
- (k) Give hub cabinet foundation a broom finish and chamfered edges.
- (l) Seal space between cabinet base and foundation with a permanent, flexible, waterproof sealing material.

D. Hub Cabinet UPS

Install rack mounted UPS in each hub cabinet in accordance with the plans and detail drawings.

11.3. MEASUREMENT AND PAYMENT

Hub Cabinet will be measured and paid as the actual number of hub cabinets furnished, installed and accepted.

No payment will be made for the UPS, HVAC, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, DIN rail mounting brackets, DIN rails, signs, decals, labels or any other equipment or labor required to install the hub cabinet as these will be considered incidental to the installation of the hub cabinet.

Hub Cabinet Base Extender will be measured and paid as the actual number of hub cabinet base extenders furnished, installed and accepted.

Hub Cabinet Foundation will be measured and paid for as the actual number of hub cabinet foundations furnished, installed and accepted.

Payment will be made under:

Pay Item

Pay Unit

Hub Cabinet.....	Each
Hub Cabinet Base Extender.....	Each
Hub Cabinet Foundation	Each

12. JUNCTION BOXES

12.1. DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, washed stone, grounding systems, and all necessary hardware.

12.2. MATERIALS

A. General

Provide junction boxes with covers of the type and size indicated by the contract or the Plans.

Provide #67 washed stone aggregates in conformance with Sections 545 and 1005 of the *Standard Specifications*.

B. Polymer Concrete (PC) Junction Boxes

Provide polymer concrete (PC) boxes which are stackable, have bolted covers and have open bottoms. Ensure vertical extensions of 6" to 12" are available from the junction box manufacturer.

Use polymer concrete material made of an aggregate consisting of sand and gravel bound together with a polymer and reinforced with glass strands to fabricate box and cover components which are exposed to sunlight. Other thermosetting glass-reinforced materials may be used for components that are not normally exposed to sunlight.

Provide certification that the polymer concrete boxes and covers meet Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

Provide junction box covers with the required logos on the cover as follows:

- For standard size junction boxes, provide covers with "NCDOT Electrical" logo.
- For oversized or special-oversized junction boxes, provide covers with the NCDOT Fiber Optic logo.

Provide at least two size 3/8" diameter hex head stainless steel cover bolts to match inserts in the box. Provide pull slot(s) with stainless steel pin(s). Polymer concrete junction boxes are not required to be listed electrical devices.

A. Junction Box Sizes

Provide junction boxes and covers of the following size as called for in the Plans:

Junction Box Size	Minimum Inside Dimensions
Standard Size	18"(l) x 11"(w) x 12"(d)
Special Oversized	36"(l) x 24"(w) x 24"(d)

12.3. CONSTRUCTION METHODS

A. General

Install junction boxes flush with finished grade. Backfill beneath and around the junction box using #67 washed stone as shown in NCDOT Roadway Standard Drawing No. 1716.01. Do not install sealant compound between junction boxes and covers.

Upon completion of junction box installation and backfilling of all excavations, restore the disturbed ground to its original condition as determined and approved by the Engineer. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with same type of grass as surrounding area and mulch the newly seeded area. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

Install special-sized junction boxes at all underground splice enclosure locations in underground fiber-optic communications cable runs as shown in the Plans.

B. GPS Coordinates

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

Provide both a digital copy and hard copy of all information regarding the location (including to but not limited to manufacturer, model number) in the Microsoft Excel spreadsheet using the format shown in example below.

City Sys ID#	Name	Location	Latitude	Longitude	Manufacturer	Model #
	Equipment Cabinet	US 70 at Raynor Road/ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

12.4. MEASUREMENT AND PAYMENT

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

No measurement will be made of covers, curb markers on covers, washed stone, removal of existing junction boxes and grounding systems as these will be considered incidental to furnishing and installing junction boxes.

No measurement will be made of restoration of paved roadways/driveways and unpaved ground surfaces with like materials, including but not limited to backfill, graded stone, paved materials, seeding and mulching, as this work will be considered incidental to junction box installation. The Department will make no payment for a given junction box until all repairs to paved and unpaved surfaces damaged/disturbed during the installation of the junction box have been completed and accepted.

No measurement will be made of collecting and recording GPS coordinates for junction boxes and compiling this data in the prescribed Microsoft Excel spreadsheet as such work will be considered incidental to furnishing and installing junction boxes.

Payment will be made under:

Pay Item	Pay Unit
Junction Box (Standard Size)	Each
Junction Box (Special Oversized).....	Each

13. ELECTRICAL SERVICE

13.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service pedestal, poles, and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard

Specifications, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

Obtain the maximum available ground fault current from the utility company. Print this information on a durable label and adhere to the dead front of the disconnect.

13.2. MATERIAL

A. Wood Poles

Use 40' Class 4 or better wood poles for overhead electrical service structures as shown in the Plans. Refer to 2018 NCDOT *Standard Specifications for Roads and Structures* Article 1720-3.

B. Wood Pedestal

Furnish 6" x 6" x 8' wood pedestals for electrical service equipment as shown in the Plans. Refer to Articles 1082-3 (Treated Timber and Lumber), 1082-4 (Preservative Treatment) of the Standard Specifications..

C. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum 125A main service disconnect and a minimum of eight (8) additional spaces. Furnish a single pole 15A circuit breaker at CCTV locations. Furnish a double pole 70A circuit breaker at shared DMS/CCTV locations. Furnish a double pole 50A circuit breakers at locations. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Place barriers so that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Furnish NEMA Type 3R combinational panels rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meet the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

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

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

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

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

D. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

C. 10KVA Single Phase General Purpose Transformer

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

- Primary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- Secondary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- 10 kVA power rating.
- Electrostatic shielding between primary and secondary windings.
- Epoxy-silica encapsulated core and coil.
- Copper windings and copper lead wire terminations.
- Multiple front and bottom knockout for conduit entry/exit.

- Ground studs for conduit bonding.

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

D. 3-Wire Copper Service Entrance Conductors

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

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

See the Plans for wire sizes and quantities.

E. 4-Wire Copper Feeder Conductors

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

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

See the Plans for wire sizes and quantities.

F. 3-Wire Copper Feeder Conductors

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

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

See the Plans for wire sizes and quantities.

G. Grounding System

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

13.3. CONSTRUCTION METHODS

A. General

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

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

B. Wood Poles

Install all 40' Class 4 poles for electrical services in compliance with all requirements of Section 1720-3 of the Standard Specifications.

C. Wood Pedestal

Install a 6" x 6" x 8' wood pedestal in compliance with all requirements of Section 1720-3 of the Standard Specifications.

D. Meter Base/Disconnect Combination Panel

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

E. Electrical Service Disconnect

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

F. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.5 inch rigid galvanized risers as shown in the plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

G. 3-Wire Copper Feeder Conductors

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

H. 4-Wire Copper Feeder Conductors

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

I. 10KVA Single Phase General Purpose Transformer

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

J. Grounding System

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

13.4. MEASUREMENT AND PAYMENT

Wood Poles will be measured and paid in accordance with section 1720-4 of the *2018 Standard Specifications*

Wood Pedestal will be measured and paid as the actual number of complete and functional 6" x 6" x 8' wood pedestals installed for underground electrical services.

Meter base/disconnect Combination Panel will be measured and paid as the actual number of complete and functional meter base/disconnect combination panel service locations furnished, installed and accepted. Breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, 3-Wire Service Entrance Conductors, and any remaining hardware, fittings, and conduit bodies to connect the electrical service to the cabinet will be considered incidental to meter base/disconnect combination panels. All other required feeder conductors will be paid for separately.

3-Wire Copper Service Entrance Conductors will be incidental to furnish and installing the meter base/disconnect combination panel. All other required feeder conductors will be paid for separately.

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

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

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

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

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

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

Payment will be made under:

Pay Item	Pay Unit
Wood Pole	Each
Wood Pedestal	Each
Meter Base/Disconnect Combination Panel	Each
Equipment Cabinet Disconnect	Each
3-Wire Copper Feeder Conductors	Linear Foot
4-Wire Copper Feeder Conductors	Linear Foot
10KVA Single Phase Transformer	Each
5/8" X 10' Grounding Electrode.....	Each
#4 Solid Bare Copper Grounding Conductor	Linear Foot

**Project Special Provisions
Structures**

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DocuSigned by:

A handwritten signature in blue ink, appearing to read "Adam A. Cole", is placed over a blue rectangular stamp.

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08/10/2022

SCOPE OF WORK

This work shall consist of furnishing all labor, equipment, and materials to overlay the existing bridge decks with Polymer Concrete, replace joints, steel beam repairs, and complete substructure repairs, as directed in the plans. Work includes: existing bridge deck surface preparation by scarification and shotblasting, overlaying the prepared bridge deck with Polymer Concrete overlay, replacing joints, disposal of waste material, grooving bridge deck, pavement markings, substructure repairs using concrete, shotcrete, and epoxy resin injection, cleaning and painting existing bearings with HRCSA, epoxy coating and debris removal on the top of the end bent and interior bent caps, containment and disposal of the existing paint system; steel beam repairs, preparation of the surface to be painted and applying the new paint system; seeding and mulching all grassed areas disturbed; and all incidental items necessary to complete the project as specified and shown on the plans. No separate measurement or payment will be made for seeding, mulching or any measures required to control erosion or prevent off-site sedimentation. The cost of this work shall be included in the lump sum price bid for Mobilization.

Work will be performed on the existing bridges at the following locations:

Forsyth County Bridge #394– SR2698 over I-74 and US 3111

Contractor shall provide all necessary access; provide all traffic control; provide all staging areas, material storage, waste disposal, sawing equipment, and chipping equipment; and all else necessary to complete the work.

The contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated January 2018, except as otherwise specified herein.

POLYMER CONCRETE BRIDGE DECK OVERLAY**(SPECIAL)****DESCRIPTION**

This work consists of furnishing and placing a Polymer Concrete (PC) overlay system with a resin primer on concrete surfaces. The surface of the concrete shall be prepared and the PC overlay system shall be applied in accordance with this special provision in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans or as approved by the Engineer. Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

The Contractor shall select one of the PC overlay systems below:

- (A) Polyester Polymer Concrete (PPC) with a High Molecular Weight Methacrylate (HMWM) resin primer.
- (B) Epoxy Polymer Concrete (EPC) with an epoxy resin primer.

Work includes: placement of resin primer; placement of PC surface patching and/or overlay; and any incidentals necessary to complete the project as specified or as shown on the plans.

The System Provider is the manufacturer that will provide the PC system for the PC overlay. The System shall include the necessary and appropriate PC components, as well as the necessary and appropriate resin primer components. Contractor shall not change System Provider during project, without approval from the Engineer.

QUALIFICATIONS AND SUBMITTALS

The Contractor shall submit the following requested items and any other relevant documents at least two (2) weeks prior to the PC Overlay Pre-placement Conference. These submittals are for approval and shall be directed to the Engineer.

- (A) Overlay System: The Contractor shall submit two (2) copies of the System Provider's material information, written installation instructions, safety data sheets, and independent test results for approval.
- (B) System Provider Qualifications: The Contractor shall install an overlay system with all components provided through a single System Provider with documented experience successfully supplying at least five (5) PC overlay projects of similar size and scope installed within the past five (5) years. The Contractor shall submit documentation of the System Provider's project experience including the following:
- (1) Project Location.
 - (2) Owner Agency.
 - (3) Project construction date.
 - (4) Overlay quantities.
 - (5) Reference name and contact information for owner representative.
- (C) Contractor Qualifications: The Contractor shall submit documentation of successful projects placing structural concrete bridge decks, modified concrete bridge deck overlays, or PC overlay systems to finished grade using similar equipment as specified herein within the past five (5) years. A minimum of two (2) employees on site must have the equivalent work experience qualifications of the Contractor. The documentation of Contractor's qualifications shall include the following:
- (1) Project Location.
 - (2) Owner Agency.
 - (3) Project construction date.
 - (4) Overlay quantities.
 - (5) Reference name and contact information for owner representative.
- (D) System Provider Technical Representative Qualifications: The System Provider Technical Representative shall be an employee of the PC overlay system manufacturer, have a minimum of five (5) successful PC overlay projects within the last five (5) years, and be completely competent in all aspects of the work, including surface preparation, mixing, placement, curing, and testing of the PC overlay system. The Technical Representative shall have experience on a minimum of five (5) successful projects of similar size and scope. The Contractor shall submit documentation of the System Provider Technical Representative's experience including the following:

- (1) Years of Experience with PC overlay systems
- (2) Project location
- (3) Project construction date
- (4) Overlay quantities
- (5) Reference name and contact information for owner representative

The Technical Representative shall be available on site, for a minimum of three (3) days per project, to give the installer advice and guidance on the installation of PC overlay systems. This includes, but is not limited to: deck concrete surface preparation, PC overlay materials, PC overlay application, PC overlay curing or any time there are questions or issues that may arise. The Technical Representative shall be on site for the first PC overlay placement and shall remain on site until the Engineer is satisfied with the PC overlay preparation, placement, and finishing operations.

(E) Overlay Placement Plan: The Contractor shall submit an Overlay Placement Plan that includes the following:

- (1) Schedule of overlay work and testing for each bridge.
- (2) Anticipated concrete deck repair locations and repair method.
- (3) Staging plan describing overlay placement sequence including:
 - (a) Construction joint locations. Longitudinal construction joints between passes shall be located along the centerline of travel lanes or edge of travel lanes.
 - (b) Sequence of placement.
 - (c) Placement widths.
 - (d) Anticipated placement lengths.
 - (e) Placement direction.
 - (f) Joint locations.
 - (g) Location of proposed trial overlay(s).
- (4) Description of equipment used for:
 - (a) Surface preparation including grinding and shotblasting.
 - (b) Applying resin primer.
 - (c) Measuring, mixing, placing, and finishing the PC overlay.
 - (d) Applying surface finish sand/fine aggregate.
- (5) Method of protecting and finishing inlets and bridge drains.
- (6) Method for isolating expansion joints.
- (7) Method for measuring and maintaining overlay thickness and profile.
- (8) Cure time for PC overlay.
- (9) Storage and handling of resin primer and PC overlay components.
- (10) Procedure for disposal of excess resin primer, PC overlay materials, and containers.
- (11) Procedure for cleanup of mixing and placement equipment.

(F) Equipment: The Contractor shall submit documentation of current certification that mixing equipment has been calibrated (Caltrans California test CT 109 or similar accepted). The Contractor shall submit a documented history of the use of the placement equipment to successfully place PC overlays on bridge projects for review and approval by the Engineer.

MATERIALS

The Polymer Concrete shall consist of a resin binder and aggregate as specified below. It shall also include a compatible primer which when mixed with other specified ingredients and applied

as specified herein, is capable of producing a Polymer Concrete meeting the requirements of this specification.

- (1) Verification. The Contractor shall submit a Certified Test Report from independent labs for all of the materials associated with the PC overlay in accordance with this special provision.
- (2) Packaging and Shipment. All components shall be shipped in strong, substantial containers, bearing the manufacturer's label specifying batch/lot number, brand name, and quantity. If bulk resin is to be used, the contractor shall notify the Engineer in writing ten (10) working days prior to the delivery of the bulk resin to the job site. Bulk resin is any resin that is stored in containers in excess of 55 gallons.
- (3) Sampling. NCDOT reserves the right to retain and test samples of components of the PC overlay system. This includes requiring submittal of samples prior to the first installation or on-site sampling during construction.

Only use materials that are specified for the selected PC overlay system. Mixing materials from different PC overlay systems shall not be permitted.

(A) Polyester Polymer Concrete (PPC) materials shall consist of a polyester resin binder, a High Molecular Weight Methacrylate (HMWM) primer, and aggregate.

- (1) Polyester Resin Binder: Polyester resin binder shall have the following properties:
 - (a) Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
 - (b) Contain at least 1 percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
 - (c) Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
 - (d) Meet the required values for the material properties shown in Table 1, below.

Accelerators or inhibitors may be required to achieve proper setting time of PPC. They shall be used as recommended by the overlay System Provider.

Table 1
POLYESTER RESIN BINDER PROPERTIES (PPC ONLY)
(Each lot sent to job shall be tested)

Property	Test Method	Requirement
Viscosity*	ASTM D 2196	75 – 200 cps (RVT No.1 Spindle, 20 RPM at 77 °F)
Specific Gravity*	ASTM D 1475	1.05 to 1.10 at 77 °F
Elongation	ASTM D 638	35 percent, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D 638	2,500 psi, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70

* Test shall be performed before adding initiator.

- (2) High Molecular Weight Methacrylate (HMWM) Primer: Primer for the substrate concrete surface shall be a wax-free, low odor, high molecular weight methacrylate primer, and consist of a resin, initiator, and promoter. The primer shall conform to requirements indicated in Table 2, below, and all components shall be supplied by the System Provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed with the peroxide directly; a VIOLENT EXOTHERMIC REACTION will occur. The containers and measuring devices shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 2
HMWM PRIMER PROPERTIES (PPC ONLY)
(Tested yearly)

Property	Test Method	Requirement
Viscosity**	ASTM D 2196	25 cps maximum (Brookfield RVT with UL adapter, 50 RPM at 77 °F)
Volatile Content**	ASTM D 2369	30 percent, maximum
Specific Gravity**	ASTM D 1475	0.90 minimum at 77 °F
Flash Point	ASTM D 3278	180 °F minimum
Vapor Pressure**	ASTM D 323	1.0 mm Hg, maximum at 77 °F
PCC Saturated Surface-Dry Bond Strength (Adhesive)	California Test 551, part 5	700 psi, minimum at 24 hours and 70 ± 1°F (with PPC at 12% resin content by weight of the dry aggregate), primed surface
**Test shall be performed before initiator is added		

- (B) Epoxy Polymer Concrete (EPC) materials shall consist of an epoxy resin binder/primer and aggregate.

- (1) Epoxy Resin Binder/Primer: Epoxy resin binder/primer shall have the following properties:
- Be a low viscosity epoxy resin. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
 - Be 100% solids epoxy.
 - Be a two-part, low modulus epoxy resin.
 - Be moisture insensitive.
 - Meet the required values for the material properties shown in Table 3, below.

Accelerators or inhibitors may not be used to achieve proper setting time of EPC.

Table 3
EPOXY RESIN BINDER/PRIMER PROPERTIES (EPC ONLY)
(Each lot sent to job shall be tested)

Property	Test Method	Requirement
Viscosity	ASTM D 2196	75 – 150 cps (RVT No.1 Spindle, 20 RPM at 77 °F)
Specific Gravity	ASTM D 1475	1.05 to 1.08 at 77 °F
Elongation	ASTM D 638	35 percent, minimum Type I specimen, thickness 0.25 ± 0.03 " at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D 638	2,800 psi, minimum Type I specimen, thickness 0.25 ± 0.03 " at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70

(C) Aggregates: PC overlay aggregate shall be used for PPC and EPC and have the following properties:

- (1) No more than 45 percent crushed particles retained on the No. 8 sieve when tested in accordance with American Association of State Highway and Transportation Officials (AASHTO) Test Method T335.
- (2) Fine aggregate consists of natural sand only.
- (3) Weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85.
- (4) At the time of mixing with resin, have moisture content of not more than one-half ($\frac{1}{2}$) of the weighted-average aggregate absorption when tested under AASHTO Test Method T255.
- (5) Moh's hardness of seven (7) or greater.
- (6) Comply with the requirements for the aggregate gradation indicated in Table 4, below:

Table 4
AGGREGATE GRADATION
(Tested yearly)

Sieve Size	Percent Passing
3/8"	100
No. 4	60-85
No. 8	55-65
No. 16	29-50
No. 30	16-36
No. 50	5-20
No. 100	0-7
No. 200	0-3

(D) Sand/Fine Aggregate: Sand or fine aggregate for an abrasive finish shall be used for PPC and EPC and have the following properties:

- (1) Commercial-quality blast sand/fine aggregate.
- (2) Not less than 95 percent pass the No. 8 sieve and not less than 95 percent retained on the No. 20 sieve when tested under AASHTO Test Method T27.
- (3) Shall be dry at the time of application.

(E) Composite system: The composite PC overlay system shall have the following properties indicated in Table 5, below:

Table 5
COMPOSITE PROPERTIES
(Tested every 2 years)

Property	Test Method	Requirement
PCC Saturated Surface Dry Bond Strength	CT 551	500 psi minimum at 24 hrs. and 70° F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen)
Abrasion Resistance	CT 550	< 2g weight loss (at 12% resin content by weight of the dry aggregate)
Modulus of Elasticity	ASTM C 469	1,000,000 psi to 2,000,000 psi (at 12% resin content by weight of the dry aggregate)

CONSTRUCTION REQUIREMENTS

(A) PC Overlay Pre-placement Conference: A Pre-placement Conference shall be held before any overlay operations begin. Attendees shall include representatives from all parties involved in the work. If necessary, teleconferencing of attendees may be approved by the Engineer.

(B) PC Overlay Placement Notice: Contractor shall provide a minimum 48 hours notice to the Engineer, prior to placement of PC overlay on any structure.

(C) Trial Application: Prior to constructing the overlay, one or more trial applications shall be placed on a previously constructed concrete base to demonstrate proper initial set time and the effectiveness of the mixing, placing, and finishing equipment proposed. The set time can be determined as the time elapsed from resin catalyzation until the in-place PC trial application cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Each trial application shall be the planned paving width, at least ten (10) feet long, and have the same thickness as the specified overlay. Conditions during the construction of the trial application(s) and equipment used shall be similar to those to be used for construction of the overlay. The location of the trial application(s) shall be approved by the Engineer. Trial applications shall be properly disposed of off-site by the Contractor, if removal is necessary.

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency to perform the work. However, the installer or proposed equipment/techniques may be rejected if not shown to be acceptable after three (3) trials.

Overlay direct tension bond testing shall be performed in accordance with Section (F)(1) of this special provision. Acceptable test results shall be achieved on a trial application before the installation may proceed.

(D) Equipment: All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations, as approved by the Engineer prior to commencement of any work.

(1) Surface Preparation Equipment: Provide appropriate scarifying, shotblasting, sandblasting and other equipment to adequately prepare the bridge deck substrate, as required in the Overlay Surface Preparation for Polymer Concrete special provision.

(2) Mixing Equipment: A continuous automated mixer shall be used for all PC overlay applications. The continuous mixer shall:

- (a) Employ an auger screw/chute device capable of sufficiently mixing catalyzed resin with dry aggregate.
- (b) Employ a plural component pumping system capable of handling binder resin and catalyst while maintaining proper ratios to achieve set/cure times within the specified limits. Catalyzed resin shall flow through a static mix tube for sufficient duration to completely mix the liquid system.
- (c) Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every five (5) minutes, including time and date. Submit recorded volumes at the end of the work shift to the Engineer.
- (d) Have a visible readout gage that displays volumes of aggregate and resin being recorded.
- (e) Produce a satisfactory mix consistently during the entire placement.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the System Provider and approved by the Engineer, may be used for all PC patching applications and for smaller area overlay applications if approved by the Engineer.

(3) Finishing Equipment: Finishing may be accomplished with a Self-Propelled Slip-Form Paving Machine or Vibratory Screed.

(a) Self-Propelled Slip-Form Paving Machine: A self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PC overlay in a manner that meets the objectives and requirements of the project, may be used for PC overlay applications. The paving machine shall:

- (i) Employ a vibrating pan to consolidate and finish the PC overlay.
- (ii) Be fitted with hydraulically controlled grade automation to establish the finished profile. The automation shall be fitted with substrate grade averaging devices on both sides of the new placement; the device shall average 15 feet in front and behind the automation sensors; or the sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PC.
- (iii) Be calibrated for the projects requirements, and calibrated periodically following the manufacturers recommendations.
- (iv) Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.

(v) Be capable of both forward and reverse motion under its own power.

(b) Vibratory Screed: A vibratory screed may be used for finishing the PC overlay, but must be approved by the Engineer at least two (2) weeks prior to PC overlay placement.

(D) Concrete Deck Repairs and Surface Preparation: All areas that require removal of existing patches or unsound concrete shall be removed and prepared in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision. Placement of concrete for deck repair material shall be Polymer Concrete in accordance with this special provision. Prepare all concrete deck and repaired deck surfaces in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision.

(E) Application of Overlay: Methods indicated in this special provision are typical of general installations and may be modified per the System Provider's recommendations as approved by the Engineer. The application of the overlay shall not begin until the concrete deck is completely surface dry in accordance with ASTM D4263, with a wait time revised from 16 hours to two (2) hours, or as directed by the System Provider's Technical Representative. Prior to overlay application, the concrete surface temperature shall be within the specified temperature ranges below. Night work may be required when temperatures cannot be met during the day.

(a) For PPC overlays, the concrete surface temperature shall be between 40° and 100° F.

(b) For EPC overlays, the concrete surface temperature shall be between 60° and 90° F.

During overlay application, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer.

During overlay application, the Contractor shall provide suitable coverings (e.g. heavy duty drop cloths) as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from this application shall be cleaned and/or repaired to the Engineer's satisfaction at no additional cost to the Department.

(1) Primer Application: Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and are dry, primer shall be applied in accordance with the System Provider's recommendations. Primer shall be placed within five (5) minutes of mixing at approximately 90-100 ft²/ gal or the rate acceptable to the Engineer.

Primer shall be applied by flooding and uniformly spread to completely cover surfaces to receive overlay. Care shall be taken to avoid heavy application that results in excess ponding. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas that appear dry prior to overlay placement.

Primer shall not be allowed to leak onto areas that have not received surface preparation.

(2) PC Overlay Application: The PC overlay shall be applied during the interval between 15 minutes and two (2) hours after the primer has been applied. The PC overlay shall be placed prior to gelling. For PPC overlays, the overlay shall be placed within 15 minutes following addition of initiator, unless otherwise recommended by the System Provider's Technical Representative.

The resin binder shall be initiated for PPC overlays and blended completely. Aggregate shall be added and mixed sufficiently.

The set time can be determined in the field when the in-place PC application cannot be deformed by pressing with a finger, indicating that the resin binder is no longer in a liquid state.

- (a) When using PPC, the initial set time shall be at least 30 minutes and at most 90 minutes. If the PPC initial set is not within 30 to 90 minutes, the material shall be removed and replaced.
- (b) When using EPC, the initial set time shall be at least 30 minutes and at most 180 minutes. If the EPC initial set is not within 30 to 180 minutes, the material shall be removed and replaced.

The overlay shall be consolidated and finished to the required grade and cross-section using PC placement equipment as defined herein.

If a vibratory screed is used, prior to placing the PC overlay, place and fasten screed rails in position to ensure finishing the new surface to the required profile. Do not treat screed rails with parting compound to facilitate their removal. Prior to placing the overlay, attach a filler block to the bottom of the screed and pass it over the overlay area to check the thickness. The filler block thickness shall be equal to the design overlay thickness as shown in the plans. Remove all concrete that the block does not clear.

Place the PC overlay in one operation. Provide a minimum overlay thickness as shown in the plans.

Although the paver or screed may yield a finished or nearly finished surface, additional finishing may be necessary. The PC overlay shall be finished, as necessary, through traditional concrete finishing methods, producing a slight resin bleed indicating complete consolidation of aggregates.

Finishing of Polymer Concrete used as patching of an existing deck surface or overlay shall be completed and finished using traditional concrete hand finishing methods and hand concrete finishing tools. Such patches shall be placed flush with the top of the existing deck surface.

Resin content shall be as specified in the Materials section of this special provision and to yield a Polymer Concrete consistency that requires surface applied consolidation and finishing to consolidate aggregates and yield a slight sheen of bleed resin on top surface, yet does not yield excess bleed resin.

A surface friction sand/fine aggregate finish of at least 2.2 lbs/ yd² shall be broadcast onto the glossy surface immediately after sufficient finishing and before resin gelling occurs. To ensure adequate pavement friction, the completed PC overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Any such surface defects shall be repaired by the Contractor in the manner recommended by the System Provider and approved by the Engineer at no additional cost to the Department.

All final edges of PC overlay not adjacent to barrier rail, parapet, or bridge deck joints shall be finished neat, straight, and square, unless otherwise noted on project plans or approved by the Engineer.

Unless otherwise indicated on the plans, groove the deck surface in accordance with Subarticle 420-14(B) of the *Standard Specifications*. Vehicular traffic may travel across a deck surface that has not been grooved; however, the entire deck area shall be grooved after the PC overlay achieves design strength and no later than seven (7) calendar days after completion of the overlay unless otherwise approved by the Engineer.

Before completion of the project, all deck joints shall be sawcut, prepared, and sealed according to the details in the plans.

After the PC material has set, if final sawcutting for joint seals will not be done within 12 hours, at minimum, a single sawcut shall be made at the approximate midpoint of each joint. The sawcut shall be made within 12 hours or prior to opening of PC placement to traffic, if traffic will be allowed within 12 hours. Two (2) saw cuts may be made, but final saw cutting for the joints shall be done in accordance with the special provisions for the installation of the joint seals.

Any surface that is scarified shall be covered with the PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer.

Upon approval by the Engineer, if traffic is to be returned to the site, but the overlay is not completed within the allowable lane closure time and is more than $\frac{3}{4}$ inch higher in elevation than the adjacent pavement, the PC overlay edges shall be tapered. The leading edge of the overlay shall be tapered at a 4:1 (horizontal: vertical) slope. Tapered edges longitudinal to the direction of traffic and tapered edges on the trailing edge of the overlay and shall be at a 45 degree slope. Tapers of 45 degrees may remain, and PC overlay may be placed adjacent. Tapers with a 4:1 (horizontal: vertical) slope shall be sawcut square to the overlay surface, prior to placing adjacent PC overlay.

The Contractor shall collect a ticket for each pass or portion of a pass that is provided by each mixer, and ensure that the following information is shown on each ticket:

- (a) Project Number.
- (b) Bridge Number.
- (c) Date and Time.
- (d) Location of Placement (Lane and Station Limits or location and length of placement along the length of the bridge).
- (e) Aggregate Weight.
- (f) Resin Binder Weight.

The tickets shall be available on site for Inspection personnel to use in tabulating quantities.

Curing: The Contractor shall allow the overlay to cure sufficiently before subjecting it to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures as well as initiator/accelerator levels.

The overlay shall be considered cured to a traffic ready state when a minimum reading of 25 on a properly calibrated Swiss hammer is achieved. Other rebound hammers may be use as approved by the Engineer.

- (F) Acceptance Testing: Acceptance of the deck repairs, surface preparation, and PC overlay will be determined by the Engineer based on direct tension bond testing, and smoothness quality testing performed by the Engineer, assisted by the Contractor.

- (1) Overlay Direct Tension Bond Testing: Direct tension bond (pull-off) tests shall be performed after 24 hours by the Contractor in accordance with ASTM C1583. At a minimum, three (3) direct tension bond tests shall be performed on each bridge overlay. For bridges with deck areas greater than 25,000 square feet, additional tests shall be performed at a frequency of one test per 25,000 square feet of additional deck area, rounded up. Additional testing may be required as directed by the Engineer.

The test result shall be the average of the tests for each structure. Test cores shall be drilled a minimum of ½" below the bond line.

The average minimum bond strength of the PC overlay system on normal weight concrete shall be 250 psi, with no individual test measured below 225 psi. An acceptable test will demonstrate that the overlay bond strength is sufficient, or by producing a concrete subsurface failure area greater than 50% of the test surface area. The Contractor shall repair all direct tension test locations with PC overlay in accordance with this special provision.

Direct tension bond testing shall be performed by an independent testing firm and shall be arranged by the Contractor. The Contractor may perform the direct tension bond testing with the approval of the Engineer. Testing shall be performed using a calibrated tensile loading device, in the presence of the Engineer. The tensile loading device shall be calibrated annually. The cost of direct tension bond testing shall be included in the bid price for *Placing and Finishing PC Overlay* item.

- (2) Smoothness Quality Testing: As soon as practical after the PC overlay has hardened sufficiently, the Contractor shall test the finished surface with an approved rolling straightedge that is designed, constructed, and adjusted, so that it will accurately indicate or mark all deck areas which deviate from a plane surface by more than ⅛" in 10'. The Contractor shall remove all high areas in the hardened surface in excess of ⅛" in 10' with an approved grinding or cutting machine. Any fins or other protrusions remaining after grinding operations shall be removed to the satisfaction of the Engineer. Additionally, the final PC deck surface shall not deviate from the line and elevation indicated on the plans by more than 0.3" over any 50' length. If approved by the Engineer, correct low areas in an acceptable manner.

(G) Corrective Work

- (1) Repair of Surface Defects: The repair materials and finishing methods for surface defects in the overlay shall be in accordance with those used for the application of the overlay. All surface defects shall be repaired to the satisfaction of the Engineer before acceptance of the work is made.
- (2) Correction for Smoothness: Areas showing high spots of more than ⅛" in 10' shall be marked and ground until the high spot does not exceed ⅛" in 10'. Ground surface may be sawcut grooved to restore the texture if ordered by the Engineer. Areas showing low spots of more than ⅛" in 10' shall be marked and a proposed repair procedure shall be submitted to the Engineer. The use of the proposed repair procedure shall be as recommended by the System Provider and approved by the Engineer.
- (3) Replacement of Defective Overlay: A defective overlay, or portion thereof, resulting in failing overlay pull bond test results shall be removed and replaced at the Contractor's expense. The Contractor shall submit a written corrective work proposal to the Engineer,

which shall include the methods and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer. The Engineer's approval shall not relieve the Contractor of the responsibility of producing work in conformity with the Contract.

- (4) Repair of Cracking: After a one-week cure period, if cracks are in the overlay, the Contractor shall fill the cracks with properly catalyzed and mixed primer material at no cost to the Department. Care shall be taken to fill the cracks only and ensure minimal primer material is left on the finished surface of the overlay.

MEASUREMENT AND PAYMENT

Concrete Deck Repair for PC Overlay will be measured and paid for at the contract unit price bid per square yard and will be full compensation for placement of concrete deck repair material and shall include the cost of labor, tools, equipment and incidentals necessary to complete the work.

Placing and Finishing PC Overlay will be measured and paid for as the contract unit price bid per square yard of overlay placement and final surface finishing. Payment will be full compensation for all labor, equipment, and all incidentals necessary to complete the PC overlay placement. Construction and removal (if required) of trial application(s), including concrete base surfaces, will not be measured and paid for separately, but shall be incidental to complete the work. Tining of bridge deck, if used, will be incidental to this pay item.

Grooving Bridge Floors will be measured and paid in accordance with Article 420-21 of the *Standard Specifications*.

Only one of the following pay items shall be used for materials, dependent on the PC overlay system used.

(A) *Polyester Polymer Concrete Materials* will be measured as the actual volume of PPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of PPC produced, shall be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the permanent overlay. *Polyester Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the PPC material, including HMWM primer, freight to the project site, receiving, storage, and disposal of any unused PPC overlay material. Payment by cubic foot will be based on a 135 lbs/ ft³ unit weight and quantities recorded by calibrated mixer unit readouts.

(B) *Epoxy Polymer Concrete Materials* will be measured as the actual volume of EPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of EPC produced, shall be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the permanent overlay. *Epoxy Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the EPC material, including epoxy primer, freight to the project site, receiving, storage, and disposal of any unused EPC overlay

material. Payment by cubic foot will be based on a 135 lbs/ ft³ unit weight and quantities recorded by calibrated mixer unit readouts.

Payment will be made under:

Pay Item

Concrete Deck Repair for Polymer Concrete Overlay
Placing & Finishing Polymer Concrete Overlay
Grooving Bridge Floors
Polyester Polymer Concrete Materials
Epoxy Polymer Concrete Materials

Pay Unit

Square Yard
Square Yard
Square Feet
Cubic Yard
Cubic Yard

OVERLAY SURFACE PREPARATION FOR

POLYMER CONCRETE

(SPECIAL)

DESCRIPTION

This special provision addresses the surface preparation activities required prior to the placement of polymer concrete (PC). Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

Work includes: removal of unsound and sound bridge deck concrete and existing patches in deck repair areas; preparation of repair areas prior to placement of PC bridge deck repair material; bridge deck surface preparation prior to placement of PC overlay; and any incidentals necessary to prepare the bridge deck for placement of PC repair material or PC overlay, as specified or as shown on the plans.

DEFINITIONS

Scarification shall consist of the removal of any asphalt wearing surface and concrete surface to the uniform depth and limits shown on the plans.

Shotblasting shall consist of steel beads (or other materials as approved by the Engineer) “shot” out of a machine onto the bridge concrete deck concrete floor to remove soft or deteriorated concrete, and to clean the concrete deck surface for the application of the PC overlay. Contractor shall vary the speed of the shotblaster or make multiple passes, as necessary, to achieve the required surface preparation for the PC overlay. Areas inaccessible with shotblasting equipment may require surface preparation with sandblasting equipment and hand equipment.

EQUIPMENT

All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider’s recommendations, as approved by the Engineer prior to commencement of any work:

- (A) Scarifying equipment that is a power-operated, mechanical grinder capable of removing a minimum depth of ¼” for each pass.
- (B) Shotblasting and sandblasting equipment to adequately prepare the bridge deck substrate, as required in this special provision. Provide equipment to supply oil-free and moisture-free compressed air for final surface preparation.
- (C) Equipment capable of sawing concrete to the specified plan depth.

(D) Power driven hand tools for removal of unsound concrete are required that meet the following requirements:

(1) Pneumatic hammers weighing a nominal 15 lbs. or less.

(2) Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width.

(E) Hand tools, such as hammers and chisels, for removal of final particles of unsound concrete.

(F) Self-propelled vacuum capable of picking up dust and other loose material from prepared deck surface.

(G) Equipment to supply oil-free and moisture-free compressed air for final surface preparation.

The equipment must operate at a noise level less than 90 decibels at a distance of 50 feet.

MANAGEMENT AND DISPOSAL OF CONCRETE DEBRIS

All concrete debris shall become the property of the Contractor. The contractor shall be responsible for disposing of all debris generated by scarification, shotblasting, sandblasting, and any other surface preparation operations, in compliance with applicable regulations concerning such disposal.

All costs associated with management and disposal of all debris shall be included in the payment of other items.

OSP PLAN SUBMITTAL

Prior to beginning surface preparation activities, the Contractor shall submit for review and approval the Overlay Surface Preparation (OSP) Plan. The OSP Plan shall detail the type of equipment that is intended to be used and the means by which the Contractor will achieve the following requirements:

(A) Estimate depth of reinforcing steel.

(B) Scarification of deck to depth required.

(C) Measure depth of scarification to show completed within limits.

(D) Measure depth of shotblasting to show completed within limits.

The OSP Plan shall also include a schedule showing lane closures with estimated amount of bridge deck to be scarified, anticipated areas of Class II/III to be repaired and PC to be placed within that lane closure time. The Contractor should assume that any surface that is scarified shall be covered with the proper PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer. The Contractor may propose traffic to be allowed on scarified bridge deck surfaces provided that the surface and joints are found to be structurally sound after scarification and a smooth transition is provided at the leading and trailing ends and throughout the bridge surface. The duration between bridge deck scarification and PC placement shall be specified by the Engineer. The number of bridges, if any, that can be scarified in advance of PC placement shall be specified by the Engineer. Any additional approach work required to provide a smooth transition to the scarified surface before opening to traffic is incidental to the other items of work. The OSP plan shall clearly show the Contractor's intended plan and order of scarifying and placing PC on all bridges with associated timeframes. The OSP plan and associated scarification timeframes must be approved by the Engineer prior to starting any surface preparation operations.

SURFACE PREPARATION

Prior to any construction, take the necessary precautions to ensure debris from bridge deck preparation and repairs is not allowed to fall below the bridge deck.

Remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete to the limits shown on the plans with the following requirements.

During surface preparation, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer. During surface preparation, the Contractor shall provide suitable coverings, as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from surface preparation shall be repaired to the Engineer's satisfaction at no additional cost to the Department.

(A) Sealing of Bridge Deck: Seal all expansion joints subject to run-off water from the scarification, shotblasting, and PC placement process with material approved by the Engineer, prior to beginning any demolition. The expansion joints shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer. Take all steps necessary to eliminate the flow of water or materials through the expansion joints, and any other locations water or materials could leak from the deck.

All deck drains in the immediate work area and other sections of the bridge affected by the work being performed shall be sealed prior to beginning scarification. Drains shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer.

(B) Scarifying Bridge Deck: Remove any asphalt wearing surface from the bridge deck and scarify the concrete deck to remove the entire concrete surface of the deck to the uniform depth and limits shown on the plans.

It will be the Contractor's responsibility to determine amount of cover for the reinforcing steel. Use a pachometer or other approved device, as approved by Engineer, prior to scarification. Readings shall be read and recorded in the presence of the Engineer. Readings shall be recorded for each span at 1/5 points longitudinally and 1/3 points transversely. The cost for this work will be considered incidental to the cost of surface preparation of the bridge deck.

Estimated average cover to top mat:

Bridge 330394: 2 1/2" +/-1/2"

The above top mat cover dimensions are an estimate based on the best available information. Calibrate scarifying equipment in order to avoid damaging the reinforcing steel in the bridge floor or the approach slab. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel. If reinforcing bars or bridge drainage devices are pulled up or snagged during scarification operations, cease work and consult with the Engineer to determine any necessary adjustments to the roto-milling operation.

Remove and dispose of all concrete and asphalt, and thoroughly clean the scarified surface. In areas where reinforcing steel is located in the depth to be scarified, use another method with the Engineer's approval.

The Engineer will re-inspect after each removal and require additional removals until compliance with plans and specifications are met.

Regardless of the method of removal, the removal operation shall be stopped if it is determined that sound concrete is being removed to a depth greater than required by the plans.

- (C) **Class II Surface Preparation (Partial Depth):** At locations specified on the plans or identified by the Engineer for Class II Surface Preparation, verify the depth of removal achieved by the scarification. Remove by additional scarification or chipping with hand tools all existing patches and unsound concrete. No additional payment will be made for Class II Surface Preparation depths achieved by the initial scarification.

All patches shall be removed under Class II Surface Preparation. If any patch cannot be removed by means of scarification, the Contractor shall use hand tools to remove the patch. Areas indicated on the plans that require Class II Surface Preparation, including the locations of existing patches, are from the best information available. The Contractor shall verify prior to surface preparation the location of all existing patches.

Spalled or unsound areas of the deck not removed by scarification shall be removed to sound concrete at locations noted in the contract plans or as directed by the Engineer. Remove existing spalled or unsound areas of the bridge concrete deck by methods approved by the Engineer.

Provide a 1" deep saw cut around the perimeter of areas noted for bridge deck or patch removal. Remove, using the type of tools listed above, all concrete or patch material within the sawcut to a minimum depth of 1" and as necessary to remove unsound concrete. All loose and unsound concrete or patch material shall be removed.

Thoroughly clean the newly exposed surface to be free of all grease, oil, curing compounds, acids, dirt, or loose debris in accordance with this special provision.

Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft²/ft length of bridge without overhang support is permitted unless the Engineer directs otherwise. Overhang support is required for areas removed greater than 0.60 ft²/ft length of bridge. Submit details of overhang support to the Engineer for approval prior to beginning the work.

- (D) **Class III Surface Preparation (Full Depth):** At locations specified on the plans or identified by the Engineer for Class III Surface Preparation, remove the concrete by chipping with hand tools the full depth of slab. Dispose of the removed concrete, clean, repair or replace damaged reinforcing steel and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

For areas of less than 3 ft², suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

Overhang support is required for full depth removal adjacent to bridge rails. Submit details of overhang support to the Engineer for approval prior to beginning the work.

- (E) Preparation of Reinforcing Steel: Remove concrete without cutting or damaging existing steel unless otherwise noted in the plans. Clean, repair, or replace rusted or loose reinforcing steel. Damaged reinforcing steel, such as bars with nicks deeper than 20% of the bar diameter, shall be repaired or replaced. Reinforcing steel which has a cross section reduced to 75% or less shall be replaced with new reinforcing steel of similar cross section area. Replacement bars shall be Grade 60 and meet the material requirements of Section 1070 of the *Standard Specifications*.

Replacement bars shall be spliced to existing bars using either minimum 30 bar diameter lap splices to existing steel with 100% cross sectional area or approved mechanical connectors.

For reinforcing steel left unsupported by the concrete removal process, support and protect the exposed reinforcing steel against displacement and damage from loads, such as those caused by removal equipment and delivery buggies. All reinforcing steel damaged or dislodged by these operations shall be replaced with bars of the same size at the contractor's expense.

Reinforcing steel exposed and satisfactorily cleaned and prepared will not require additional cleaning, if encased in concrete within seven (7) days. Rebar exposed for more than seven (7) days shall be satisfactorily cleaned and prepared, prior to placement of the new concrete. The satisfactory cleanliness and preparation of the reinforcing steel shall be determined by the Engineer.

When large areas of the deck on composite bridges are removed resulting in the debonding of the primary reinforcing bars, the removal shall be performed in stages to comply with the construction sequence shown on the plans or as directed by the Engineer.

- (F) Concrete Deck Repair: Repair and fill the Class II Surface Preparation areas of the existing bridge concrete deck prior to the final surface preparation and application of the PC overlay, at locations shown in the plans, or as determined by the Engineer, if necessary. Materials other than PC may be used for concrete deck repairs, but shall be approved by the PC System Provider's Technical Representative and shall be applied and prepared as required by the PC System Provider. For concrete deck repairs with PC:

- (1) Removal and surface preparation of the repair area shall be in accordance with and shall be paid for under pay items in this special provision.
- (2) Materials, equipment, placement, and finishing of PC used for concrete deck repairs shall meet the requirements of and shall be paid for under pay items in the Polymer Concrete Bridge Deck Overlay special provision.

PC repair material may be placed up to one (1) hour prior to overlay placement.

All repairs shall be placed and finished to match substrate deck grade prior to PC placement, in order to provide a uniform overlay thickness.

Concrete deck repairs with PC may be utilized as a stand-alone item where required on structures not to receive a PC overlay.

- (G) Surface Cleaning: The surface of concrete substrate and repaired areas shall be prepared for application of the overlay by shotblasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, curing compound, rust, membrane, weak surface mortar, or any other

contaminants that could interfere with the proper adhesion of the overlay system. The final prepared surface shall adhere to the following requirements:

- (1) If expansion joints are not being replaced or have been replaced prior to shotblasting they shall be protected from damage from the shotblasting operation. Deck drains and areas of curb or railing above the proposed surface shall be protected from the shotblasting operation.
 - (2) The areas to receive overlay shall be cleaned by shotblasting, or abrasive sandblasting in the event that the shotblaster cannot access areas to be prepared. Do not begin shotblasting until all grinding or milling operations are completed. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shotblasting unit shall be adjusted, so as to result in all weak or loose surface mortar being removed, aggregates within the concrete being exposed, and open pores in the concrete exposed, as well as a visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the overlay, the Contractor shall shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer at no additional cost to the Department.
 - (3) Prior to the overlay placement, any loose particles shall be removed by magnets, oil free compressed air, and vacuuming, such that no trapped particles remain. Power washing will not be allowed.
 - (4) The areas to be overlaid shall be blown off with oil and moisture free compressed air just prior to placement of the primer and shall be completely dry.
 - (5) Cleaning methods other than those detailed by specification may be suggested by the PC System Provider and approved by the Engineer.
 - (6) All steel surfaces that will be in contact with the PC overlay shall be cleaned in accordance with Structural Steel Paint Council (SSPC) Surface Preparation (SP) No. 10, Near-White Blast Cleaning, except that wet blasting methods shall not be allowed.
- (H) Safety: Provide a containment system for handling expected and unexpected blow through of the deck. The containment system shall retain runoff water and debris and protect the area under the bridge deck. The Contractor shall be responsible for any injury or damage caused by these operations. The containment system shall remain in place until the concrete has been cast and attained minimum strength.

Provide adequate lighting when performing deck preparation activities at night. Submit a lighting plan to the Engineer for approval prior to beginning work.

MEASUREMENT AND PAYMENT

Scarifying Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the milling of existing asphalt wearing surface from the bridge deck and approaches, milling of the entire concrete bridge deck, repairing or replacing any damaged reinforcing steel, and the cleaning and disposal of all waste material generated.

Shotblasting Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the shotblasting and necessary sandblasting and handwork to prepare the entire concrete bridge deck and approaches, and removal and disposal of all waste material generated.

Class II Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class II (partial depth) deck preparation where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete, removal of all existing patches, cleaning, repairing, or replacing of reinforcing steel, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Class III Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class III (full depth) deck preparation and repair where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete, cleaning, repairing or replacing of reinforcing steel, under deck containment, placing and finishing concrete for full depth repair, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Reinforcing Steel that is required for the repairs will be in accordance with Section 425 of the *Standard Specifications*.

Payment will be made under:

Pav Item

Scarifying Bridge Deck
Shotblasting Bridge Deck
Class II Surface Preparation
Class III Surface Preparation

Pav Unit

Square Yard
Square Yard
Square Yard
Square Yard

FOAM JOINT SEALS FOR PRESERVATION

(SPECIAL)

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.

Use seals manufactured with grooves 1/8"± wide by 1/8"± 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, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft ²
Elongation at Break	ASTM D3575	180% - 210%
Tear Resistance	ASTM D624 (D3575, Suffix G)	14 – 20 pli
Density	ASTM D3575, Suffix W, Method A	1.8 – 2.2 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.

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	3,000 psi (min.)
Compressive strength	ASTM D695	7,000 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	2,000 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.

SAWING THE JOINT

The concrete at the face of the joint (elastomeric concrete, polyester polymer concrete, Portland cement concrete, etc.) shall have sufficient time to cure such that no damage can occur to the 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 (1) or two (2) passes of the saw by placing and spacing two (2) metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus $\frac{1}{4}$ " 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 $\frac{1}{4}$ " 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.

PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete or polyester polymer concrete at the joint shall cure a minimum of 24 hours prior to seal installation. Portland cement concrete at the joint shall cure following the special provisions.

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, at no cost to the Department.

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 joint concrete may be exposed after sandblasting.

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.

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 ensure 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. Stir each epoxy bonding agent component independently, using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two (2) 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 joint concrete, as well as both sides of the joint seal, making certain to fill completely 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 ¼" 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.

(A) Watertight Integrity Test

- (1) Upon completion of each foam seal expansion joint, 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 six (6) inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- (2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of five (5) hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The foam seal expansion joint 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 considered a sign of leakage.
- (3) 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.

- (4) 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 additional cost to the Department.

Do not place pavement markings on top of foam joint seals.

BASIS OF PAYMENT

Foam Joint Seals for Preservation will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for furnishing all material, labor, tools, and equipment necessary for installing these seals in place and accepted.

Pay Item	Pay Unit
Foam Joint Seals for Preservation	Linear Feet

POURABLE SILICONE JOINT SEALANT

(SPECIAL)

SEALS

Provide and install a low modulus silicone sealant (non-sag or self-leveling) and backer rod which conforms to the *Standard Specifications* (Subsections 1028-3 and 1028-4, respectively) and this special provision. Use silicone approved for use on joint openings as indicated on project plans and provide a seal with a working range of minimum 50% compression and extension. Silicone joint seal product shall be designated as approved for use on the NCDOT Approved Products List. If non-sag and self-leveling sealants are to be in contact with each other, they shall be from the same manufacturer and shall be compatible for such use.

SAWING THE JOINT

Joint concrete material or joint concrete header material shall have sufficient time to cure such that no damage can occur to the concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the 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 (2) passes of the saw by placing and spacing two (2) metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus $\frac{1}{4}$ " 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 $\frac{1}{4}$ " 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.

PREPARATION OF FORMED OR SAWED JOINT FOR SEAL INSTALLATION

Joint concrete material or joint concrete header material shall cure a minimum of 24 hours prior to seal installation.

After forming or sawing the joint, the Engineer will thoroughly inspect the joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal, at no cost to the Department.

Clean the joints by sandblasting 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 polyester polymer concrete may be exposed after sandblasting.

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.

Apply recommended primer in accordance with the manufacturer's recommendations. Uniformly coat the entire surface. Over application may affect adhesion. Allow to thoroughly dry before installing backer rod and sealant.

Install a circular backer rod that is a minimum 25 percent oversized into the joint approximately 1 in. below the surface. The backer rod shall be sized according to the manufacturer's recommendation for the size of the joint to be sealed as measured by the Contractor. If two (2) pieces must be joined, abut the two (2) ends and tape them together to prevent sealant run down. The backer rod may be installed by hand, but roller device shall be used to insure a consistent, uniform placement at the proper depth below the top surface.

Install the backer rod and silicone sealant in the blast-cleaned opening on the same day the surface is blast cleaned.

SEAL INSTALLATION

Install the silicone joint sealant(s) as indicated on the plans, in accordance with 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, to provide guidance for the proper installation of the silicone joint sealant(s).

The sealant must be recessed a minimum $\frac{1}{2}$ in. below the pavement surface to prevent traffic abrasion or snow plow damage.

After a joint has been sealed, remove excess joint sealer on the pavement or bridge deck concrete as soon as possible.

The installed system shall be watertight and will be monitored until final inspection and approval.

Do not place pavement markings on top of pourable joint seals.

(B) Watertight Integrity Test

- (1) Upon completion of each pourable silicone joint, 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 six (6) inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- (2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of five (5) hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The strip seal expansion joint 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 considered a sign of leakage.
- (3) 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.
- (4) 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 additional cost to the Department.

BASIS OF PAYMENT

Pourable Silicone Joint Sealant will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for furnishing all material, including backer rod, labor, tools, and equipment necessary for installing these seals in place and accepted.

Pay Item

Pourable Silicone Joint Sealant

Pay Unit

Linear Feet

EPOXY RESIN INJECTION**(08-08-22)****GENERAL**

For repairing cracks, an applicator certified by the manufacturer of epoxy injection system to be used is required to perform the epoxy resin injection. The Contractor shall submit documentation that indicates the firm, supervisor and the workmen have completed an instruction program in the methods of restoring concrete structures utilizing the epoxy injection process and have five (5) years of relative experience with a record of satisfactory performance on similar projects.

The Contractor furnishes all materials, tools, equipment, appliances, labor and supervision required when repairing cracks with the injection of an epoxy resin adhesive.

SCOPE OF WORK

Using Epoxy Resin Injection, repair all cracks 25 mils (625 μm) wide or greater in the interior bent columns and caps, in the ends of the girders, in the cantilevered portion of the ends of the girders, and in the cantilevered portion of the superstructure deck on the downstream side.

Repair the column cracks to the top of the footings. Make the underwater repairs when water surface elevation is low and the water is still. For underwater repairs, use manufacturer recommended materials.

Repair any crack, void, honeycomb or spall area unsuitable for repair by injection with epoxy mortar, or as otherwise approved by the Engineer.

SUBMITTALS

Prior to construction, the Contractor shall submit the following to the Engineer for review and approval:

- (A) Materials – Information detailing the materials and their properties, storage and handling requirements, and Material Safety Data Sheets. Material certifications and sampling shall be as required as per the NCDOT *Standard Specifications* Section 106.
- (B) Injection Procedures – Preparation and epoxy injection installation procedures, including written instructions from the manufacturer of the proportioning dispenser and the procedures recommended to monitor and assure its proportioning accuracy of the unit.
- (C) Contingencies – Proposed injection repair procedures in the event that during testing it is found that the injection installation procedure did not completely fill the cracks with epoxy.
- (D) Qualifications – The resumes of the Contractor's staff and/or the epoxy resin manufacturer's Technical Representative that will be on site performing the epoxy injection. The resumes shall detail the installer's applicable certifications and epoxy injection installation experience.
- (E) References – The names and telephone numbers of contact persons for recent (< 2years?) epoxy injection projects.

COOPERATION

Cooperate and coordinate with the Technical Representative of the epoxy resin manufacturer for satisfactory performance of the work.

Have the material manufacturer's Technical Representative present when the epoxy resin injection process begins and until the Engineer is assured that their service is no longer needed.

The expense of having this representative on the job is the Contractor's responsibility at no additional cost to the Department .

MATERIAL PROPERTIES

Provide a two-component structural epoxy adhesive for injection into cracks or other voids. Provide modified epoxy resin (Component "A") that conforms to the following requirements:

	Test Method	Specification Requirements
Viscosity @ $40 \pm 3^{\circ}\text{F}$, cps	Brookfield RVT Spindle No. 4 @ 20 rpm	6,000 – 8,000
Viscosity @ $77 \pm 3^{\circ}\text{F}$, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	400 - 700
Epoxide Equivalent Weight	ASTM D1652	152 - 168
Ash Content, %	ASTM D482	1 max.

Provide the amine curing agent (Component "B") used with the epoxy resin that meets the following requirements:

	Test Method	Specification Requirements
Viscosity @ $40 \pm 3^{\circ}\text{F}$, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	700 - 1400
Viscosity @ $77 \pm 3^{\circ}\text{F}$, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	105 - 240
Amine Value, mg KOH/g	ASTM D664*	490 - 560
Ash Content, %	ASTM D482	1 max.
* Method modified to use perchloric acid in acetic acid.		

Certify that the Uncured Adhesive, when mixed in the mix ratio that the material supplier specifies, has the following properties:

Pot Life (60 gram mass)

@ $77 \pm 3^{\circ}\text{F}$ - 15 minutes minimum

@ $100 \pm 3^{\circ}\text{F}$ - 5 minutes minimum

Certify that the Adhesive, when cured for seven (7) days at $77 \pm 3^{\circ}\text{F}$ unless otherwise specified, has the following properties:

	Test Method	Specification Requirements
Ultimate Tensile Strength	ASTM D638	7,000 psi (min.)
Tensile Elongation at Break	ASTM D638	4% max.
Flexural Strength	ASTM D790	10,000 psi (min.)
Flexural Modulus	ASTM D790	3.5×10^5 psi
Compressive Yield Strength	ASTM D695	11,000 psi (min.)
Compressive Modulus	ASTM D695	$2.0 - 3.5 \times 10^5$ psi
Heat Deflection Temperature Cured 28 days @ $77 \pm 3^{\circ}\text{F}$	ASTM D648*	125°F min. 135°F min.
Slant Shear Strength, 5,000 psi (34.5 MPa) compressive strength concrete Cured 3 days @ 40°F wet concrete Cured 7 days @ 40°F wet concrete Cured 1 day @ 77°F dry concrete	AASHTO T237	 3,500 psi (min.) 4,000 psi (min.) 5,000 psi (min.)
* Cure test specimens so the peak exothermic temperature does not exceed 77°F.		

Use an epoxy bonding agent, as specified for epoxy mortar, as the surface seal (used to confine the epoxy resin during injection).

EQUIPMENT FOR INJECTION

Use portable positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two (2) components at the nozzle to meter and mix the two (2) injection adhesive components and inject the mixed adhesive into the crack. Use electric or air powered pumps that provide in-line metering and mixing.

Use injection equipment with automatic pressure control capable of discharging the mixed adhesive at any pre-set pressure up to 200 ± 5 psi and equipped with a manual pressure control override.

Use equipment capable of maintaining the volume ratio for the injection adhesive as prescribed by the manufacturer. A tolerance of $\pm 5\%$ by volume at any discharge pressure up to 200 psi is permitted.

Provide injection equipment with sensors on both the Component A and B reservoirs that automatically stop the machine when only one component is being pumped to the mixing head.

PREPARATION

Follow these steps prior to injecting the epoxy resin:

- (A) Remove all dirt, dust, grease, oil, efflorescence and other foreign matter detrimental to the bond of the epoxy injection surface seal system from the surfaces adjacent to the cracks or other areas of application. Acids and corrosives are not permitted.
- (B) Provide entry ports along the crack at intervals determined by the Contractor to ensure full penetration of the crack.
- (C) Apply surface seal material to the face of the crack between the entry ports. For through cracks, apply surface seal to both faces.
- (D) Allow enough time for the surface seal material to gain adequate strength before proceeding with the injection.
- (E) Perform an air pressure check of the surface seal to ensure the system is airtight prior to proceeding with the injection.

EPOXY INJECTION

Before epoxy adhesive injection occurs, the Contractor shall test discharge one pint of epoxy to calibrate the equipment and to demonstrate that the workmen and equipment are working properly.

Follow approved preparation and installation procedures submitted by the Contractor. It is the Contractor's responsibility to achieve full penetration of cracks being injected.

Perform epoxy adhesive injection continuously until cracks are completely filled. Pressure shall be maintained until complete refusal of material is achieved. Any stoppage of injection for more than 15 minutes shall result in the injection equipment being cleaned, at no additional cost to the Department, before resuming injection.

If port to port travel of epoxy adhesive is not indicated, or the surface seal and/or ports become dislodged, immediately stop the work and notify the Engineer.

TESTING

The Contractor shall core 3" diameter by 6" deep samples of the cured epoxy to verify the cracks have been completely filled with epoxy. When coring, care shall be taken to avoid existing steel reinforcement, where possible. Injection will not proceed beyond the initial 50 feet until three (3) cores have been submitted to, and approved by, the Engineer. If the epoxy does not penetrate a minimum of 6" or the full depth of the crack, whichever is less, the repair will be rejected, and the contractor shall follow their proposed repair procedure that has been approved by the Engineer. The presence of the technical representative will be required when repairs begin.

The Engineer will take possession of the cores from the repaired concrete for compressive strength testing. If the failure plane is located at the repaired crack, a minimum compressive strength of 3,000 psi is required of these cores. The cost of coring is incidental to the pay item for epoxy injection. If the core fails, the contractor will be required to take corrective action before proceeding and another 50' test section will be required.

After the contractor demonstrates acceptable repairs, cores will be taken at a rate of one per 100 linear feet of repair until completion of the work or unacceptable cores are encountered.

FINISHING

When cracks are completely filled, allow the epoxy adhesive to cure for sufficient time to allow the removal of the surface seal without any draining or runback of epoxy material from the cracks.

Fill all cored holes with Type 3 grout in accordance with Section 1003 of the *Standard Specifications*.

Remove the surface seal material and injection adhesive runs or spills from concrete surfaces.

Finish the face of the crack and all core holes flush to the adjacent concrete, removing any indentations or protrusions caused by the placement of entry ports or grout placement.

BASIS OF PAYMENT

Epoxy Resin Injection will be paid at the contract unit price per linear foot. For full depth cracks, payment will be made for one side only. Such payment will be full compensation for all materials, tools, equipment, labor, coring and for all incidentals necessary to complete the work.

Pay Item	Pay Unit
Epoxy Resin Injection	Linear Foot

SHOTCRETE REPAIRS

(08-08-22)

GENERAL

The work covered by this special provision consists of removing deteriorated concrete from the structure in accordance with the limits, depth and details shown on the plans, described herein and as established by the Engineer. This work also includes removing and disposing all loose debris, cleaning and repairing reinforcing steel and applying structural shotcrete.

The location and extent of repairs shown on the plans are general in nature. The Engineer shall determine the extent of removal in the field based on an evaluation of the condition of the exposed surfaces.

Any portion of the structure that is damaged from construction operations shall be repaired to the Engineer's satisfaction, at no extra cost to the Department.

MATERIAL REQUIREMENTS

Use prepackaged dry mix shotcrete conforming to the requirements of ASTM C1480, the applicable sections of the *Standard Specifications* and the following:

Test Description	Test Method	Age (Days)	Specified Requirements
Silica Fume (%)	ASTM C1240	-	10 (Max.)
Air Content - As Shot (%)	ASTM C231 or ASTM C457	-	5 ± 2
Minimum Compressive Strength (psi)	ASTM C109	7 28	3,000 5,000
Minimum Bond Pull-off Strength (psi)	ASTM C1583 or ASTM C882	28	250
Rapid Chloride Permeability Tests (range in coulombs)	ASTM C1202	-	100 - 1000

Admixtures are not allowed unless approved by the Engineer. Store shotcrete in an environment where temperatures remain above 40°F and less than 95°F

All equipment must operate in accordance with the manufacturer's specifications and material must be placed within the recommended time.

QUALITY CONTROL**(A) Qualification of Shotcrete Contractor**

The shotcrete Contractor shall provide proof of experience by submitting a description of jobs similar in size and character that have been completed within the last five (5) years. The name, address and telephone number of references for the submitted projects shall also be furnished. Failure to provide appropriate documentation will result in the rejection of the proposed shotcrete contractor.

(B) Qualification of Nozzleman

The shotcrete Contractor's nozzleman shall be certified by the American Concrete Institute (ACI). Submit proof of certification to the Engineer prior to beginning repair work. The nozzleman shall maintain certification at all times while work is being performed for the Department. Failure to provide and maintain certification will result in the rejection of the proposed nozzleman.

TEMPORARY WORK PLATFORM

Prior to beginning any repair work, provide details for a sufficiently sized temporary work platform at each repair location. Design steel members to meet the requirements of the American Institute of Steel Construction Manual. Design timber members in accordance with the *National Design*

Specification for Stress-Grade Lumber and Its Fastenings of the National Forest Products Association. Submit the platform design and plans for review and approval. The design and plans shall be sealed and signed by a North Carolina registered Professional Engineer. Do not install the platform until the design and plans are approved. Drilling holes in the superstructure for the purpose of attaching the platform is prohibited. Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

SURFACE PREPARATION

Prior to starting the repair operation, delineate all surfaces and areas assumed to be deteriorated by visually examining and sounding the concrete surface with a hammer or other approved method. The Engineer is the sole judge in determining the limits of deterioration.

Prior to removal, introduce a shallow saw cut approximately ½" in depth around the repair area at right angles to the concrete surface. Remove all deteriorated concrete 1 inch below the reinforcing steel with a 17 lb (maximum) pneumatic hammer with points that do not exceed the width of the shank or with hand picks or chisels as directed by the Engineer. Do not cut or remove the existing reinforcing steel. Unless specifically directed by the Engineer, do not remove concrete deeper than 1 inch below the reinforcing steel.

Abrasive blast all exposed concrete surfaces and existing reinforcing steel in repair areas to remove all debris, loose concrete, loose mortar, rust, scale, etc. After sandblasting examine the reinforcing steel to ensure at least 90% of the original diameter remains. If there is more than 10% reduction in the rebar diameter, splice in and securely tie supplemental reinforcing bars as directed by the Engineer.

Provide stainless welded wire fabric at each repair area larger than one square foot if the depth of the repair exceeds 2 inches from the existing, intact exterior face of the concrete member. Provide a minimum 4" x 4" - 12 gage stainless welded wire fabric unless otherwise shown on the plans. Rigidly secure the welded wire fabric to existing steel or to $\frac{3}{16}$ " diameter stainless hook fasteners adequately spaced to prevent sagging. Encase the welded wire fabric in shotcrete a minimum depth of 1½ inches.

With the exception of overhead applications, the contractor has the option to use synthetic fiber reinforcement as an alternate to welded wire fabric if attaching welded wire fabric is impractical or if approved by the Engineer. Welded wire fabric and synthetic fiber reinforcement shall not be used in the same repair area.

Thoroughly clean the repair area of all dirt, grease, oil or foreign matter, and remove all loose or weakened material before applying shotcrete. Saturate the repair area with clean water the day before applying shotcrete. Bring the wetted surface to a saturated surface dry (SSD) condition prior to applying shotcrete and maintain this condition until the application begins. Use a blowpipe to facilitate removal of free surface water. Only oil-free compressed air is to be used in the blowpipe.

The time between removal of deteriorated concrete and applying shotcrete shall not exceed five (5) calendar days. If the time allowance exceeds (5) calendar days, prepare the surface at the direction of the Engineer before applying shotcrete.

APPLICATION AND SURFACE FINISH

Apply shotcrete only when the surface temperature of the repair area is greater than 40°F and less than 95°F. Do not apply shotcrete to frosted surfaces. Maintain shotcrete at a minimum temperature of 40°F for three (3) calendar days after placement.

Apply shotcrete in layers. The properties of the applied shotcrete determine the proper thickness of each layer or lift.

The nozzleman should hold the nozzle three (3) to four (4) feet from the surface being covered in a position that ensures the shotcrete strikes at right angles to the surface being covered without excessive impact. The nozzleman shall maintain the water amount at a practicable minimum, so the mix properly adheres to the repair area. Water content should not become high enough to cause the mix to sag or fall from vertical or inclined surfaces, or to separate in horizontal layers.

Use shooting wires or guide strips that do not entrap rebound sand. Use guide wires to provide a positive means of checking the total thickness of the shotcrete applied. Remove the guide wires prior to the final finish coat.

To avoid leaving sand pockets in the shotcrete, blow or rake off sand that rebounds and does not fall clear of the work, or which collects in pockets in the work. Do not reuse rebound material in the work.

If a work stoppage longer than two (2) hours takes place on any shotcrete layer prior to the time it has been built up to required thickness, saturate the area with clean water and use a blowpipe as outlined previously, prior to continuing with the remaining shotcrete course. Do not apply shotcrete to a dry surface.

Finish all repaired areas, including chamfered edges, as close as practicable to their original dimensions and configuration, unless otherwise required to provide a minimum 2" of cover for reinforcing steel exposed during repair. If necessary to extend shotcrete repair material beyond the original member dimensions and geometry, coordinate with the Engineer to determine methods, geometry, and dimensions of the final finished surface to provide a minimum 2" of cover on reinforcing steel. Slightly build up and trim shotcrete to the final surface by cutting with the leading edge of a sharp trowel. Use a rubber float to correct any imperfections. Limit work on the finished surface to correcting imperfections caused by trowel cutting.

Immediately after bringing shotcrete surfaces to final thickness, thoroughly check for sags, bridging, and other deficiencies. Repair any imperfections at the direction of the Engineer.

Cure the completed shotcrete surface in accordance with Article 420-15(B) Water Method, of the *Standard Specifications* for seven (7) calendar days. If the water method is impracticable and if approved by the Engineer, a membrane curing compound may be used in accordance with Subarticle 420-15(C) at double the manufacturer's recommended coverage rate.

MATERIAL TESTING & ACCEPTANCE

Each day shotcreting takes place, the nozzleman shall shoot one 18" x 18" x 3.5" test panel in the same position as the repair work that is being done to demonstrate the shotcrete is being applied properly. Store, handle and cure the test panel in the same manner as the repaired substructure and do not disturb for the first 24 hours after shotcreting.

Approximately 72 hours after completing the final shotcrete placement, thoroughly test the surface with a hammer. At this time, the repair area should have sufficient strength for all sound sections to ring sharply. Remove and replace any unsound portions prior to the final inspection of the work. No additional compensation will be provided for removal and replacement of unsound shotcrete.

In accordance with Subarticle 1002-3(H) of the Standard Specifications, core three (3) 3" diameter samples from each test panel. Compressive strength values on test panels shall equal or exceed the required 28-day strength requirements. Should failures occur on the test panel cores, acceptance of the material will be determined by tests on cores from the installed work on the structure. A minimum of (3) three cores shall be taken from the area in question of the structure. The average compressive strength of the cores taken from the structure shall equal or exceed the specified strength of the shotcrete applied, and no single core shall have strength less than 85% of the specified value. Any cores taken from the structure shall penetrate into the existing concrete at least two (2) inches. Cores shall also be inspected for delamination, sand pockets, segregation, and voids.

The adequacy of the bond between the existing concrete and the shotcrete shall be determined by direct tension bond testing, in accordance with ASTM C1583 or ASTM C882, as directed by the Engineer. A minimum bond strength of 250 psi will be accepted as satisfactory. Bond failure less than 250 psi attributable to the failure of existing concrete will not be cause for rejection. The cost of up to three passing direct tension bond tests shall be the responsibility of the Contractor; additional passing pull-off tests will be the responsibility of the Department.

Any repair work failing to meet the requirements of this provision will be rejected and the Contractor shall implement a remediation plan to correct the deficiency at no additional cost to the Department. No extra payment will be provided for drilling extra cores. Patch all core holes in the repaired structure to the satisfaction of the Engineer.

MEASUREMENT AND PAYMENT

Shotcrete Repairs will be measured and paid for at the contract unit price bid per cubic foot and will be full compensation for removal, containment and disposal off-site of unsound concrete including the cost of materials, labor, tools, equipment and incidentals necessary to complete the repair work. Depth will be measured from the original outside concrete face. If modifications to the dimensions and geometry are approved by the Engineer to achieve proper clearance over reinforcing steel, depth measurements will be made from the modified final outside face. The Contractor and Engineer will measure quantities after removal of unsound concrete and before application of repair material. Payment will also include the cost of sandblasting, surface cleaning and preparation, cleaning of reinforcing steel, placement of new steel, cost of temporary work

platform, testing for soundness and bond strength, curing of shotcrete and taking core samples from the test panels and the structure.

Payment will be made under:

Pay Item

Shotcrete Repairs

Pay Unit

Cubic Feet

CONCRETE REPAIRS**(2-11-19)****DESCRIPTION**

Work includes removal of concrete in spalled, delaminated and/or cracked areas of the existing bent caps, bent columns, underside of bridge decks, deck slabs, girders, and bridge rails in reasonably close conformity with the lines, depth, and details shown on the plans, described herein and as established by the Engineer. This work also includes straightening, cleaning, and replacement of reinforcing steel, doweling new reinforcing steel, removing all loose materials, removing and disposing of debris, formwork, applying repair material, and protecting adjacent areas of the bridge and environment from material leakage. The repair material shall be one of the materials described in this Special Provision, unless otherwise noted in the plans or special provisions.

The location and extent of repairs shown on the plans described herein are general in nature. The Engineer shall determine the extent of removal in the field based on an evaluation of the condition of the exposed surfaces. The Contractor shall coordinate removal operations with the Engineer. No more than 30% of a round or square column or 30% of the bearing area under a beam shall be removed without a temporary support system and approval from the Engineer.

Repair, to the Engineer's satisfaction, any portion of the structure that is damaged from construction operations. No extra payment is provided for these repairs.

SURFACE PREPARATION

1. Adhere to the following surface preparation requirements or the repair material manufacturer's requirements, whichever is more stringent.
2. Prior to starting the repair operation, delineate all surfaces and areas assumed to be deteriorated by visually examining and sounding the concrete surface with a hammer or other approved method. The Engineer is the sole judge in determining the limits of deterioration.
3. Prior to concrete removal, introduce a shallow saw cut, 1/2" in depth, around the repair area at right angles to the concrete surface. Sawcut should be located a minimum 2" beyond the perimeter of the deteriorated concrete area to be repaired. Remove all concrete within the sawcut to a minimum depth of 1/2". If concrete removal exposes reinforcing steel, remove all deteriorated concrete 1" below the reinforcing steel with a 17 lb (maximum) pneumatic hammer, with points that do not exceed the width of the shank, or with hand picks or chisels, as directed by the Engineer.

Do not cut or remove the existing reinforcing steel. Unless specifically directed by the Engineer, do not remove concrete deeper than 1" below the reinforcing steel.

4. Abrasive blast all exposed concrete surfaces and existing reinforcing steel in repair areas to remove all debris, loose concrete, loose mortar, rust, scale, etc. After blasting, examine the reinforcing steel to ensure at least 90% of the original diameter remains. If there is more than 10% reduction in the rebar diameter, splice in and securely tie supplemental reinforcing bars as directed by the Engineer. This might require additional removal of concrete, in order to achieve an appropriate splice length of the reinforcing steel.

5. Thoroughly clean the repair area of all dirt, grease, oil, or foreign matter, and remove all loose or weakened material by abrasive blasting before applying concrete repair material. Acid etch with 15% hydrochloric acid, only if approved by the Engineer. Follow acid etching by scrubbing and flushing with copious amounts of clean water. Check the cleaning using moist pH paper. Water cleaning is complete when the paper reads ten (10) or higher.

6. Follow all abrasive blasting with vacuum cleaning.

7. The time between removal of deteriorated concrete and applying concrete repair material shall not exceed 72 hours. If the time allowance exceeds 72 hours, prepare the surface at the direction of the Engineer before applying concrete repair material.

APPLICATION AND SURFACE FINISH

Apply repair material to damp surfaces only when allowed by repair material recommendations and approved by the Engineer. Prepare damp surfaces in accordance with the *Standard Specifications* and/ or repair material manufacturer's recommendations. Use a blowpipe to facilitate removal of free surface water. Only oil-free compressed air is to be used in the blowpipe.

When surface preparation is completed, mix and apply repair material in accordance with the *Standard Specifications* and/ or repair material manufacturer's recommendations.

Use aggregate that is washed, kiln-dried, and bagged. Maximum size of aggregate shall not exceed 2/3 of the minimum depth of the repair area, or 3/4 of the depth of excavation behind the reinforcing steel, whichever is smaller.

Unless otherwise required by the repair material manufacturer, apply bonding agent to all repair areas immediately prior to placing repair material.

Repair areas shall be formed unless otherwise approved by the Engineer. Form and finish all repaired areas, including chamfered edges, as close as practicable to their original "As Built" dimensions and configuration. After applying the repair material, remove excessive material and provide a smooth, flush surface, unless directed otherwise.

Cure finished Class A concrete repair material by maintaining 95% relative humidity at the repair and surrounding areas by fogging, moist curing, or other approved means for seven (7) days. Cure polymer modified concrete repair material in accordance with manufacturer's recommendations.

REPAIR MATERIAL OPTIONS**(A) Polymer Modified Concrete Repair Material**

Repair material shall be polymer modified cement mortar for vertical or overhead applications and shall be suitable for applications in marine environments. Material shall be approved for use by NCDOT. Submit repair material to the Engineer for review and approval prior to beginning the work. Color of repair material shall be concrete gray.

(B) Class A Concrete Repair Material

Repair material shall be Class A Portland Cement Concrete as described in Article 1000-4 of the *Standard Specifications*.

TEMPORARY WORK PLATFORM

8. Prior to beginning any repair work, provide details for a sufficiently sized temporary work platform at each repair location. Design steel members to meet the requirements of the *American Institute of Steel Construction Manual*. Design timber members in accordance with the *National Design Specification for Stress-Grade Lumber and Its Fastenings* of the National Forest Products Association. Submit the platform design and plans for review and approval. The design and plans shall be sealed and signed by a North Carolina registered Professional Engineer. Do not install the platform until the design and plans are approved. Drilling holes in the superstructure for the purpose of attaching the platform is prohibited. Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

MEASUREMENT AND PAYMENT

Concrete Repairs will be measured and paid for at the contract unit price bid per cubic foot and will be full compensation for removal, containment and disposal off-site of unsound concrete including the cost of materials, reinforcing steel, labor, tools, equipment and incidentals necessary to complete the repair work. Depth will be measured from the original outside concrete face. The Contractor and Engineer will measure quantities after removal of unsound concrete and before application of repair material. Payment will also include the cost of abrasive blasting, surface cleaning and preparation, blast cleaning of reinforcing steel, placement of new reinforcing steel, cost of temporary work platform, testing of the soundness of the exposed concrete surface, furnishing and installation of repair mortar material, curing and sampling of concrete, and protection/cleaning of adjacent areas from splatter or leakage.

Reinforcing Steel that is required for the repairs will be in accordance with Section 425 of the *Standard Specifications*.

Payment will be made under:

Pay Item

Concrete Repairs

Pay Unit

Cubic Feet

FALSEWORK AND FORMWORK**(2-14-22)****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.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab. For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

For links slabs, the tops of girders directly beneath the link slab shall be free of overhang falsework attachments or other hardware. Submit calculations and working drawings for overhang falsework in the link slab region.

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 $\frac{3}{4}$ ".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft ² for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS**(2-14-22)****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.

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 Email: SMU-wdr@ncdot.gov (do not cc SMU Working Drawings staff)

Via US mail:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office addresses:

Via Email: EastGeotechnicalSubmittal@ncdot.gov

Via US mail:

Mr. David Hering, L.G., P. E.
Assistant State Geotechnical

Via other delivery service:

Mr. David Hering, L.G., P. E.
Assistant State Geotechnical

Engineer – Eastern Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Engineer – Eastern Region
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 addresses:

Via Email: WestGeotechnicalSubmittal@ncdot.gov

Via US mail or other delivery service:

Mr. Eric Williams, P. E.
Assistant State Geotechnical
Engineer – Western Region
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 website, via the "[Drawing Submittal Status](#)" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "[Geotechnical Construction Submittals](#)" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: James Bolden (919) 707 – 6408
jlbolden@ncdot.gov

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
eomile@ncdot.gov

Madonna Rorie (919) 707 – 6508
mrorie@ncdot.gov

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):

Eric Williams (704) 455 – 8902
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 a copy of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit as specified in the tables below.

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.

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	Submittal Required by Structures Management Unit?	Submittal Required by Geotechnical Engineering Unit?	Contract Reference Requiring Submittal ¹
Arch Culvert Falsework	Y	N	Plan Note, SN Sheet & “Falsework and Formwork”
Box Culvert Falsework ⁷	Y	N	Plan Note, SN Sheet & “Falsework and Formwork”
Cofferdams	Y	Y	Article 410-4
Foam Joint Seals ⁶	Y	N	“Foam Joint Seals”
Expansion Joint Seals (hold down plate type with base angle)	Y	N	“Expansion Joint Seals”
Expansion Joint Seals (modular)	Y	N	“Modular Expansion Joint Seals”
Expansion Joint Seals (strip seals)	Y	N	“Strip Seal Expansion Joints”

Falsework & Forms ² (substructure)	Y	N	Article 420-3 & “Falsework and Formwork”
Falsework & Forms (superstructure)	Y	N	Article 420-3 & “Falsework and Formwork”
Girder Erection over Railroad	Y	N	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	Y	N	“Maintenance and Protection of Traffic Beneath Proposed Structure at Station ____”
Metal Bridge Railing	Y	N	Plan Note
Metal Stay-in-Place Forms	Y	N	Article 420-3
Metalwork for Elastomeric Bearings ^{4,5}	Y	N	Article 1072-8
Miscellaneous Metalwork ^{4,5}	Y	N	Article 1072-8
Disc Bearings ⁴	Y	N	“Disc Bearings”
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	Y	N	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	Y	N	Article 420-20
Prestressed Concrete Box Beam (detensioning sequences) ³	Y	N	Article 1078-11
Precast Concrete Box Culverts	Y	N	“Optional Precast Reinforced Concrete Box Culvert at Station ____”
Prestressed Concrete Cored Slab (detensioning sequences) ³	Y	N	Article 1078-11
Prestressed Concrete Deck Panels	Y	N	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	Y	N	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	Y	N	Railroad Provisions
	Y	N	Article 420-3

Revised Bridge Deck Plans
(adaptation to prestressed deck
panels)

Revised Bridge Deck Plans
(adaptation to modular
expansion joint seals)

Y

N

“Modular Expansion Joint
Seals”

Sound Barrier Wall (precast
items)

Y

N

Article 1077-2 &
“Sound Barrier Wall”

Sound Barrier Wall Steel
Fabrication Plans ⁵

Y

N

Article 1072-8 &
“Sound Barrier Wall”

Structural Steel ⁴

Y

N

Article 1072-8

Temporary Detour Structures

Y

Y

Article 400-3 &
“Construction,
Maintenance and Removal
of Temporary Structure at
Station _____”

TFE Expansion Bearings ⁴

Y

N

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	Submittals Required by Geotechnical Engineering Unit	Submittals Required by Structures Management Unit	Contract Reference Requiring Submittal ¹
Drilled Pier Construction Plans ²	Y	N	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports ²	Y	N	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms ^{2,3}	Y	N	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports ²	Y	N	Subarticle 450-3(F)(3)
Retaining Walls ⁴	Y; drawings and calculations	Y; drawings	Applicable Provisions
Temporary Shoring ⁴	Y; drawings and calculations	Y; drawings	“Temporary Shoring” & “Temporary Soil Nail Walls”

FOOTNOTES

- 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*.
- Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email), US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.
- 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.
- Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY**(6-20-19)**

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES**(12-1-17)****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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

EPOXY COATING AND DEBRIS REMOVAL**(SPECIAL)****GENERAL**

This work applies to all bents and end bents of all bridges throughout the project as noted in the plans. Pressure wash, clean and epoxy coat top of the all bent and end bent caps under open joints and at the expansion joints of steel girder spans after painting of all girders is concluded.

Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Use a Type 4A flexible and moisture insensitive epoxy coating in accordance with Section 1081 of the *Standard Specifications*. Provide a Type 3 material certification in accordance with Article 106-3 showing the proposed epoxy meets Type 4A requirements.

SURFACES

Apply the epoxy protective coating to the top surface area, including chamfer area of bent caps under open joints and expansion joints of the steel girder spans, excluding areas under elastomeric bearings.

Thoroughly clean all dust, dirt, grease, oil, laitance and other objectionable material from the concrete surfaces to be coated. Air blast all surfaces immediately before applying the protective coating.

Use only cleaning agents preapproved by the Engineer.

APPLICATION

Apply epoxy protective coating only when the air temperature is at least 40°F and rising, but less than 95°F and the surface temperature of the area to be coated is at least 40°F. Remove any excess or free-standing water from the surfaces before applying the coating. Apply one coat of epoxy protective coating at a rate such that it covers between 100 and 200 sf/gal.

Under certain combinations of circumstances, the cured epoxy protective coating may develop an oily condition on the surface due to amine blush. This condition is not detrimental to the applied system.

Apply the coating so the entire designated surface of the concrete is covered and all pores are filled. To provide a uniform appearance, use the exact same material on all visible surfaces.

BASIS OF PAYMENT

Epoxy Coating will be measured and paid for by the contract unit price per square foot and shall be full compensation for furnishing all material, labor, tools and equipment necessary for cleaning and coating the tops of bent caps. Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Pay Item**Pay Unit**

Epoxy Coating

Square Feet

STEEL BEARING KEEPER ANGLE ASSEMBLY**(SPECIAL)****DESCRIPTION**

Fabricate and install steel bearing keeper angle assemblies at locations shown on the plans and as determined by the Engineer. Install steel bearing keeper angle assemblies after any new paint system has been applied, concrete bent cap repairs have been completed, and the top of the bent cap has been pressure washed and cleaned (if necessary), but before epoxy coating the top of the bent cap. Measures shall be taken to prevent damage to the paint system during installation of the steel bearing keeper angle assemblies. Any damage to the paint system shall be repaired by the Contractor at no additional cost to the Department.

BASIS OF PAYMENT

Steel Bearing Keeper Angle Assembly will be measured and paid in units of each. The price per each steel bearing keeper angle assembly will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Steel Bearing Keeper Angle Assembly	Each

STEEL BEARING RETAINER ANGLE ASSEMBLY**(SPECIAL)****DESCRIPTION**

Fabricate and install steel bearing retainer angle assemblies at locations shown on the plans and as determined by the Engineer. Install steel bearing retainer angle assemblies after any new paint system has been applied, concrete bent cap repairs have been completed, and the top of the bent cap has been pressure washed and cleaned (if necessary), but before epoxy coating the top of the bent cap. Measures shall be taken to prevent damage to the paint system during installation of the steel bearing retainer angle assemblies. Any damage to the paint system shall be repaired by the Contractor at no additional cost to the Department.

BASIS OF PAYMENT

Steel Bearing Retainer Angle Assembly will be measured and paid in units of each. The price per each steel bearing retainer angle assembly will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Steel Bearing Retainer Angle Assembly	Each

CLEANING AND PAINTING EXISTING BEARINGS WITH HRCSA**(SPECIAL)****DESCRIPTION**

These items of work shall consist of cleaning, preparation, and field application of the specified paint system to existing steel bridge bearings and for all labor, materials, tools and equipment necessary, to complete the work to the limits shown on the plans, described in these special provisions, or as directed by the Engineer.

The bridge bearings shall be cleaned using hand tools, power tools, and high pressure water equipment. Using dry compressed air, connections and crevices will be dried completely. Rust penetrant will be applied to all open connections, crevices, pack rust and rust scale areas. A paint system with a co-polymerized high ratio of 'active' calcium sulfonate (HRCSA) shall be used as a stripe coat at all connections/crevices and as a topcoat over the bearings.

The bearings shall be considered to be plates (including masonry plates, sole plates, embedded plates, and other associated plates), bolts, nuts, washers, rockers, and any other components or

hardware that comprise the bearing assembly.

TWELVE-MONTH OBSERVATION PERIOD

The Contractor maintains responsibility for the coating system for a 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 shall guarantee the coating system under the payment and performance bond (refer to Article 109-10 of the *Standard Specifications*). To complete successfully the observation period, the coating system shall meet the following requirements after 12 months service:

- (A) No visible rust, contamination or application defect is observed in any coated area.
- (B) Painted surfaces have a uniform color and gloss.
- (C) Painted surfaces have an adhesion that meets an ASTM D3359, 3A rating.

Final acceptance is made only after the paint system meets the above requirements.

SUBMITTALS

Submit all of the following to the Engineer for review and approval before scheduling the pre-construction meeting. Allow at least two (2) weeks for the review process.

- (A) The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The contractor shall be currently Society for Protective Coatings (SSPC) Quality Program (QP) 2, Category A certified, and have successfully completed lead paint removal and field painting on similar structures within 18 months prior to this bid. Lead abatement work completed within the 18 month period shall have been completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include, but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, personal protective equipment (PPE), etc.); and containment. This requirement is in addition to the contractor pre-qualification requirements covered by Article 102-2 of the *Standard Specifications*.

The apparent low bidder shall submit a list of projects for which QP 2 work was performed within the last 18 months including owner contact information and submit to the Engineer a "Lead Abatement Affidavit". This form may be downloaded from: <https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/leadabatementaffidavit.pdf>

- (B) Work schedule which shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner.
- (C) Containment system plans and design calculations in accordance with SSPC Guide 6, Class 2A and other project requirements, signed and sealed by a Professional Engineer licensed by the State of North Carolina.
- (D) Bridge wash water sampling and disposal plan.
- (E) Subcontractor identification.

- (F) Lighting plan for night work in accordance with Section 1413 of the *Standard Specifications*.
- (G) Traffic control plan with NCDOT certified supervisors, flaggers and traffic control devices.
- (H) Health and safety plan addressing at least the required topics as specified by the SSPC QP 1 and QP 2 program and including hazard communication, respiratory health, emergency procedures, and local hospital and treatment facilities with directions and phone numbers, disciplinary criteria for workers who violate the plan and accident investigation. The plan shall address the following: hazardous materials, personal protective equipment, general health and safety, occupational health and environmental controls, fire protection and prevention, signs signals, and barricades, materials handling, storage, use, and disposal, hand and power tools, welding and cutting, electrical, scaffolds, fall protection, cranes, derricks, hoists, elevators, and conveyors, ladders, toxic and hazardous substances, airless injection and high pressure water jet (HPWJ).
- (I) Provide the Engineer a letter of certification that all employees performing work on the project have blood lead levels that are below the Occupational Safety and Health Administration (OSHA) action level.
- (J) Provide the Engineer with Competent Person qualifications and summary of work experience.
- (K) Environmental Compliance Plan.
- (L) Quality Control Plan (Project Specific) with quality control qualifications and summary of work experience.
- (M) Bridge and Public Protection Plan (Overspray, Utilities, etc. - Project/Task Specific).
- (N) Abrasive Blast Media:
 - (1) Product Data Sheet.
 - (2) Blast Media Test Reports in accordance with Article 1080-12 of the *Standard Specification*.
- (O) Coating Material:
 - (1) NCDOT HICAMS Test Reports (testing performed by NCDOT Materials and Tests Unit).
 - (2) Product Data Sheets.
 - (3) Material Safety Data Sheets.
 - (4) Product Specific Repair Procedures.
 - (5) Acceptance letters from paint manufacturer's for work practices that conflict with special provisions and/or paint manufactures product data sheets.

PRE-CONSTRUCTION MEETING

Submittals shall be reviewed and approved by the Engineer prior to scheduling the pre-construction meeting. Allow no less than two (2) weeks for a review process. When requesting a pre-construction meeting, contact the Engineer at least seven (7) working days in advance of the desired pre-construction date. The contractor's project supervisor, Competent Person, quality control personnel and certified traffic control supervisor shall be in attendance at the pre-construction meeting in order for the Contractor and NCDOT team to establish responsibilities for various personnel during project duration and to establish realistic timeframes for problem escalation.

CONTAINMENT SYSTEM

If a containment plan for Painting of Existing Structure is submitted for a bridge that will have its bearings cleaned and painted with HRCSA, the containment plan for that structural steel painting operation will suffice for cleaning and painting existing bearings with HRCSA. If the structural

steel of a bridge is not to be cleaned and painted, and no containment plan has been submitted for that bridge, and that bridge will have its bearings cleaned and painted with HRCSA, a containment plan for cleaning and painting existing bearings with HRCSA shall be submitted for review and approval.

Prior to performing any construction or painting operations on the structure, the Contractor shall furnish the Engineer with plans and design calculations for a sufficiently designed containment system, which will provide access for any repairs on structural steel members, cleaning and surface preparations for structural steel members, and coating operations for structural steel members of the bridge. The containment system shall not be installed, and no work shall begin, until the Engineer has reviewed and approved, in writing, the submitted containment system plans and design calculations. Containment system plans and design calculations shall be prepared, sealed, and signed by a Professional Engineer licensed by the State of North Carolina. Allow a minimum of two (2) weeks for review of the containment plans and calculations.

The containment system shall meet or exceed the requirements of Class 3W containment in accordance with SSPC Guide 6. The Contractor shall determine the required capacity of the containment system, which, at a minimum, shall include loads due to wind, repair materials and repair operations, equipment, and tools; however, the capacity shall not be less than that required by Federal or State regulations. Design steel members to meet the requirements of the *American Institute of Steel Construction Manual*. Design timber members in accordance with the *National Design Specification for Stress-Grade Lumber and Its Fastenings* of the National Forest Products Association. The containment system shall be constructed of materials capable of withstanding damage from any of the work required on this project and shall provide a two (2) hour resistance to fire.

In the containment system plans, describe how debris is contained and collected. Describe the type of tarpaulin, bracing materials, and the maximum designed wind load. Design wind loads shall be in accordance with the Falsework and Formwork special provision. Describe the dust collection system and how a negative pressure of 0.03 inches of water column is maintained inside the enclosure, while blasting operations are being conducted. Describe how the airflow inside the containment structure is designed to meet all applicable OSHA Standards. Describe how water run-off from rain will be routed by or through the enclosure. Describe how wash water will be contained and paint chips separated. Describe what physical containment will be provided during painting application to protect the public and areas not to be painted.

Drilling holes in the superstructure for the purpose of attaching the containment system is prohibited.

The Contractor will be responsible for certifying the containment system has been constructed in accordance with the approved plans.

The containment system shall be cleaned after each workday.

Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

Protect non-metallic parts of bearings from blasting and painting (i.e.: Pot Bearings, Elastomeric Pads, and Disc Bearings).

WASH WATER SAMPLING AND DISPOSAL PLAN

All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to North Carolina Administrative Code 15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211(3), 15A NCAC 02T.0505(b)(1) and 15A NCAC 2T.0905(h). Depending on the test results, wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current Federal and State regulations. See link for NCDOT Guidelines for Managing Bridge Wash Water:

<https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/WashWater.pdf>

WASTE HANDLING OF PAINT AND ABRASIVES

Comply with all Federal, State, and local regulations. Failure to comply with the regulations could result in fines and loss of qualified status with NCDOT.

Comply with the Resource Conservation and Recovery Act (RCRA - 40 CFR 261 - 265) and the Occupational Safety and Health Act (OSHA - 29 CFR 1910 - 1926) regulations for employee training, and for the handling, storage, labeling, recordkeeping, reporting, inspections and disposal of all hazardous waste generated during paint removal.

A summary of Generator Requirements is available at the above NCDOT web link, which cites the specific regulations for each Generator category. Quantities of waste by weight and dates of waste generation shall be recorded. Waste stored at the project site shall be properly labeled. All waste, hazardous or non-hazardous, requires numbered shipping manifests.

The North Carolina Department of Environmental Quality (NCDEQ) have adopted RCRA as the North Carolina Hazardous Waste Management Rules and are responsible for enforcement. The *Hazardous Waste Generator Compliance Manual* is published by the Compliance Branch of the Division of Waste Management of NCDEQ, and can be found at: <https://files.nc.gov/ncdeq/Waste%20Management/DWM/HW/Compliance/Generator%20Compliance%20Manual.pdf>

Immediately after award of the contract, arrange for waste containers, sampling, testing, transportation, and disposal of all waste. No work shall begin until the Contractor furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste shall be pre-approved by the Engineer. Use an approved waste management company from the following link:

<https://www.ebs.nc.gov/VendorDirectory/results.html?sap-params=cD0xJTIwJmN1cnJlbnRfc2VhcmNoX3BhZ2U9d2Mmc2VsZWNoaW9uX2Zpcm1fbmFtZT0mc2VsZWNoaW9uX2NlcnQ9JnNlbGVjdGlvbI9maXJtdHlwZT0meXNjX2Zpcm10eXB1PSZzZWxlY3Rpb25fd29ya2xvY2F0aW9uPSZ5c2Nfd29ya2xvY2F0aW9uPSZzZWxlY3Rpb25fYWRkcN0YXRIPSZ5c2NfYWRkcN0YXRIPSZzZWxlY3Rpb25fYWRkcNvdW50eT0meXNjX2FkZHIjb3VudHk9JnNlbGVjdGlvbI93a2NvZGU9MDAzMDQwJnlzY193a2NvZGU9MDAzMDQwJTIwQ09OVEFNSU5BVEVEJTIwTUFURVJJQUxTJTlwUkVNT1ZBTCZzZWxlY3>

[Rpb25fZGlzYz0meXNjX2Rpc2M9JnNlbGVjdGlvl9uYWljcz0meXNjX25haWNzPSZzZWxlY3Rpb25fY3R5cGU9MA%3d%3d](https://ncdenr.s3.amazonaws.com/s3fs-public/document-library/Lead%20Disposal.pdf)

All removed paint and spent abrasive media shall be tested for lead following the SW-846 Toxicity Characteristic Leaching Procedure (TCLP) Method 1311 Extraction, as required in 40 CFR 261, Appendix 11, to determine whether it shall be disposed of as hazardous waste. Furnish the Engineer certified test reports showing TCLP results of the paint chips stored on site, with disposal in accordance with “Flowchart on Lead Waste Identification and Disposal” at: <https://ncdenr.s3.amazonaws.com/s3fs-public/document-library/Lead%20Disposal.pdf>

All sampling shall be done in presence of the Engineer’s representative.

The Competent Person shall obtain composite samples from each barrel of the wash water and waste generated by collecting two or more portions taken at regularly spaced intervals during accumulation. Composite the portions into one sample for testing purposes. Acquire samples after 10% or before 90% of the barrel has accumulated. The intent is to provide samples that are representative of widely separated portions, but not the beginning and end of wash water or waste accumulation.

Perform sampling by passing a receptacle completely through the discharge stream or by completely diverting the discharge into a sample container. If discharge of the wash water or waste is too rapid to divert the complete discharge stream, discharge into a container or transportation unit sufficiently large to accommodate the flow and then accomplish the sampling in the same manner as described above.

Comply with the NCDEQ *Hazardous Waste Compliance Generator Manual*. Record quantities of waste by weight and dates of waste generation. Until test results are received, store all waste, and label as “NCDOT Bridge Paint Removal Waste - Pending Analysis” and include the date generated and contact information for the Engineer. Store waste containers in an enclosed, sealed, and secured storage container protected from traffic from all directions. Obtain approval for the protection plan for these containers from the Engineer. If adequate protection cannot be obtained by use of existing guardrail, provide the necessary supplies and equipment to maintain adequate protection. Once test results are received and characterized, label waste as either “Hazardous Waste - Pending Disposal” or “Paint Waste - Pending Disposal”.

Once the waste has been collected, and the quantities determined, prepare the appropriate shipping documents and manifests and present them to the Engineer. The Engineer will verify the type and quantity of waste and obtain a Provisional Environmental Protection Agency (EPA) ID number from:

Melodi Deaver
Division of Waste Management/Hazardous Waste Section
North Carolina Department of Environmental Quality
1646 Mail Service Center
Raleigh, NC 27699
Phone: (919) 707-8204, Email: melodi.deaver@ncdenr.gov

At the time of shipping, the Engineer will sign, date, and add the ID number in the appropriate section on the manifest. The maximum on-site storage time for collected waste shall be 90 calendar days. All waste whether hazardous or non-hazardous will require numbered shipping manifests. The cost for waste disposal (including lab and Provisional EPA ID number) is included in the bid price for this contract. Note NC Hazardous Waste Management Rules (15A NCAC 13A) for more information. Provisional EPA ID numbers may be obtained at:

<https://deq.nc.gov/about/divisions/waste-management/hw/provisional-notification>

Testing labs shall be certified in accordance with North Carolina State Laboratory Public Health Environmental Sciences. List of certified laboratories may be obtained at:

<https://slphreporting.ncpublichealth.com/Certification/CertifiedLaboratory.asp>

All test results shall be documented on the lab analysis as follows:

(A) For leachable lead:

(1) Soils/Solid/Liquid- EPA 1311/200.7/6010

Area sampling will be performed for the first two (2) days at each bridge location. The area sample will be located within five (5) feet of the containment and where the highest probability of leakage will occur (access door, etc.). Results from the area sampling will be given to the Engineer within 72 hours of sampling (excluding weekends). If the results of the samples exceed $20 \mu\text{g}/\text{m}^3$ corrective measures shall be taken and monitoring shall be continued until two (2) consecutive sample results are less than $20 \mu\text{g}/\text{m}^3$.

Time Weighted Average (TWA) may suspend the work if there are visible emissions outside the containment enclosure or pump monitoring results exceeding the level of $30 \mu\text{g}/\text{m}^3$.

Where schools, housing and/or buildings are within 500 feet of the containment, the Contractor shall perform initial Total Suspended Monitoring (TSP) Lead monitoring for the first ten (10) days of the project during abrasive blasting, vacuuming and containment removal. Additional monitoring will be required during abrasive blasting two (2) days per month thereafter. Results of the TSP monitoring at any location shall not exceed $1.5 \mu\text{g}/\text{m}^3$.

EQUIPMENT MOBILIZATION

The equipment used in any travel lanes and paved shoulder shall be mobile equipment on wheels that has the ability to move on/off the roadway in less than 30 minutes. All work conducted in travel lanes shall be from truck or trailer supported platforms and all equipment shall be self-propelled or attached to a tow vehicle at all times.

QUALITY CONTROL INSPECTOR

Provide a quality control (QC) inspector in accordance with the SSPC QP guidelines to ensure that all processes, preparation, blasting and coating application are in accordance with the requirements of the contract. The inspector shall have written authority to perform QC duties to include continuous improvement of all QC internal procedures. The presence of the engineer or inspector at the work site shall in no way lessen the contractor's responsibility for conformity with the contract.

QUALITY ASSURANCE INSPECTOR

The quality assurance inspector which may be a Department employee or a designated representative of the Department shall observe, document, assess, and report that the Contractor is complying with all of the requirements of the contract. Inspectors employed by the Department are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. Each stage in preparing the structure to be coated which includes but not limited to washing, blasting, coating testing and inspection shall be inspected and approved by the Engineer or an authorized representative.

SUBLETTING OF CONTRACT

Only contractors certified to meet SSPC QP 2, Category A, and have successfully completed lead paint removal and field painting on all similar structures within 18 months prior to this bid are qualified for this work. Work is only sublet by approval of the Engineer.

PREPARATION OF SURFACES**(A) Removal of Soil, Concrete, Debris, and Other Material**

Soil, concrete, debris, and other foreign material that might be on or attached to the bearings, plates, or any other bearing components shall be removed. Removal of such material may require the use of brooms, brushes, hand tools, hammers, chisels, pneumatic hammers, or other tools or power tools. Pneumatic hammers used for removal of such material shall weigh a nominal 15 lbs. or less. Exercise care to avoid nicking or gouging the bearing components during removal of soil, concrete, debris, and other foreign material. Should damage occur, repairs shall be made to the bearings at no cost to the Department.

(B) Cleaning and Removal of Pack Rust

Removal of pack rust shall be done by hand tool cleaning to meet requirements of SSPC Surface Preparation (SP)-SP 2, or by power tool cleaning to meet requirements of SSPC-SP 3, or a combination of these methods. Any black oxide scale shall be removed, unless otherwise directed by the Engineer. Pay particular attention to crevice areas when removing pack rust and rust scale. Exercise care to avoid nicking or gouging the bearing components during removal. Remove all rust scale and loose pack rust, followed by high pressure water cleaning.

(C) High Pressure Water Cleaning (HPWC)

The bearings shall be cleaned with water at a minimum pressure of 5,000 psi, at five (5) gallons per minute, with a rotating tip, at a maximum four (4) inch standoff distance from the steel surface, held as perpendicular to the steel surface as possible.

All water to be used in the surface preparation shall be potable water.

Ambient wash water temperature is allowed; hot water is not necessary.

The wash water shall include a soluble salt removing chemical at a minimum ratio of 100:1 and in compliance with manufacturer recommendations.

Care should be taken to ensure that the potable wash water does not have a level of chloride exceeding 15 parts per million (ppm) when tested. If higher, the level of soluble salt removing chemical should be proportionally increased as per manufactures recommendation.

It should be expected that the surfaces of the steel (and connections) are contaminated with soluble salts (e.g. Chlorides, Sulfates, or Nitrates). Using an acceptable sample method in accordance with SSPC Guide 15, ensure that soluble salt levels on the surfaces do not exceed allowable soluble salt limits listed below:

- (1) Chloride - NVC3 3 $\mu\text{g}/\text{cm}^2$
- (2) Sulfate - NVS10 10 $\mu\text{g}/\text{cm}^2$
- (3) Nitrate - NVN10 10 $\mu\text{g}/\text{cm}^2$

The frequency of testing shall be two (2) tests per span after all surface preparation has been completed and immediately prior to painting. Select test areas representing the greatest amount of corrosion in the span as determined by the Engineers' representative. Additional testing may be required if significant amounts of chloride are detected.

The surface cleaning shall meet the requirements of SSPC Waterjet (WJ)-WJ4, to remove loose paint and loose rust. SSPC SP2 or SP3 (hand or power tool cleaning) may be used in inaccessible areas or when water cleaning is not possible.

In some cases, after HPWC, there may be areas of tightly adhered black oxide that were not removed. All black oxide scale shall be removed, unless otherwise directed by the Engineer.

If there is a question of whether all loose paint has been removed, adhesion testing of the remaining "tightly adhered" paint shall be done in accordance with ASTM D 4541-02 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers, with a minimum value of 300 psi.

Care should be taken to ensure all crevice corroded and pack rusted joints connections and corrosion frozen bearings are flushed with water containing a soluble salt removing chemical, at a minimum pressure of 5,000 psi, at five (5) gallons per minute, to ensure removal of all loose materials and to flush out any contaminant.

(D) Compressed Air Drying

All joints, connections, and bearings shall be blown dry with clean, dry, oil free, high pressure (100 psi) compressed air, regardless if the areas appear to be dry. Use the white blotter test in accordance with ASTM D4285 to verify the cleanliness of the compressed air used for blowout of "Limited Access" areas and drying. Conduct the test at least once per shift for each compressor system. Sufficient freedom from oil and moisture is confirmed if soiling and/or discoloration are not visible on the paper. If air contamination is evidenced, change filters, clean traps, add moisture separators or filters, or make adjustments as necessary to achieve clean, dry air.

All surfaces shall be inspected at this point. Surface preparation found to be deficient will be repeated at the Contractor's expense as directed by the Engineer. Once areas are agreed to be satisfactory, the Contractor may proceed with penetrating sealer application.

PAINTING OF STEEL

(A) Penetrating Sealer

Penetrating sealer may be applied by brush, roller, or airless spray method as recommended by the manufacturer. The mixing amount and method of mixing for the sealer components must be in accordance with the manufacturer's instruction. Wet coat sufficiently to completely cover and penetrate the steel surface, but do not apply heavy coat. Use coat thickness as recommended by the manufacturer. Apply liberally to crevices and joints and/or spaces where a gap has been created between plates and around bolts, nuts and washers. Allow material to soak into spaces. Brush out any excess material, so as to not retard curing of the topcoat or result in an unaesthetically pleasing surface.

The penetrating sealer shall be applied within 24-hours after completion of the cleaning operations and before flash-rusting occurs. No bare steel surface prepared for penetrating sealer application shall be left uncoated long enough to allow the formation of rust. Cleaned areas upon which rust has formed shall be re-cleaned in accordance with the cleaning requirement at no additional cost. The presence of rust shall be determined by the Engineer.

The receiving steel surface shall be clean and absolutely dry. The permissible steel surface temperature and the ambient temperature shall be as recommended by the sealer manufacturer. However, in no case, shall the penetrating sealer be applied when the steel surface or the ambient temperatures is below 36°F or above 104°F, or the relative humidity exceeds 99% or a 3.6°F (2°C) temperature-Dew Point temperature spread.

Drying time is temperature, humidity, and film thickness dependent. Use manufacturer's recommended drying schedule to estimate the drying time of the penetrating sealer for application of the other coatings. If the manufacturer's recommendations allow, the use of forced air pressure to dry the surface will be permitted.

(B) HRCSA – Striping and Topcoat

No application of any stripe/primer shall be allowed until cleaning and preparation of the substrate has been approved by the Engineer. See drawings to determine exact location of structure components to be painted.

The permissible steel surface temperature and the ambient temperature shall be as recommended by the coating manufacturer. However, in no case, shall the coating be applied when the steel surface or the ambient temperatures is below 36°F or above 104°F, or the relative humidity exceeds 99% or a 3.6°F (2°C) temperature-Dew Point temperature spread.

The Contractor shall provide paint brushes, rollers, and spray equipment to conduct the work as specified in this special provision.

The Contractor shall also provide specialized equipment as required for the painting of limited access areas and for other difficult-to-clean areas. Specialized equipment may include, but is not limited to:

- (1) Pole guns for spray painting.
- (2) Mitts, daubers, or other methods to supplement brush application.

Stripe painting will be required on the following surfaces that have been cleaned: edges of plates, angles, lattice, connections (rivets and bolt heads) or other shapes, corners, crevices, back-to-back angles, and built-up edges. The surfaces of existing steel members to which new steel may be connected (faying surfaces) shall also be cleaned and painted as herein described. The stripe coat shall have a band width of at least four (4) in. (101.6 mm) to each side of the adjoining edges and is to completely coat the interior of all crevices. All stripe painting should be applied by spray, but immediately afterwards it may be “brushed in” using a brush. No other method of paint application will be allowed for stripe painting.

Paint for intermediate coat or topcoat may be applied using spray, brush, or roll methods.

Spray painting will be permitted only within a containment that will contain all of the sprayed material, as approved by the Engineer. Complete protection from paint spatter, spillage, overspray, wind-blown paint, or similar releases of paint shall be provided. Covers, tarps, mesh, and similar materials shall be placed around the work area to protect public and private property, pedestrian, vehicular, marine, or other traffic, all portions of the bridge, highway appurtenances, waterways, and similar surrounding areas and property, upon, beneath, or adjacent to the structure.

Apply HRCSA as directed by the manufacturer. Wait time between the stripe coats, intermediate coats, and the topcoat shall be as per the manufacturer’s recommendations. The following paint schedule shall be used unless special exceptions are submitted and approved according to manufacturer recommendations prior to the start of this work.

Application Location	Description	Film Thickness
SPOT	Liberally apply a stripe coat to crevice corroded and pack rusted bearings and connections, provide extra material to bolts, nuts and any gaps around rivets.	15-18 mils (wet)
		10-12 mils (dry)
SPOT	Over exposed metal areas and areas of tightly adhered contaminant free rust or flash rust, apply a spot prime with 5 to 7 mils DFT of Topcoat, including areas mentioned in previous SPOT application.	7-10 mils (wet) 5-7 mils (dry)

Prior to placing the subsequent coats, the Contractor will ensure that the prior coat is clean of all foreign matter, such as grease, dirt, bird waste, etc., before application of the subsequent coat.

Sealer, stripe, spot, and finish coats shall be applied in sufficient quantity so as to produce the minimum specified Dry Film Thicknesses (DFT). Care should be taken to not over apply the primer/topcoat, especially on flat surfaces. Maximum 25 mils DFT.

Active calcium sulfonate coatings cure slowly, so wet film measurements may be used as criteria for **preliminary** acceptance of the coating. Wet film thickness (WFT) measurements shall be determined as the job progresses and corrections shall be made during paint application.

Dry film thicknesses shall be determined using SSPC Paint Application (PA) PA2 – using a digital film thickness gage and a shim – after the coating has cured sufficiently to allow accurate measurements. Depending upon ambient air conditions, it may take more than one week before DFT measurements can be taken.

Areas failing to meet the specified WFT range shall be over-coated with the same paint to produce at least the total WFT required.

Paint applied containing unauthorized thinners, paint applied to contaminated surfaces, and paint applied contrary to this special provision shall result in the re-cleaning and re-painting of the surface. The work of re-cleaning, re-painting, or over-coating, if required, shall be performed within ten (10) working days following notification by the Engineer and shall be done by the Contractor to the satisfaction of the Engineer, at no additional cost to the Department.

MATERIALS

(A) Penetrant and Paint System

The paint system to be used shall be a High Ratio Co-Polymerized Calcium Sulfonate (HRCSA) coating system. Characteristics of submitted products shall meet or exceed those of the requirements listed within this special provision.

The structure is to be coated with a High Ratio, Co-Polymerized Calcium Sulfonate (HRCSA) corrosion mitigation system. Any Contractor-proposed coating system shall meet the following requirements:

- (1) The proposed coating system shall be an HRCSA coating as defined by this special provision and shall be submitted for approval.
 - (a) Primer/Topcoat (Minimum 9.5% active sulfonate) must maintain a 9-11 to 1 ratio Total Base Number to Active Sulfonate, i.e., total base number of 85 to 104 to 9.5% Active Sulfonate, as determined by Percent Active Sulfonate Content by Cationic Titration (Hyamine) testing, Procedure No. 817/4.9/T1409A.
 - (b) Formulations with greater than 27% Alkyd or co-polymer are not valid HRCSA.
 - (c) Zero Volatile Organic Compounds (VOC), 100% Solids Penetrant/Sealer approved by HRCSA manufacturer (Minimum 15% active sulfonate, a total base number of 135 to 165, must maintain a 9-11 to 1 ratio Active Sulfonate to Total Base Number as determined by Total Base Number Determination testing, Procedure No. 817/4.9/T1401.

- (2) The proposed coating system shall be certified in writing by the coating manufacturer that the HRCSA Primer/Topcoat and the HRCSA Penetrant Sealer meets the HRCSA special provision and has been verified by the testing titration protocols indicated above. The Engineer may choose to perform verification testing using the same protocols on materials delivered to the job site.
- (3) The proposed coating formulation shall have independent laboratory tests showing that the HRCSA coating, as supplied, has been tested to ASTM D5894 with a 24 hour freeze-thaw cycle and has passed a minimum 5,000 hours with no rust creepage at the scribe. The manufacturer shall certify that the currently manufactured formulation used is the same as the formulation that was tested, and can supply supporting documentation.

Lighting shall be equipped with explosion-proof fixtures.

The accumulation of empty paint cans, combustibles, and other debris will not be permitted.

Material Safety Data Sheets (MSDS) sheets for all materials shall be maintained on file and provided to the Engineer prior to receipt of the material from the manufacturers.

If required, paint shall be mixed with mechanical mixers in accordance with the paint manufacturer's recommendations.

The primer, stripe, and other coats may be thinned only if recommended by the manufacturer, done in compliance with the manufacturer's instructions, approved by the Engineer, and mixed in the presence of the Engineer. If recommended by the manufacturer and approved by the Engineer, a measuring cup, having graduation in ounces, shall be used in the addition of thinner to any paint. No "eye balling" during addition of thinner to paint will be allowed. Paint mixed with thinner by "eye balling" will be subject to rejection by the Engineer as ruined material.

(B) Penetrant and Paint Storage

Do not expose penetrant and paint materials to rain, excessive condensation, long periods of direct sunlight, or temperatures above 100°F or below 40°F. In addition, the Contractor shall place a device which records the high, low, and current temperatures inside the storage location. Follow the manufacturer's storage requirements if more restrictive than the above requirements. Any material found to be damaged or beyond its expiration date shown on the container shall be immediately removed from the project site and will be considered as ruined material.

All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers' requirements. The more restrictive requirements will apply.

(C) Testing of Paint Samples

Engineer reserves the right to conduct tests of the materials at any time, and any number of times during the period of field painting.

The Engineer will sample the paint(s) being used. A representative size sample of each

component of paint(s) at the construction site will be transferred to metal containers, identified, sealed, and certified in the presence of the Contractor.

Tests on paint samples may be performed by the Department in order to confirm the manufacturer's test results submitted with each batch of material.

If the laboratory test results show that the material being used does not comply with the requirements specified in this special provision, the Contractor will be directed to stop painting work and remove non-complying paint; pay for testing; re-paint surfaces coated with rejected paint; or remove rejected paint from previously painted surfaces if, upon re-painting with specified paint, the two (2) coatings are not compatible.

INSPECTION

Surface Preparation for System 1 shall be in accordance with SSPC SP-10. Any area(s) not meeting the requirements of SSPC SP-10 shall be remediated prior to application of coating. Surface inspection is considered ready for inspection when all blast abrasive, residue and dust is removed from surfaces to be coated.

(A) Quality Assurance Inspection

The Contractor furnishes all necessary OSHA approved apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The contractor illuminates the surfaces to be inspected to a minimum of 50-foot candles of light. All access points shall be illuminated to a minimum of 20-foot candles of light.

NCDOT reserves the right for ongoing Quality Assurance (QA) inspection to include but not limited to surface contamination testing, adhesion pull testing, and DFT readings as necessary to assure quality.

Inform the Engineer and the Division Safety Engineer of all scheduled and unannounced inspections from SSPC, OSHA, EPA and/or others that come on site. Furnish the Engineer a copy of all inspection reports except for reports performed by a third party and or consultant on behalf of the Contractor.

(B) Inspection Instruments

At a minimum, furnish the following calibrated instruments and conduct the following quality control tests:

- (1) Sling Psychrometer - ASTM E337 - bulb type
- (2) Surface Temperature Thermometer
- (3) Wind Speed Indicator
- (4) Tape Profile Tester - ASTM D4417 Method C
- (5) Surface Condition Standards - SSPC VIS-1 and VIS-3
- (6) Wet Film Thickness Gage - ASTM D4414
- (7) Dry Film Thickness Gage - SSPC-PA2 Modified
- (8) Solvent Rub Test Kit - ASTM D4752
- (9) Adhesion Test Kit - ASTM D3359 Method A (Tape Test)

- (10) Adhesion Pull test - ASTM D4541
- (11) Surface Contamination Analysis Kit or (Chloride Level Test Kit) SSPC Technology Guide 15

(C) Quality Control

Maintain a daily quality control record in accordance with Subarticle 442-12(D) of the *Standard Specifications* and make such records available at the job site for review by the inspector and submit to the Engineer as directed. In addition to the information required on Form M&T-610, submit all Dry Film Thickness (DFT) readings on a form equivalent to Form M&T-611. These forms can be found at:

<https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM-03-02>

Film thickness shall be measured at no less than six (6) random spots per bearing (each of four (4) bearing plate edges and two (2) readings on top of the sole plate). Also, film thickness shall be measured at no less than six (6) random spots per span on diaphragms/cross frames.

Each spot is an average of three (3) to five (5) individual gage readings as defined in SSPC PA-2. No spot average shall be less than 80% of minimum film thickness for each layer applied; this does not apply to stripe coat application. These non-conforming areas shall be corrected by the Contractor prior to applying successive coats.

Areas failing to meet the specified film thickness range shall be over-coated with the same paint to produce at least the total film thickness required.

REPAIR OF DAMAGED COATINGS

All damaged coatings, new or existing, shall be repaired prior to project completion and acceptance in accordance with the above specifications for re-coating and over-coating and as directed by the Engineer, at no additional cost to the Department.

COATING MANUFACTURER'S REPRESENTATIVE

Unless waived by the Engineer, the Contractor shall make arrangements for a representative of the coating manufacturer to be present on-site as work begins, at a minimum, and as necessary as work progresses, to work together with the Contractor and representatives of the Department and to provide comments and guidance, so that the cleaning, application, and inspection procedures are done properly.

SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS

Personnel access boundaries are delineated for each work site using signs, tape, cones, or other approved means. Submit copies of safety and environmental compliance plans that comply with SSPC QP 2 Certification requirements.

HEALTH AND SAFETY RESPONSIBILITIES

This project may involve toxic metals such as arsenic, lead, cadmium and hexavalent chromium. It is the contractor's responsibility to test for toxic metals and if found, comply with the OSHA regulations, which may include medical testing.

Ensure a "Competent Person" as defined in OSHA 29 CFR 1926.62; one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them; is on site during all surface preparation activities and monitors the effectiveness of containment, dust collection systems and waste sampling. Before any work begins, provide a written summary of the Competent Person's safety training.

Comply with Subarticle 442-14(B) of the *Standard Specifications*.

Comply with Subarticle 442-14(D) of the *Standard Specifications*. Ensure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

An employee who has been removed with a blood level of 50 micrograms per deciliter or more shall have two (2) consecutive blood sampling tests spaced one week apart indicating that the employee's blood lead level is at or below 40 micrograms per deciliter before returning to work activities involving any lead exposure.

All OSHA recordable accidents that occur during the project duration are to be reported to the Engineer within twenty-four (24) hours of occurrence. In addition, for accidents that involve civilians or property damage that occurs within the work zone the Division Safety Engineer shall be notified immediately.

Prior to blasting operations, the Contractor shall have an operational OSHA approved hand wash station at each bridge location and a decontamination trailer at each bridge or between bridges unless the work is on the roadway, or the Contractor shall show reason why it is not feasible to do so and provide an alternative site as approved by the Engineer. The Contractor shall assure that all employees whose airborne exposure to lead is above the Permissible Exposure Limit (PEL) shall shower at the end of their work shift.

STORAGE OF PAINT AND EQUIPMENT

Provide a location for materials, equipment, and waste storage. Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive recycling and other waste handling equipment or containers. All land and or lease agreements that involve private property shall disclose to the property owner that heavy metals may be present on the Contractor's equipment. Prior to storing the Contractor's equipment on private property, provide a notarized written consent signed by the land owner received by the Engineer at least forty-eight (48) hours before using property. All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers' requirements. The more restrictive requirements will apply.

UTILITIES

Protect all utility lines or mains that may be supported on, under, or adjacent to bridge work sites from damage and paint overspray.

MEASUREMENT AND PAYMENT

Painting Containment for Bridge No. ____ will be paid for at the contract unit price which will be full compensation for the design, materials, installation, maintenance, and removal of the containment system.

Pollution Control will be paid at the contract lump sum price which will be full compensation for all collection, handling, storage, air monitoring, and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements, and all equipment, material and labor necessary for the daily collection of the blast debris into specified containers; and any measures necessary to ensure conformance to all safety and environmental regulations as directed by the Engineer.

Cleaning and Painting Existing Bearings will be measured and paid for each bearing location. The price for each bearing will be full compensation for all labor, materials and equipment necessary to complete the work. All work shall be done in a manner satisfactory to the Engineer.

Payment will be made under:

Pay Item	Pay Unit
Painting Containment for Bridge No. ____	Lump Sum
Pollution Control	Lump Sum
Cleaning and Painting Existing Bearings with High Ratio Calcium Sulfonate	Each

BEAM REPAIR-PLATING**(SPECIAL)****DESCRIPTION**

Plate beam webs, flanges, or stiffeners identified as deteriorated, damaged, or with excessive section loss at locations determined by the Engineer, after blasting and priming for new paint system. The Engineer will determine the extent of the section to be plated. The repair plate shall be inspected by NCDOT during fit-up and approved before welding the new plate may begin. After approval of the new plate, weld the plate into place. Welding shall be performed by certified welders as specified in the *Standard Specifications*.

CONTAINMENT SYSTEM

An approved containment system must be installed prior to beginning work. See the Containment System section of the *Painting Existing Structure* or *Painting Existing Weathering Steel Structure*

Special Provisions regarding loading, design, and submittal requirements for the containment system.

FIELD ALTERATIONS

Since this repair involves working with an existing structure where the dimensions may vary throughout the structure, the contractor should expect and shall be prepared to make alterations in the field. This includes, but is not limited to, having qualified personnel on hand to perform necessary alterations and having extra material on hand (or the ability to procure extra material in a timely manner). All such alterations shall be brought to the attention of the Engineer and agreed upon prior to alteration.

BASIS OF PAYMENT

Payment will be made at the contract price bid per pounds structural steel used for *Beam Repair Plating*. Such payment will be full compensation for all materials, equipment, tools, labor, welding, miscellaneous steel, and incidentals necessary to complete the work.

Pay Item**Pay Unit**

Beam Repair Plating

Lb.

PAINTING EXISTING WEATHERING STEEL STRUCTURE**(2-11-19)****DESCRIPTION**

This work shall consist of furnishing all labor, equipment, and materials necessary to clean and paint the ends of the weathering steel girders, zones of excessive corrosion, bent diaphragms, all bearing plates, anchor bolts, nuts, and washers of the existing structure. Work includes: removal, containment and disposal of the existing paint system; preparation of the surface to be painted and applying the new paint system; a containment enclosure; and any incidentals necessary to complete the project as specified and shown on the plans.

TWELVE-MONTH OBSERVATION PERIOD

The Contractor maintains responsibility for the coating system for a 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 shall guarantee the coating system under the payment and performance bond (refer to Article 109-10 of the *Standard Specifications*). To complete successfully the observation period, the coating system shall meet the following requirements after 12 months service:

- (A) No visible rust, contamination or application defect is observed in any coated area.
- (B) Painted surfaces have a uniform color and gloss.

(C) Painted surfaces have an adhesion that meets an ASTM D3359, 3A rating.

Final acceptance is made only after the paint system meets the above requirements.

SUBMITTALS

Submit all of the following to the Engineer for review and approval before scheduling the pre-construction meeting. Allow at least two (2) weeks for the review process.

(B) The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The contractor shall be currently Society for Protective Coatings (SSPC) Quality Program (QP) 2, Category A certified, and have successfully completed lead paint removal and field painting on similar structures within 18 months prior to this bid. Lead abatement work completed within the 18 month period shall have been completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include, but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, personal protective equipment (PPE), etc.); and containment. This requirement is in addition to the contractor pre-qualification requirements covered by Article 102-2 of the *Standard Specifications*.

The apparent low bidder shall submit a list of projects for which QP 2 work was performed within the last 18 months including owner contact information and submit to the Engineer a "Lead Abatement Affidavit". This form may be downloaded from: <https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/leadabatementaffidavit.pdf>

(M) Work schedule which shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner.

(N) Containment system plans and design calculations in accordance with SSPC Guide 6, Class 3A and other project requirements, signed and sealed by a Professional Engineer licensed by the State of North Carolina.

(O) Bridge wash water sampling and disposal plan.

(P) Subcontractor identification.

(Q) Lighting plan for night work in accordance with Section 1413 of the *Standard Specifications*.

(R) Traffic control plan with NCDOT certified supervisors, flaggers and traffic control devices.

(S) Health and safety plan addressing at least the required topics as specified by the SSPC QP 1 and QP 2 program and including hazard communication, respiratory health, emergency procedures, and local hospital and treatment facilities with directions and phone numbers, disciplinary criteria for workers who violate the plan and accident investigation. The plan shall address the following: hazardous materials, personal protective equipment, general health and safety, occupational health and environmental controls, fire protection and prevention, signs signals, and barricades, materials handling, storage, use, and disposal, hand and power tools,

welding and cutting, electrical, scaffolds, fall protection, cranes, derricks, hoists, elevators, and conveyors, ladders, toxic and hazardous substances, airless injection and high pressure water jet (HPWJ).

(T) Provide the Engineer a letter of certification that all employees performing work on the project have blood lead levels that are below the Occupational Safety and Health Administration (OSHA) action level.

(U) Provide the Engineer with Competent Person qualifications and summary of work experience.

(V) Environmental Compliance Plan.

(W) Quality Control Plan (Project Specific) with quality control qualifications and summary of work experience.

(P) Bridge and Public Protection Plan (Overspray, Utilities, etc. - Project/Task Specific).

(Q) Abrasive Blast Media:

(3) Product Data Sheet.

(4) Blast Media Test Reports in accordance with Article 1080-12 of the *Standard Specification*.

(R) Coating Material:

(6) NCDOT HICAMS Test Reports (testing performed by NCDOT Materials and Tests Unit).

(7) Product Data Sheets.

(8) Material Safety Data Sheets.

(9) Product Specific Repair Procedures.

(10) Acceptance letters from paint manufacturer's for work practices that conflict with special provisions and/or paint manufactures product data sheets.

PRE-CONSTRUCTION MEETING

Submittals shall be reviewed and approved by the Engineer prior to scheduling the pre-construction meeting. Allow no less than two (2) weeks for a review process. When requesting a pre-construction meeting, contact the Engineer at least seven (7) working days in advance of the desired pre-construction date. The contractor's project supervisor, Competent Person, quality control personnel and certified traffic control supervisor shall be in attendance at the pre-construction meeting in order for the Contractor and NCDOT team to establish responsibilities for various personnel during project duration and to establish realistic timeframes for problem escalation.

CONTAINMENT SYSTEM

Prior to performing any construction or painting operations on the structure, the Contractor shall furnish the Engineer with plans and design calculations for a sufficiently designed containment system, which will provide access for any repairs on structural steel members, cleaning and surface preparations for structural steel members, and coating operations for structural steel members of the bridge. The containment system shall not be installed, and no work shall begin, until the Engineer has reviewed and approved, in writing, the submitted containment system plans and design calculations. Containment system plans and design calculations shall be prepared, sealed, and signed by a Professional Engineer licensed by the State of North Carolina. Allow a minimum of two (2) weeks for review of the containment plans and calculations.

The containment system shall meet or exceed the requirements of Class 3A containment in accordance with SSPC Guide 6. The Contractor shall determine the required capacity of the containment system, which, at a minimum, shall include loads due to wind, repair materials and repair operations, equipment, and tools; however, the capacity shall not be less than that required by Federal or State regulations. Design steel members to meet the requirements of the *American Institute of Steel Construction Manual*. Design timber members in accordance with the *National Design Specification for Stress-Grade Lumber and Its Fastenings* of the National Forest Products Association. The containment system shall be constructed of materials capable of withstanding damage from any of the work required on this project and shall provide a two (2) hour resistance to fire.

In the containment system plans, describe how debris is contained and collected. Describe the type of tarpaulin, bracing materials, and the maximum designed wind load. Design wind loads shall be in accordance with the Falsework and Formwork special provision. Describe the dust collection system and how a negative pressure of 0.03 inches of water column is maintained inside the enclosure, while blasting operations are being conducted. Describe how the airflow inside the containment structure is designed to meet all applicable OSHA Standards. Describe how water run-off from rain will be routed by or through the enclosure. Describe how wash water will be contained and paint chips separated. Describe what physical containment will be provided during painting application to protect the public and areas not to be painted.

Drilling holes in the superstructure for the purpose of attaching the containment system is prohibited.

The Contractor will be responsible for certifying the containment system has been constructed in accordance with the approved plans.

The containment system shall be cleaned after each workday.

Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

Protect non-metallic parts of bearings from blasting and painting (i.e.: Pot Bearings, Elastomeric Pads, and Disc Bearings).

WASH WATER SAMPLING AND DISPOSAL PLAN

All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to North Carolina Administrative Code 15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211(3), 15A NCAC 02T.0505(b)(1) and 15A NCAC 2T.0905(h). Depending on the test results, wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current Federal and State regulations. See link for NCDOT Guidelines for Managing Bridge Wash Water: <https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/WashWater.pdf>

WASTE HANDLING OF PAINT AND ABRASIVES

Comply with all Federal, State, and local regulations. Failure to comply with the regulations could result in fines and loss of qualified status with NCDOT.

Comply with the Resource Conservation and Recovery Act (RCRA - 40 CFR 261 - 265) and the Occupational Safety and Health Act (OSHA - 29 CFR 1910 - 1926) regulations for employee training, and for the handling, storage, labeling, recordkeeping, reporting, inspections and disposal of all hazardous waste generated during paint removal.

A summary of Generator Requirements is available at the above NCDOT web link, which cites the specific regulations for each Generator category. Quantities of waste by weight and dates of waste generation shall be recorded. Waste stored at the project site shall be properly labeled. All waste, hazardous or non-hazardous, requires numbered shipping manifests.

The North Carolina Department of Environmental Quality (NCDEQ) have adopted RCRA as the North Carolina Hazardous Waste Management Rules and are responsible for enforcement. The *Hazardous Waste Generator Compliance Manual* is published by the Compliance Branch of the Division of Waste Management of NCDEQ, and can be found at: <https://files.nc.gov/ncdeq/Waste%20Management/DWM/HW/Compliance/Generator%20Compliance%20Manual.pdf>

Immediately after award of the contract, arrange for waste containers, sampling, testing, transportation, and disposal of all waste. No work shall begin until the Contractor furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste shall be pre-approved by the Engineer. Use an approved waste management company from the following link:

<https://www.ebs.nc.gov/VendorDirectory/results.html?sap-params=cD0xJTIwJmN1cnJlbnRfc2VhcmNoX3BhZ2U9d2Mmc2VsZWN0aW9uX2Zpcm1fbmFtZT0mc2VsZWN0aW9uX2NlcnQ9JnNlbGVjdGlzY29yaXJtdHlwZT0meXNjX2Zpcm10eXB1PSZzZWx1Y3Rpb25fd29ya2xvY2F0aW9uPSZ5c2Nfd29ya2xvY2F0aW9uPSZzZWx1Y3Rpb25fYWRkcN0YXRIPSZ5c2NfYWRkcN0YXRIPSZzZWx1Y3Rpb25fYWRkcNvdW50eT0meXNjX2FkZHIjb3VudHk9JnNlbGVjdGlzY29yaXJtdHlwZT0meXNjX2Zpcm10eXB1PSZzZWx1Y3Rpb25fZGZlYz0meXNjX2Rpb2M9JnNlbGVjdGlzY29yaXJtdHlwZT0meXNjX25haWNzPSZzZWx1Y3Rpb25fY3R5cGU9MA%3d%3d>

All removed paint and spent abrasive media shall be tested for lead following the SW-846 Toxicity Characteristic Leaching Procedure (TCLP) Method 1311 Extraction, as required in 40 CFR 261, Appendix 11, to determine whether it shall be disposed of as hazardous waste. Furnish the Engineer certified test reports showing TCLP results of the paint chips stored on site, with disposal in accordance with “Flowchart on Lead Waste Identification and Disposal” at:

<https://ncdenr.s3.amazonaws.com/s3fs-public/document-library/Lead%20Disposal.pdf>

All sampling shall be done in presence of the Engineer’s representative.

The Competent Person shall obtain composite samples from each barrel of the wash water and waste generated by collecting two or more portions taken at regularly spaced intervals during accumulation. Composite the portions into one sample for testing purposes. Acquire samples after 10% or before 90% of the barrel has accumulated. The intent is to provide samples that are representative of widely separated portions, but not the beginning and end of wash water or waste accumulation.

Perform sampling by passing a receptacle completely through the discharge stream or by completely diverting the discharge into a sample container. If discharge of the wash water or waste is too rapid to divert the complete discharge stream, discharge into a container or transportation unit sufficiently large to accommodate the flow and then accomplish the sampling in the same manner as described above.

Comply with the NCDEQ *Hazardous Waste Compliance Generator Manual*. Record quantities of waste by weight and dates of waste generation. Until test results are received, store all waste, and label as “NCDOT Bridge Paint Removal Waste - Pending Analysis” and include the date generated and contact information for the Engineer. Store waste containers in an enclosed, sealed, and secured storage container protected from traffic from all directions. Obtain approval for the protection plan for these containers from the Engineer. If adequate protection cannot be obtained by use of existing guardrail, provide the necessary supplies and equipment to maintain adequate protection. Once test results are received and characterized, label waste as either “Hazardous Waste - Pending Disposal” or “Paint Waste - Pending Disposal”.

Once the waste has been collected, and the quantities determined, prepare the appropriate shipping documents and manifests and present them to the Engineer. The Engineer will verify the type and quantity of waste and obtain a Provisional Environmental Protection Agency (EPA) ID number from:

Melodi Deaver
Division of Waste Management/Hazardous Waste Section
North Carolina Department of Environmental Quality
1646 Mail Service Center
Raleigh, NC 27699
Phone: (919) 707-8204, Email: melodi.deaver@ncdenr.gov

At the time of shipping, the Engineer will sign, date, and add the ID number in the appropriate section on the manifest. The maximum on-site storage time for collected waste shall be 90 calendar

days. All waste whether hazardous or non-hazardous will require numbered shipping manifests. The cost for waste disposal (including lab and Provisional EPA ID number) is included in the bid price for this contract. Note NC Hazardous Waste Management Rules (15A NCAC 13A) for more information. Provisional EPA ID numbers may be obtained at:

<https://deq.nc.gov/about/divisions/waste-management/hw/provisional-notification>

Testing labs shall be certified in accordance with North Carolina State Laboratory Public Health Environmental Sciences. List of certified laboratories may be obtained at:

<https://slphreporting.ncpublichealth.com/Certification/CertifiedLaboratory.asp>

All test results shall be documented on the lab analysis as follows:

(B) For leachable lead:

(1) Soils/Solid/Liquid- EPA 1311/200.7/6010

Area sampling will be performed for the first two (2) days at each bridge location. The area sample will be located within five (5) feet of the containment and where the highest probability of leakage will occur (access door, etc.). Results from the area sampling will be given to the Engineer within 72 hours of sampling (excluding weekends). If the results of the samples exceed $20 \mu\text{g}/\text{m}^3$ corrective measures shall be taken and monitoring shall be continued until two (2) consecutive sample results are less than $20 \mu\text{g}/\text{m}^3$.

Time Weighted Average (TWA) may suspend the work if there are visible emissions outside the containment enclosure or pump monitoring results exceeding the level of $30 \mu\text{g}/\text{m}^3$.

Where schools, housing and/or buildings are within 500 feet of the containment, the Contractor shall perform initial Total Suspended Monitoring (TSP) Lead monitoring for the first ten (10) days of the project during abrasive blasting, vacuuming and containment removal. Additional monitoring will be required during abrasive blasting two (2) days per month thereafter. Results of the TSP monitoring at any location shall not exceed $1.5 \mu\text{g}/\text{m}^3$.

EQUIPMENT MOBILIZATION

The equipment used in any travel lanes and paved shoulder shall be mobile equipment on wheels that has the ability to move on/off the roadway in less than 30 minutes. All work conducted in travel lanes shall be from truck or trailer supported platforms and all equipment shall be self-propelled or attached to a tow vehicle at all times.

QUALITY CONTROL INSPECTOR

Provide a quality control (QC) inspector in accordance with the SSPC QP guidelines to ensure that all processes, preparation, blasting and coating application are in accordance with the requirements of the contract. The inspector shall have written authority to perform QC duties to include continuous improvement of all QC internal procedures. The presence of the engineer or inspector at the work site shall in no way lessen the contractor's responsibility for conformity with the contract.

QUALITY ASSURANCE INSPECTOR

The quality assurance inspector which may be a Department employee or a designated representative of the Department shall observe, document, assess, and report that the Contractor is complying with all of the requirements of the contract. Inspectors employed by the Department are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. Each stage in preparing the structure to be coated which includes but not limited to washing, blasting, coating testing and inspection shall be inspected and approved by the Engineer or an authorized representative.

SUBLETTING OF CONTRACT

Only contractors certified to meet SSPC QP 2, Category A, and have successfully completed lead paint removal and field painting on all similar structures within 18 months prior to this bid are qualified for this work. Work is only sublet by approval of the Engineer.

LIMITS OF ZONE PAINTING

If any girder has excessive corrosion along its bottom flange, beyond the distance of 1.5 times the depth of the beam or girder, at the bearing, the area of the affected girder indicated on the plans, and other girders as directed by the Engineer, shall be cleaned in accordance with the requirements of System 5 painting system. The horizontal limits of zone painting shall extend 12" beyond the maximum horizontal extent of web/flange corrosion. The vertical limits of zone painting shall extend 3" beyond the maximum vertical extent of web corrosion.

Areas designated for zone coating shall be primed and coated in accordance with System 5 as outlined in Article 442-8 of the *Standard Specifications*.

System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint and over non-weathering steel surfaces cleaned to an SSPC SP-6 finish.

Painting shall be performed in accordance with Section 442 and Section 1080 of the *Standard Specifications*, and/ or these special provisions; the more restrictive requirement shall apply. Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material.

PREPARATION OF SURFACES

Before any other surface preparation is conducted, all surfaces shall be power washed to remove dust, salts, dirt, and other contaminants. All wash water shall be contained, collected, and tested in accordance with the requirements of NCDOT Guidelines for Managing Bridge Wash Water. Obtain approval of the Engineer and allow all cleaned surfaces to dry to the touch and without standing water before beginning surface preparation or painting activities.

Surface preparation is done with materials meeting Article 1080-12 of the *Standard Specifications*. No silica sand or other silica materials are permitted for use. The profile shall be between 1.0 and 3.0 mils when measured on a smooth steel surface. Conduct and document at least two (2) tests per beam/girder and two (2) tests per span of diaphragms/cross bracing.

Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive blasting as well as equipment and containers used to collect abrasive media. This requirement will be enforced during activity and inactivity of equipment.

Before the Contractor departs from the work site at the end of the workday, collect all debris generated during surface preparation and all dust collector hoses, tarps or other appurtenances containing blasting residue in approved containers.

Clean a 3" x 3" area at each structure to demonstrate the specified finish, and the inspector will preserve this area by covering it with tape, plastic or some other suitable means so that it can be retained as the Dry Film Thickness (DFT) gauge adjustment standard. An acceptable alternative is for the Contractor to provide a steel plate with similar properties and geometry as the substrate to be measured.

The contractor and or quality assurance representative shall notify the Engineer of any area of corroded steel that has lost more than 50% of its original thickness.

All parts of the bridges not to be painted and the travelling public shall be protected from overspray. Submit a plan to protect all parts of bridge that are not required to be painted and a plan to protect the traveling public and surrounding environment while applying all coats of paint to a structure.

Ensure that chloride levels on the surfaces are $7 \mu\text{g}/\text{cm}^2$ or lower using an acceptable sample method in accordance with SSPC Guide 15. The frequency of testing shall be two (2) tests per span after all surface preparation has been completed and immediately prior to painting. Select test areas representing the greatest amount of corrosion in the span as determined by the Engineers' representative. Additional testing may be required if significant amounts of chloride are detected.

All weld splatter, slag or other surface defects resulting in a raised surface above the final paint layer shall be removed prior to application of primer coat.

PAINTING OF STEEL

Paint System 5, as specified in these special provisions and Article 442-8 of the *Standard Specifications*, is to be used for this work. System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint over non-weathering steel surfaces blast-cleaned surfaces in accordance with SSPC-SP-6 (Commercial Blasting). Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material. The contractor is responsible for reporting quantities of thinner purchased as well the amounts used. No container with thinner shall be left uncovered, when not in use.

Apply 2" stripe coat, by brush or roller only, to all exposed edges of steel including fasteners before applying the finish coat. Locate the edge or corner in the approximate center of the paint stripe.

Any area where newly applied paint fails to meet the specifications shall be repaired or replaced by the Contractor, at no additional cost to the Department. The Engineer approves all repair processes before the repair is made. Repaired areas shall meet the *Standard Specifications*. The Contractor applies an additional finish coat of paint to areas where the tape adhesion test is conducted.

MATERIALS

Only paint suppliers that have a NCDOT qualified inorganic zinc primer may furnish paints for this project. All paints applied to a structure shall be from the same supplier. Before any paints are applied the Contractor shall provide the Engineer a manufacturer's certification that each batch of paint meets the requirements of the applicable Section 1080 of the *Standard Specifications*.

Color of the paint shall match that of the existing paint on the structure steel.

The inspector randomly collects a one pint sample of each paint product used on the project. Additional samples may be collected as needed to verify compliance to the specifications.

Do not expose paint materials to rain, excessive condensation, long periods of direct sunlight, or temperatures above 110°F or below 40°F. In addition, the Contractor shall place a device that records the high, low, and current temperatures inside the storage location. Follow the manufacturer's storage requirements if more restrictive than the above requirements.

INSPECTION

Surface Preparation for System 5 shall be in accordance with SSPC SP-6. Any area(s) not meeting the requirements of SSPC SP-6 shall be remediated prior to application of coating. Surface inspection is considered ready for inspection when all blast abrasive, residue and dust is removed from surfaces to be coated.

(D) Quality Assurance Inspection

The Contractor furnishes all necessary OSHA approved apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The contractor illuminates the surfaces to be inspected to a minimum of 50-foot candles of light. All access points shall be illuminated to a minimum of 20-foot candles of light.

NCDOT reserves the right for ongoing Quality Assurance (QA) inspection to include but not limited to surface contamination testing, adhesion pull testing, and DFT readings as necessary to assure quality.

Inform the Engineer and the Division Safety Engineer of all scheduled and unannounced inspections from SSPC, OSHA, EPA and/or others that come on site. Furnish the Engineer a copy of all inspection reports except for reports performed by a third party and or consultant on behalf of the Contractor.

(E) Inspection Instruments

At a minimum, furnish the following calibrated instruments and conduct the following quality control tests:

- (12) Sling Psychrometer - ASTM E337 - bulb type
- (13) Surface Temperature Thermometer
- (14) Wind Speed Indicator
- (15) Tape Profile Tester - ASTM D4417 Method C
- (16) Surface Condition Standards - SSPC VIS-1 and VIS-3
- (17) Wet Film Thickness Gage - ASTM D4414
- (18) Dry Film Thickness Gage - SSPC-PA2 Modified
- (19) Solvent Rub Test Kit - ASTM D4752
- (20) Adhesion Test Kit - ASTM D3359 Method A (Tape Test)
- (21) Adhesion Pull test - ASTM D4541
- (22) Surface Contamination Analysis Kit or (Chloride Level Test Kit) SSPC Technology Guide 15

(F) Quality Control

Maintain a daily quality control record in accordance with Subarticle 442-12(D) of the *Standard Specifications* and make such records available at the job site for review by the inspector and submit to the Engineer as directed. In addition to the information required on Form M&T-610, submit all Dry Film Thickness (DFT) readings on a form equivalent to Form M&T-611. These forms can be found at:

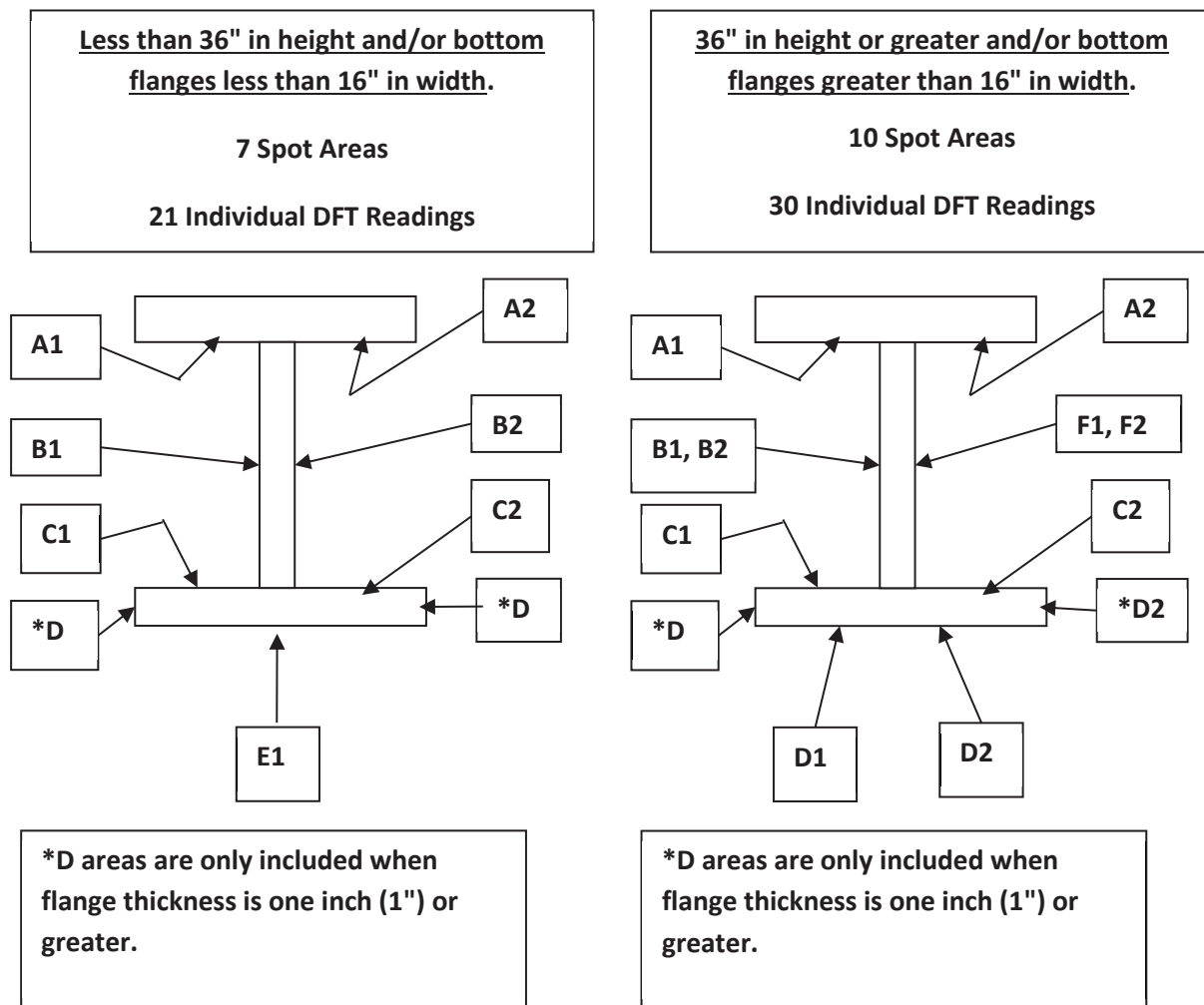
<https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM-03-02>

- (1) Measure DFT at each spot on the attached diagram and at the required number of locations as specified below:
 - (a) For span members less than 45 feet; three (3) random locations along each girder in each span.
 - (b) For span members greater than 45 feet; add one additional location for each additional ten (10) feet in span length.

DFT measurements for the prime coat shall not be taken for record until the zinc primer has cured in accordance with ASTM D4752 (MEK Rub Test) with no less than a four (4) resistance rating.

Stiffeners and other attachments to beams and or plate girders shall be measured at no less than five (5) random spots per span. Also, dry film thickness is measured at no less than six (6) random spots per span on diaphragms/cross frames.

Each spot is an average of three (3) to five (5) individual gage readings as defined in SSPC PA-2. No spot average shall be less than 80% of minimum DFT for each layer applied; this does not apply to stripe coat application. Spot readings that are non-conforming shall be re-assessed by performing additional spot measurements not to exceed one-foot intervals on both sides of the low areas until acceptable spot averages are obtained. These non-conforming areas shall be corrected by the Contractor prior to applying successive coats.



- (2) Two (2) random adhesion tests (1 test = 3 dollies) per span are conducted on interior surfaces in accordance with ASTM D4541 (Adhesion Pull Test) after the prime coat has been properly cured in accordance with ASTM D3363 (Pencil Hardness) with no less than

2H, and will be touched up by the Contractor. The required minimum average adhesion is 400 psi.

- (3) Cure of the intermediate and stripe coats shall be accessed by using the thumb test in accordance with ASTM D1640 (Curing Formation Test) prior to the application of any successive layers of paint.
- (4) One random Cut Tape adhesion test per span is conducted in accordance with ASTM D3359 (X-Cut Tape Test) on interior surface after the finish coat is cured. Repair areas shall be properly tapered and touched up by the Contractor.

ZONE PAINTING

If any girder has excessive corrosion along its bottom flange, beyond the distance of 1.5 times the depth of the beam or girder, at the bearing, the area of the affected girder indicated on the plans, and other girders as directed by the Engineer, shall be cleaned in accordance with the requirements of System 5 painting system. The horizontal limits of zone painting shall extend 12" beyond the maximum horizontal extent of web/flange corrosion. The vertical limits of zone painting shall extend 3" beyond the maximum vertical extent of web corrosion.

Areas designated for zone coating shall be primed and coated in accordance with System 5 as outlined in the *Structural Steel Shop Coatings Program*.

System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint and over non-weathering steel surfaces cleaned to an SSPC SP-6 finish.

Painting shall be performed in accordance with Section 442 and Section 1080 of the *Standard Specifications*, and/ or these special provisions; the more restrictive requirement shall apply. Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material.

SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS

Personnel access boundaries are delineated for each work site using signs, tape, cones, or other approved means. Submit copies of safety and environmental compliance plans that comply with SSPC QP 2 Certification requirements.

HEALTH AND SAFETY RESPONSIBILITIES

This project may involve toxic metals such as arsenic, lead, cadmium and hexavalent chromium. It is the contractor's responsibility to test for toxic metals and if found, comply with the OSHA regulations, which may include medical testing.

Ensure a “Competent Person” as defined in OSHA 29 CFR 1926.62; one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them; is on site during all surface preparation activities and monitors the effectiveness of containment, dust collection systems and waste sampling. Before any work begins, provide a written summary of the Competent Person’s safety training.

Comply with Subarticle 442-14(B) of the *Standard Specifications*.

Comply with Subarticle 442-14(D) of the *Standard Specifications*. Ensure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

An employee who has been removed with a blood level of 50 micrograms per deciliter or more shall have two (2) consecutive blood sampling tests spaced one week apart indicating that the employee’s blood lead level is at or below 40 micrograms per deciliter before returning to work activities involving any lead exposure.

All OSHA recordable accidents that occur during the project duration are to be reported to the Engineer within twenty-four (24) hours of occurrence. In addition, for accidents that involve civilians or property damage that occurs within the work zone the Division Safety Engineer shall be notified immediately.

Prior to blasting operations, the Contractor shall have an operational OSHA approved hand wash station at each bridge location and a decontamination trailer at each bridge or between bridges unless the work is on the roadway, or the Contractor shall show reason why it is not feasible to do so and provide an alternative site as approved by the Engineer. The Contractor shall assure that all employees whose airborne exposure to lead is above the Permissible Exposure Limit (PEL) shall shower at the end of their work shift.

STORAGE OF PAINT AND EQUIPMENT

Provide a location for materials, equipment, and waste storage. Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive recycling and other waste handling equipment or containers. All land and or lease agreements that involve private property shall disclose to the property owner that heavy metals may be present on the Contractor’s equipment. Prior to storing the Contractor’s equipment on private property, provide a notarized written consent signed by the land owner received by the Engineer at least forty-eight (48) hours before using property. All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers’ requirements. The more restrictive requirements will apply.

UTILITIES

Protect all utility lines or mains that may be supported on, under, or adjacent to bridge work sites from damage and paint overspray.

MEASUREMENT AND PAYMENT

The cost of inspection, surface preparation and repainting the existing structure is included in the lump sum price bid for *Cleaning and Painting Existing Weathering Steel for Bridge #___*. This price is full compensation for furnishing all inspection equipment, all paint, cleaning abrasives, cleaning solvents and all other materials; preparing and cleaning surfaces to be painted; applying paint in the field; protecting work area, traffic and property; furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers, any other hand or power tools and any other equipment.

Pollution Control will be paid at the contract lump sum price which will be full compensation for all collection, handling, storage, air monitoring, and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements, and all equipment, material and labor necessary for the daily collection of the blast debris into specified containers; and any measures necessary to ensure conformance to all safety and environmental regulations as directed by the Engineer.

Painting Containment for Bridge #___ will be paid at the lump sum contract price and will be full compensation for the design, materials, installation, maintenance, and removal of the containment system.

Payment will be made under:

Pay Item

Cleaning and Painting Existing Weathering Steel for Bridge #___

Pollution Control

Painting Containment for Bridge #___

Pay Unit

Lump Sum

Lump Sum

Lump Sum

SCOPE OF WORK

Bridge #394: This bridge was built in 1981 and carries SR 2698 over I-74 and US 311. The superstructure consists of 4 simple spans with 2 exterior Haunched Plate Girders and 6 interior Haunched rolled steel beams totaling 8 lines of girders (Spans A and D) and 8 lines of Plate Girders (Spans B and C) @ 8'-0" spacing with steel cross frames. The Spans A and D haunched Plate Girder web depth varies from 56" to 26" and top and bottom flanges are 10" wide and W27x84 rolled beams. The Spans B and C Plate Girder web depth of 55" and top flange width of 13" and bottom flange width of 16". The bridge has an overall length of 321'-0" with a reinforced concrete deck and a 62'-10" total deck width. The existing paint system is weathering steel, and the estimated area to be cleaned and painted is 8,664 sq. ft.

CONCRETE MEDIAN REPLACEMENT**(SPECIAL)****1.0 DESCRIPTION OF WORK**

Carefully measure and record the length, size, and location of existing concrete median. Remove existing concrete median for placement of bridge deck overlay. Cut or remove existing anchoring reinforcement in bridge deck below the elevation of the planned overlay preparation.

After completion of bridge deck overlay, place new concrete median matching the length, size, and location of the median that was removed. Provide new median concrete and reinforcing as indicated on the project plans.

2.0 MEASUREMENT AND PAYMENT

The unit bid per square foot for *Concrete Median Replacement* will be full compensation for furnishing all material, labor, tools, and all other incidentals required to satisfactorily remove existing concrete median and reinforcement and to satisfactorily complete placement of new concrete median.

Payment will be made under:

Pay Item**Pay Unit**

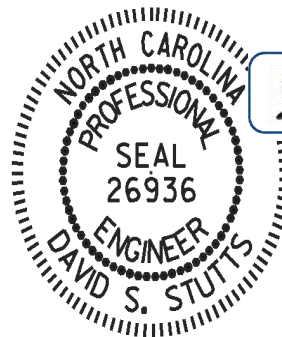
Concrete Median Replacement

Square Foot

**Project Special Provisions
Structures and Culverts**

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DocuSigned by:

A handwritten signature of David Stutts in black ink.

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08/09/2022

**MAINTENANCE AND PROTECTION OF TRAFFIC
BENEATH PROPOSED STRUCTURE****(8-13-04)****1.0 GENERAL**

Maintain traffic on the travelways listed in Table 1 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of as shown in Table 1 at all times during construction.

Station	Travelway	Min. Vertical Clearance
39+65.10 -Y2FLYCA-	US 311	17'-0"
30+02.29 -Y2FLYCA-	US 311	17'-0"
20+68.01 -Y2NBL-	US 311	17'-0"
29+89.90 -Y2SBL-	US 311	17'-0"

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.

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.

STEEL REINFORCED ELASTOMERIC BEARINGS**(6-22-16)**

The 2018 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, 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.

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
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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 ½ 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.

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)**(12-1-2017)****1.0 DESCRIPTION**

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the Thermal Sprayed Coatings (Metallization) Program and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The Thermal Sprayed Coatings (Metallization) Program is available on the Materials and Tests Unit website.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

3.0 MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the Thermal Sprayed Coatings (Metallization) Program. Apply TSC with the alloy to the thickness specified on the plans or as required by Thermal Sprayed Coatings (Metallization) Program.

5.0 INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

6.0 REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the Thermal Sprayed Coatings (Metallization) Program.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic zinc-rich coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.
 1. Minor localized areas less than or equal to 0.1 ft^2 with exposed substrate shall be repaired as outlined above for marine and non-marine environments.
 2. Large localized areas greater than 0.1 ft^2 with exposed substrate shall require the Contractor to submit a detailed repair procedure to the Engineer for review and approval.
- Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

7.0 TWELVE MONTH OBSERVATION PERIOD

All TSC materials applied under the Thermal Sprayed Coatings (Metallization) Program shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

8.0 BASIS OF PAYMENT

The contract price bid for the metal component to which the TSC is applied will be full compensation for the thermal sprayed coating.

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:

	ASTM TEST METHOD	REQUIREMENTS
Hardness, Durometer - Shore A	D2240	60 ± 5, Neoprene (upward corrugated shape - fabric reinforced) 75 ± 5, EPDM and Neoprene (upward non-corrugated shape) 80 ± 5, EPDM (upward corrugated shape-fabric reinforced)
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.

MODULAR EXPANSION JOINT SEALS**(9-30-11)****1.0 GENERAL**

Furnish and install modular expansion joint seals within the limits indicated on the plans.

Obtain modular expansion joint seals from Fabricators that are AISC certified in Category I.

Use a modular expansion joint seal that is a waterproof system such as WABOMODULAR as manufactured by Watson Bowman and Acme Corporation of Amherst New York, BROWN/MAURER as manufactured by the D. S. Brown Company of North Baltimore, Ohio or an approved equal. Do not use aluminum components in the modular expansion joint. Use a modular expansion joint seal consisting of three or more transverse rails holding two or more elastomeric seals in place and a support mechanism that ensures the rails maintain parallel and equidistant spacing. Do not use bolts to connect the rails to the support mechanism.

Provide an elastomeric component for each modular expansion joint seal that is one 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. 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 also. 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.

Provide modular expansion joint seals capable of handling a total movement measured parallel to the centerline of the roadway as shown on plans. Limit clear distance between centerbeams, and edgebeams and centerbeams, to 3½". Limit centerbeam spans to approximately 48".

2.0 DRAWING AND SPECIFICATION SUBMITTAL

Submit Shop Drawings for Fabrication and Installation Procedure and Revised Contract Plan Sheets, showing revised details of the Structure contract plans.

A. Shop Fabrication and Installation Procedure Drawings

The deck slab is detailed in the contract plans with a required full depth transverse construction joint separating the main slab pour from the blockout area for the modular joint assembly. Position the modular joint assembly in the blockout area only after the main slab pours adjacent to the blockout area have been made and the girder rotation, deflection, and longitudinal movement due to slab pours have occurred.

Detail the method of positioning and securing the modular assembly in the blockout prior to the closure pour on the working drawings.

Submit two complete sets of working drawings for review. Submit these drawings well in advance of the scheduled installation time for the modular expansion joint seals. Include material requirements and installation procedures and specifications in the drawings.

After the drawings have been reviewed and, if necessary, corrections have been made, submit nine additional sets of the working drawings.

B. Revised Contract Plan Sheets

Concurrent with the submission of the working drawings, submit two sets of revised Structure plans for review. In the revised plans, include necessary changes in dimensions, reinforcing steel, and concrete blockouts to accommodate modular expansion joint seals. Have a North Carolina Registered Professional Engineer prepare and seal the revised plans. No adjustment will be made in the contract price for any bid item due to revisions necessary to accommodate the modular expansion joint seals. This cost is included in the lump sum price bid for furnishing and installing the modular expansion joint seal.

After the revised plans have been reviewed and, if necessary, corrections have been made, submit one 22" x 34" reproducible set of revised structure contract plans.

3.0 FABRICATION AND INSTALLATION

Protect the components of the modular expansion joint seal in the following manner. Upon completion of any shop fabrication, commercially blast clean (SP-6) all steel components, excluding stainless steel parts. Metallize to a minimum thickness of 8 mils on these surfaces. Metallize in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". Repair abraded or damaged coated surfaces anytime after applying the coating as specified for repair of galvanizing in the Standard Specifications. As an alternative to Metallizing, galvanizing in accordance with the Standard Specifications is permitted.

Install the modular expansion joint seals according to the procedures and recommendations of the manufacturer, except as amended in the next paragraph.

Limit modular expansion joint seal splices to crown points, abrupt changes in deck slab cross slope, lane lines, or as necessary for proper installation and alignment. All splice locations and details must be shown on the submitted working drawings and are subject to the Engineer's approval. For shop splices, full penetration welds are required for centerbeam splices. For shop splices, partial penetration welds are not allowed for centerbeam splices, except at barrier rail upturns or sidewalk upturns. For field splices, partial penetration welds are not allowed for centerbeam splices. Show and submit for approval all splice locations on the working drawings. For location of lane markings at the modular expansion joint seals, see the Structure plans.

When indicated on the plans, provide special snowplow protection, such as a snowplow blade guide or steel ribs, to prevent the blade from entering the joint recess.

If the Engineer deems any aspects of the modular expansion joint seals unacceptable, make necessary corrections.

Watertight Integrity Test

- Upon completion of each modular 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 sidewalk, 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 modular 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 considered 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 additional cost to the Department.

4.0 BASIS OF PAYMENT

Basis of payment for all modular expansion joint seals will be at the lump sum contract price for "Modular Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the modular expansion joint seals in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

STRIP SEAL EXPANSION JOINTS**(06-25-2020)****1.0 GENERAL**

This Special Provision covers furnishing and installing strip seal expansion joints as shown on the contract drawings and in accordance with this Special Provision, the Standard Specifications and the manufacturer's recommendation. All materials, labor, equipment, and incidentals necessary for proper installation of the strip seal expansion joints are included.

2.0 MATERIALS

Provide strip seal expansion joints capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans. The components of the expansion joint include steel retainer rails and a neoprene seal gland.

The steel retainer rails shall consist of a "P" shape profile configuration with anchor studs welded to the concrete face. The rails shall have a minimum height of 8 inches, a minimum thickness of ½ inch and a maximum top surface (at the riding surface) width of 2 inches. Use AASHTO M270 Grade 36 or Grade 50 steel for the steel retainer rails.

The neoprene gland shall be extruded synthetic rubber with virgin polychloroprene as the only polymer. The gland manufacturer shall provide a Type 4 certification, in accordance with the Standard Specifications, attesting the gland has been tested and meets the following minimum properties:

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS
Tensile Strength, psi (min.)	ASTM D412	2000
Elongation at break, % (min.)	ASTM D412	250
Hardness, Type A durometer, points	ASTM D2240 Modified	60 ± 10
Oven aging, 70h @ 212°F Tensile strength, % change (max.) Elongation, % change (max.) Hardness, points change (max.)	ASTM D573	-20 -20 0 to +10
Oil Swell, ASTM Oil No. 3, 70h @ 212°F Weight change, % (max.)	ASTM D471	45
Ozone resistance 20% strain, 300 pphm in air 70h @ 104°F	ASTM D1149 Modified	No cracks
Low temperature stiffening, 7 days @ 14°F Hardness, Type A durometer, points change	ASTM D2240	0 to +15

Compression Set, 70h @ 212°F (max.)	ASTM D395 Method B (modified)	40%
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3.0 SHOP DRAWINGS

Submit a set of complete shop drawings to the Engineer via email for review, comments and acceptance and carbon copy (cc) the Structures Management Unit Working Drawing Review Group (SMU-wdr@ncdot.gov). Send the drawings well in advance of the scheduled installation time for the strip seal expansion joint rail. Prior to submitting the shop drawings, have someone, other than the draftsman who prepares the drawings, check all detailed drawings and include the signatures of both the draftsman and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor.

Steel retainer rails shall consist of one-piece construction including upturns. Welding two or more components to obtain the required cross-sectional shape is not permitted. Show all dimensions, anchor stud locations, welded splice details, splice locations and any other details or data necessary to fabricate the joint on the shop drawings. Include the joint model number and joint movement range. Draw all details to scale. Identify, in detail, welding procedures to be performed in fabricating the joint. As a minimum, also show the following on the drawings:

- All field splice locations. Steel retainer rail field splices are only permitted at crown points, locations with abrupt changes in the deck slab cross slope, and at travel lane lines. Splices within travel lanes are not permitted and splicing on edge lines is not required. For the location of travel lane markings at the strip seal expansion joint, see the structure plans. At the field splice locations, locate the horizontal stud anchors 3 inches from the centerline of the splice.
- Details of the shipping device for the steel retainer rail assemblies. Ensure the device is capable of resisting shipping and handling forces without causing damage to the steel retainer rail assemblies or metallized coating.
- The method of supporting steel retainer rails horizontally and vertically during joint installation and placement of concrete to ensure stability and proper alignment. Ensure the method is capable of resisting construction forces without causing damage to the steel retainer rail assemblies or metallized coating and are adjustable to account for variable temperature settings. Place supports near field splices of steel retainer rails to ensure that splices are straight and even.
- The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening.
- The proposed installation procedure including the sequence and suggested direction of the concrete pour(s).
- The proposed mechanism to allow joint translation after the deck pour.

- A section through the joint detail showing horizontal offset dimensions of the steel retainer rails from the centerline of the 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).

4.0 FABRICATION

Fabricate the strip seal joint components in accordance with the approved shop drawings and the plans.

Splice sections of steel retainer rail in the shop to obtain required lengths. Do not use short pieces of steel retainer rail less than 6 feet 0 inches long unless required at curbs, sidewalks or staged construction locations. Splices in an individual steel retainer rail are only permitted where a construction joint is specifically required by the plans, joint segment length exceeds 50 feet, or approved by the Engineer in writing.

At splice locations where changes in deck slab cross slope occur, cut the ends of steel retainer rails parallel to the bridge centerline for skews less than 80° and greater than 100°.

Provide a neoprene gland that is compatible with the steel retainer rail. Produce a single continuous neoprene gland for the entire length of the joint. When necessary, only vulcanized splicing of the gland in the shop is permitted. Ensure the convolution(s) of the gland does not project above the top of the steel retainer rails when the ambient temperature results in the minimum joint opening.

5.0 SHIPMENT

Bolt the steel retainer rails together in the shop to form matching pairs. Clearly mark each pair to identify where they are to be placed. Ship the neoprene gland(s) together with the steel retainer rail(s) and clearly mark them to identify where they are to be placed.

6.0 INSTALLATION

Install the strip seal expansion joint in accordance with the plan details, this Special Provision, the Standard Specifications, and the manufacturer's recommended installation procedures. Have a manufacturer's representative present during installation of the joint.

Install the steel retainer rail assemblies at proper grade and alignment. See contract drawings for width of joint opening.

Bolt, weld or clamp steel retainer rail assemblies in position using temporary or sacrificial brackets as required. Do not use temporary or sacrificial support brackets, bolts, clamps, etc. between the faces of the steel retainer rails. Do not weld within 2 inches of steel retainer rail surfaces exposed in the completed structure. Do not weld strip seal expansion joint components to reinforcing steel or structural steel.

For staged construction, install steel retainer rail assemblies in a given subsequent stage to align with those installed in an adjacent prior stage after deflection and rotation due to deck casting of adjoining spans has occurred.

Protect metalized steel retainer rail assemblies during screeding operations per the manufacturer's recommendations. Provide temporary blocking material in the steel retainer rail seal cavities to prevent concrete intrusion during deck pour and finishing.

Loosen any temporary or sacrificial support brackets, bolts, clamps, etc. that span across the joint after initial set of concrete, but not more than two hours after conclusion of concrete placement.

Install the neoprene gland after completion of deck casting. Use a single continuous neoprene gland for the entire length of the joint. Field splicing of the neoprene gland is not permitted. Remove all joint form material and blocking material prior to installing the gland. Field install the gland in accordance with manufacturer's recommendations. Thoroughly coat all contact surfaces between the gland and the steel retainer rail seal cavities with an adhesive lubricant before setting the gland in place. Use lubricant adhesive that conforms to ASTM D4070 and is compatible with manufacture's strip seal expansion joint to attach neoprene gland to the steel retainer rails.

7.0 INSPECTION

The Engineer inspects the joint system for proper alignment and proper stud placement and attachment. If any aspect of the strip seal expansion joint is deemed unacceptable, make the necessary corrections.

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 each strip seal expansion joint, perform a watertight integrity 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 sidewalk, 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 strip seal expansion joint 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 considered 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 watertight 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 additional cost to the Department.

8.0 BASIS OF PAYMENT

Basis of payment for all strip seal expansion joints will be at the lump sum contract price for "Strip Seal Expansion Joints." 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 strip seal expansion joint in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

**OPTIONAL PRECAST REINFORCED CONCRETE
BOX CULVERT****(12-12-13)****1.0 GENERAL**

This Special Provision covers the design, fabrication and construction of precast reinforced concrete box culverts intended for the conveyance of storm water.

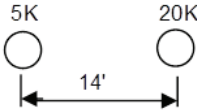
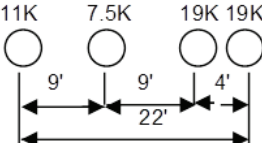
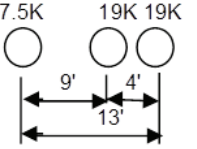
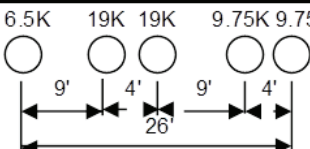
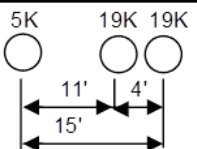
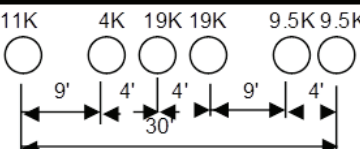
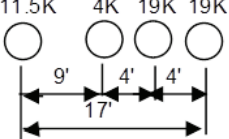
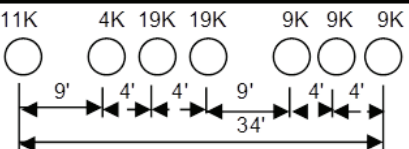
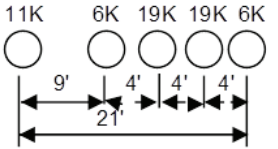
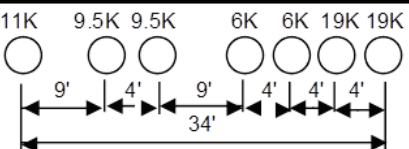
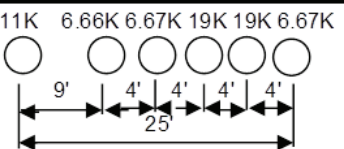
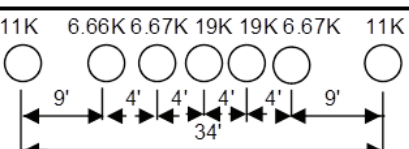
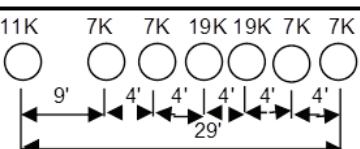
If the option is indicated on the plans, the submittal for a precast reinforced box culvert in lieu of a cast-in-place culvert is permitted. Design the precast culvert sections in accordance with ASTM C1577 or the current edition of the AASHTO LRFD Bridge Design Specifications. Rate all sizes of precast reinforced concrete box culverts in accordance with the current edition of the AASHTO Manual for Bridge Evaluation. Ensure the culvert rates for the AASHTO design loads and North Carolina's legal loads (see Section 2.0 for North Carolina's legal loads). Provide the size and number of barrels as indicated on the plans. Detail the culvert with cast-in-place wings walls and footings. Precast wing walls and footings will not be allowed. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

The design and rating of the precast and cast-in-place members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans and rating sheets for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box and cast-in-place members. Have a North Carolina Registered Professional Engineer check and seal the plans, rating sheets and design calculations. After the plans, rating sheets and design calculations are reviewed and, if necessary, the corrections made, submit one set of plans and rating sheets on 22" x 34" sheets to become part of the contract plans.

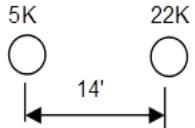
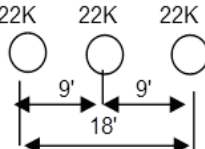
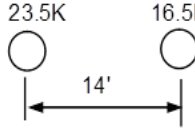
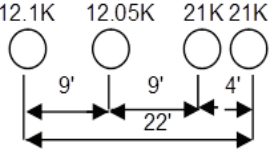
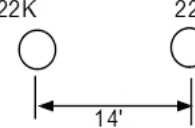
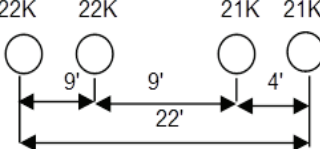
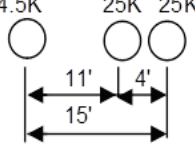
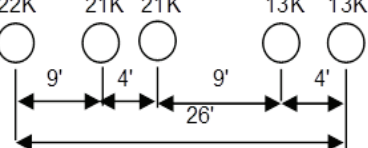
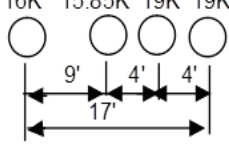
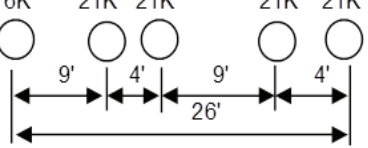
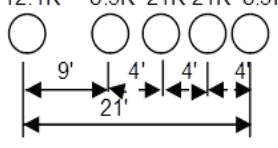
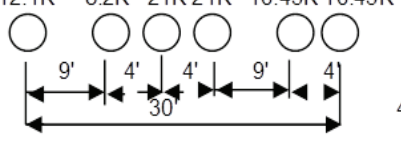
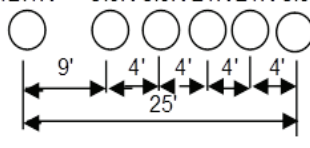
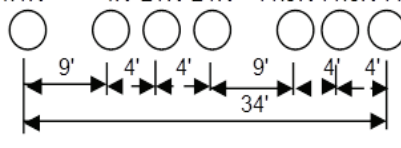
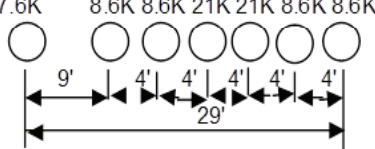
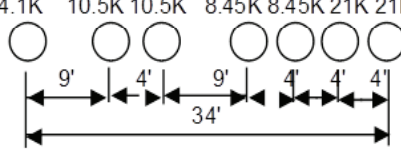
If the span, rise and design earth cover for the precast reinforced concrete box culvert are identical to a previously approved submittal, the Contractor may request the previously approved design calculations and plans be considered as the submittal for review and approval. However, a set of plans and rating sheets will need to be submitted to become part of the contract plans.

2.0 NORTH CAROLINA'S LEGAL LOADS

Apply the following legal loads to all structures carrying interstate traffic:

SINGLE VEHICLE(SV)			TRUCK TRACTOR SEMI-TRAILER(TTST)		
REF. #	SCHEMATIC		REF. #	SCHEMATIC	
SH		25K 12.5 TON	T4A		56.5K 28.25 TON
S3A		45.5K 22.75 TON	T5B		64K 32 TON
S3C		43K 21.5 TON	T6A		72K 36 TON
S4A		53.5K 26.75 TON	T7A		80K 40 TON
S5A		61K 30.5 TON	T7B		80K 40 TON
S6A		69K 34.5 TON			
S7A		80K 40 TON			
S7B		77K 38.5 TON			

Apply the following legal loads to all structures carrying non-interstate traffic:

SINGLE VEHICLE (SV)			TRUCK TRACTOR SEMI-TRAILER (TTST)		
REF. #	SCHEMATIC		REF. #	SCHEMATIC	
SNSH			TNAGRIT3		
SNGARBS2			TNT4A		
SNAGRIS2			TNAGRIT4		
SNCOTTS3			TNAGT5A		
SNAGGRS4			TNAGT5B		
SNS5A			TNT6A		
SNS6A			TNT7A		
SNS7B			TNT7B		

3.0 PRECAST REINFORCED CONCRETE BOX SECTIONS

The precast reinforced concrete box culvert sections shall match the size and hydraulic opening indicated in the contract plans.

A. Design

1. Design Fill – The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the bottom of the top slab.
2. Placement of Reinforcement – Provide a 1 inch concrete cover over the reinforcement subject to the provisions of Section F. Extend the inside reinforcement into the tongue portion of the joint and the outside reinforcement into the groove portion of the joint. Detail the clear distance of the end wires so it is not less than 1/2 inch or more than 2 inches from the ends of the box section. Assemble reinforcement per the requirements of ASTM C1577 or the approved design. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.
3. Laps and Spacing – Use lap splices for the transverse reinforcement. Detail the transverse wires so that the center to center spacing is not less than 2 inches or more than 4 inches. Do not detail the longitudinal wires with a center to center spacing of more than 8 inches.

B. Joints

1. Produce the precast reinforced concrete box section with tongue and groove ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the tongue and groove ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.
2. Seal the external joint with an outside sealer wrap conforming to ASTM C877 that is at least 12 inches wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in pieces, as indicated on Figure 1 below:

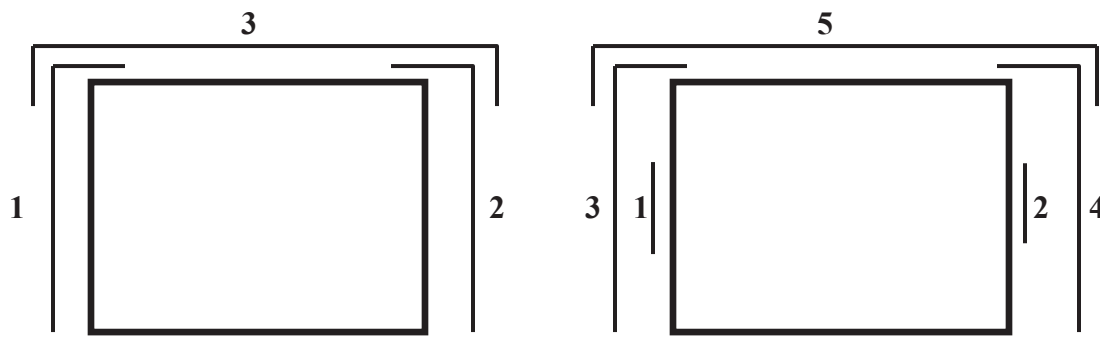


Figure 1

Cover the external joint sealer with a 3 foot strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications.

Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches. Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

C. Manufacture

Manufacture precast reinforced concrete box culvert sections by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd³ of portland cement.
2. Strength – Concrete shall develop a minimum 28-day compressive strength of 5000 psi. Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.
3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.
4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).
5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and placing. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all

handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

D. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with ASTM C31 and ASTM C39.

E. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch in 8 feet.
2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch from the plan dimensions.
3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch.
4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches. The minimum length of the groove shall be 4 inches. The dimensions of the tongue and groove shall not vary more than 1/4 inch from the plan dimensions.
5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch, whichever is greater. A thickness more than that required on the plans is not a cause for rejection.
6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of ASTM C1577, Section 11.3.
7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch in any box section.
8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is $\pm 3/8$ inch for slab and wall thicknesses of 5 inches or less and $\pm 1/2$ inch for slab and wall thicknesses greater than 5 inches. Produce sections so that the concrete cover is never less than 5/8 inch as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.
9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

F. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, the Department will verify assembly of the first five adjacent sections or 20% of the total culvert length, whichever is greater, at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked. The producer shall document the GO-NO-GO dimensional measurements of each box culvert section produced through the post-pour inspection process.
2. Clearly mark each section of the box culvert in accordance with ASTM C1577, Section 15. The information requirements of Section 15.1 shall be clearly marked on the inner surface of each section.

G. Construction

1. Pre-installation Meeting – A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.
2. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet shall be provided between sections of fabric.
3. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.
4. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

4.0 BASIS OF PAYMENT

Any additional cost of redesigning will be paid for by the Contractor if Precast Reinforced Concrete Culvert is used in lieu of the cast-in-place culvert shown on the plans. Except for Foundation Conditioning Material and Culvert Excavation, payment for the Precast Box Culvert will be a lump sum amount equal to the payment that would be allowed for construction of a Cast-in-Place Box Culvert. Plan quantities and unit bid prices will be used to compute the lump sum amount. Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor, materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, leveling pad, end curtain walls, wings and wing footings.

SOUND BARRIER WALL**(8-29-19)****1.0 DESCRIPTION**

This work consists of furnishing precast panels with an architectural surface treatment, structural steel, concrete, handling, transporting, fabricating, galvanizing, 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.

Precast panels with an architectural surface treatment shall be constructed using form lining materials and patterns to match the appearance (size, shape, color, texture, pattern, and relief) of the textured finish as specified on the plans and approved by the Engineer.

The contractor is required to use the same form liner and coloration contractor to construct the precast panels with an architectural surface treatment.

The Standard Plans allow pile spacing of 10, 15 or 20 feet. Pile spacing greater than 15 feet will not be allowed for the precast concrete panels detailed in the standard plans. Provide consistent pile spacing for 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. Architectural surface treatment shall not be applied to piles. Piles shall have a smooth, non-textured finish, and remain unstained in their natural color.

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 QUALIFICATIONS

Prior to beginning work the contractor shall submit the following qualifications to the Engineer for approval:

A. Architectural Surface Treatment Construction

The Contractor shall have a minimum of three years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 3 references who were responsible for supervision of similar projects. Include name, address, telephone number, and specific type of application.

B. Form Liners and Coloring System

The manufacturer of form liners for the standard textured finishes and coloring system shall have at least five years of experience making molds and color stains to create formed concrete surfaces to match the specified textured finish and colors. The Contractor shall schedule a pre-installation conference with a form liner manufacturer

representative and the Engineer to assure understanding of simulated textured finish form liner use, color application, requirements for construction of sample panel(s), and to coordinate the work. The Contractor shall be required to disclose their source of form liner manufacturer and final coloration contractor prior to the Preconstruction Conference.

3.0 ALTERNATE PILE SPACING FOR STANDARD PRECAST PANELS

As an alternate, the Contractor may submit plans for pile spacings greater than 10 feet and less than 15 feet for review and approval. The pile excavation 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, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

4.0 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, provide 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.

5.0 WORKING DRAWINGS

Submit precast panel casting drawings 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 the casting drawings. Submit fabrication drawings for approval prior to fabrication of wall components. Submit an erection plan and precast panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of forms. Submit five sets of detail drawings on 22" x 34" sheets.

Submit for review and acceptance, wall plan and elevation views and details showing overall simulated textured pattern, joint locations, and end, edge or other special conditions. The drawings should include typical cross sections of precast panels, joints, corners, texture relief, texture size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the working drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Working drawings should be of sufficient scale to show the detail of all textured finishes and joint patterns. Shop drawings shall be reviewed and approved prior to fabrication of form liners.

6.0 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 4 inches \pm ¼ inch thick, excluding relief for a textured finish. Architectural surface treatment shall consist of a standard textured finish and a single color of stain applied to both faces of the precast panels as specified on the plans and approved by the Engineer. Relief of any texture is not to exceed an average depth of 1 inch. No textured finish or stain shall be applied on the uppermost foot of each wall segment and along the vertical edges of the panels. These areas shall have a smooth, non-textured finish, and remain in its natural concrete color.

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.

The standard textured finish shall be constructed using form lining materials. The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall conceal construction joint lines.

Prior to each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be accepted by the Engineer before being used. Form liner panels that do not perform as intended or are no longer repairable shall be replaced.

Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼ inch seam. Blend form liner butt joints into the textured surface pattern and finish off the final concrete surface. Create no visible vertical or horizontal seams or conspicuous form liner butt joint marks. At locations where the form liners are joined, carefully blend to match the balance of the textured finish.

Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects.

When the approved textured finish requires simulated grout pattern joints, construct grout pattern joints to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

The Contractor shall have a technical representative from the form liner manufacturer on site for technical supervision during the installation and removal of form liners. Unless directed by the Engineer, installation and removal of form liners shall not be permitted if the technical representative is not present.

Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product and shall be applied in accordance with the manufacturer's recommendations. The form release agent shall be compatible with the form liner material, the concrete coloring system, any special surface finish and in accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

All form defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal. Use patching materials and procedures in accordance with the manufacturer's recommendations.

Precast concrete shall be finished in accordance with the Standard Specifications, except that curing of concrete should be done to accommodate the application of coloring and surface finish treatment.

7.0 SURFACE COLORING

All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces to be accomplished by pressure washing with water set at 3,000 psi to remove laitance. The fan nozzle shall be held perpendicular to the surface at a distance of 1 to 2 feet. Sandblasting will not be permitted.

Surface coloring shall be achieved using an approved stain suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color system shall be a single color of stain in brown or gray tones as specified on the plans and approved by the Engineer. The approved sample panel shall be the basis for determining the appropriate stain application.

The coloring agent shall be a penetrating stain mix or other approved coloring system designed for exterior application on old or new concrete with field evidence of resistance to moisture, acid or alkali, mildew, mold or fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission. Final coloring system and color of stain are subject to approval by the Engineer.

Application of coloring/staining agent to finished precast concrete and patches shall occur at a minimum of 30 days after form liners are removed. Maintain the concrete temperature between 40°F and 85°F during color/stain application and for 48 hours after color/stain application. Consult the manufacturer's recommendations for preparation, application, curing, and storage of coloring agents/stains. The contractor shall provide a Color Application Artist who is experienced in producing realistic surface appearances. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption. Linear butt joints shall be carefully blended into the approved pattern and finished off the final concrete surface. No visible vertical or horizontal seams or conspicuous form marks created by butt joining will be permitted.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

8.0 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 ½ 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.

9.0 METHOD OF MEASUREMENT

The quantity of form liner textured finish and coloring stain to be paid for will be the actual square feet of architectural surface treatment that has been incorporated into the completed and accepted work. The area of architectural surface treatment will be measured by the area of treated panels. Do not include the uppermost foot of each wall segment, panel vertical edges without architectural surface treatment, or piles in the measurement. Area of sample panels shall not be included in the measurement of architectural surface treatment.

The quantity of sound barrier wall to be paid for 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.

10.0 BASIS OF PAYMENT

The quantity of sound barrier wall and architectural surface treatment, measured as provided above, will be paid for at the contract unit price bid per square foot.

The unit price bid per square foot for “Sound Barrier Wall” will be full compensation for 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.

The unit price bid per square foot for “Architectural Surface Treatment” will be full compensation for the architectural treatment covered by this Special Provision including, but not limited to, furnishing architectural detail drawings, sample panels; the construction, finishing, and removal of all equipment, materials, labor, and incidentals necessary for furnishing and use of all form liners to produce approved textured finish and application of approved surface coloring.

Payment will be made under:

Sound Barrier Wall..... Square Foot

Architectural Surface Treatment (Sound Barrier Wall) Square Foot

FALSEWORK AND FORMWORK**(2-14-22)****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.

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. Scream Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab. For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 1/2" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

For links slabs, the tops of girders directly beneath the link slab shall be free of overhang falsework attachments or other hardware. Submit calculations and working drawings for overhang falsework in the link slab region.

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 $\frac{3}{4}$ ".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft ² for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS**(2-14-22)****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.

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 Email: SMU-wdr@ncdot.gov (do not cc SMU Working Drawings staff)

Via US mail:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office addresses:

Via Email: EastGeotechnicalSubmittal@ncdot.gov

Via US mail:

Mr. David Hering, L.G., P. E.
Assistant State Geotechnical
Engineer – Eastern Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. David Hering, L.G., P. E.
Assistant State Geotechnical
Engineer – Eastern Region
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 addresses:

Via Email: WestGeotechnicalSubmittal@ncdot.gov

Via US mail or other delivery service:

Mr. Eric Williams, P. E.
Assistant State Geotechnical
Engineer – Western Region
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 website, via the "[Drawing Submittal Status](#)" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "[Geotechnical Construction Submittals](#)" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact:

James Bolden (919) 707 – 6408
jlbolden@ncdot.gov

Secondary Structures Contacts:

Emmanuel Omile (919) 707 – 6451
eomile@ncdot.gov

Madonna Rorie (919) 707 – 6508
mrorie@ncdot.gov

Eastern Regional Geotechnical Contact (Divisions 1-7):

David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):

Eric Williams (704) 455 – 8902
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 a copy of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit as specified in the tables below.

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.

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	Submittal Required by Structures Management Unit?	Submittal Required by Geotechnical Engineering Unit?	Contract Reference Requiring Submittal ¹
Arch Culvert Falsework	Y	N	Plan Note, SN Sheet & “Falsework and Formwork”
Box Culvert Falsework ⁷	Y	N	Plan Note, SN Sheet & “Falsework and Formwork”
Cofferdams	Y	Y	Article 410-4
Foam Joint Seals ⁶	Y	N	“Foam Joint Seals”
Expansion Joint Seals (hold down plate type with base angle)	Y	N	“Expansion Joint Seals”
Expansion Joint Seals	Y	N	“Modular Expansion Joint

(modular)			Seals”
Expansion Joint Seals (strip seals)	Y	N	“Strip Seal Expansion Joints”
Falsework & Forms ² (substructure)	Y	N	Article 420-3 & “Falsework and Formwork”
Falsework & Forms (superstructure)	Y	N	Article 420-3 & “Falsework and Formwork”
Girder Erection over Railroad	Y	N	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	Y	N	“Maintenance and Protection of Traffic Beneath Proposed Structure at Station ____”
Metal Bridge Railing	Y	N	Plan Note
Metal Stay-in-Place Forms	Y	N	Article 420-3
Metalwork for Elastomeric Bearings ^{4,5}	Y	N	Article 1072-8
Miscellaneous Metalwork ^{4,5}	Y	N	Article 1072-8
Disc Bearings ⁴	Y	N	“Disc Bearings”
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	Y	N	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	Y	N	Article 420-20
Prestressed Concrete Box Beam (detensioning sequences) ³	Y	N	Article 1078-11
Precast Concrete Box Culverts	Y	N	“Optional Precast Reinforced Concrete Box Culvert at Station ____”
Prestressed Concrete Cored Slab (detensioning sequences) ³	Y	N	Article 1078-11
Prestressed Concrete Deck Panels	Y	N	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	Y	N	Articles 1078-8 and 1078- 11
Removal of Existing Structure over Railroad	Y	N	Railroad Provisions

Revised Bridge Deck Plans (adaptation to prestressed deck panels)	Y	N	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	Y	N	“Modular Expansion Joint Seals”
Sound Barrier Wall (precast items)	Y	N	Article 1077-2 & “Sound Barrier Wall”
Sound Barrier Wall Steel Fabrication Plans ⁵	Y	N	Article 1072-8 & “Sound Barrier Wall”
Structural Steel ⁴	Y	N	Article 1072-8
Temporary Detour Structures	Y	Y	Article 400-3 & “Construction, Maintenance and Removal of Temporary Structure at Station _____”
TFE Expansion Bearings ⁴	Y	N	Article 1072-8

FOOTNOTES

- 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*.
- Submittals for these items are necessary only when required by a note on plans.
- Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
- The fabricator may submit these items directly to the Structures Management Unit.
- The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
- Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
- Submittals are necessary only when the top slab thickness is 18” or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Submittals Required by Geotechnical Engineering Unit	Submittals Required by Structures Management Unit	Contract Reference Requiring Submittal ¹
Drilled Pier Construction Plans ²	Y	N	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports ²	Y	N	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms ^{2,3}	Y	N	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports ²	Y	N	Subarticle 450-3(F)(3)
Retaining Walls ⁴	Y; drawings and calculations	Y; drawings	Applicable Provisions
Temporary Shoring ⁴	Y; drawings and calculations	Y; drawings	“Temporary Shoring” & “Temporary Soil Nail Walls”

FOOTNOTES

- 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*.
- Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email), US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.
- 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.
- Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY**(6-20-19)**

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES**(12-1-17)****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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

MASS CONCRETE**(6-20-19)**

This special provision applies to substructure components (footings, columns or caps) where the smallest dimension of that component is greater than or equal to six feet and less than or equal to eight feet.

The mass concrete temperature after placement shall not exceed 158°F and the temperature difference between the core and exterior surfaces shall not exceed 35°F. Mass concrete should remain covered and monitored until the difference between the core temperature and the average daily ambient temperature is below 35°F. All mass concrete pours shall remain covered and protected a minimum of 7 days unless otherwise directed by the Engineer.

Submit an analysis, for review and approval, of the anticipated thermal developments in the mass concrete based on the proposed mix design, materials and casting procedures. At a minimum the analysis shall provide: an anticipated range of peak temperatures, temperature gradients, time to peak temperature and recommended cure time. The submittal shall also describe the measures and procedures that will be taken to limit the temperature differential to 35°F or less between the core and exterior surfaces.

Methods for reducing thermal differential may involve but are not limited to a combination of the following:

- A. Selecting materials that minimize the heat generated by hydration of the cement.
- B. Cooling materials to reduce the temperature of the concrete in its plastic state.
- C. Controlling the rate of concrete placement.
- D. Insulating the concrete surface to prevent heat loss.
- E. Providing supplemental heat at the concrete surface to prevent heat loss.
- F. Other acceptable methods which may be developed by the Contractor.

The temperature of mass concrete at the time of placement shall not be less than 40°F nor more than 75°F.

Mass concrete shall contain an approved set-retarding, water-reducing admixture, and flyash or ground granulated blast furnace slag in the amount of 25% by weight of the total cementitious material (portland cement plus flyash). Fly ash or ground granulated blast furnace slag used in the mass concrete mix shall meet the requirements of Articles 1024-5 and 1024-6 of the Standard Specifications. Portland Cement shall meet the requirements of AASHTO M85 for Type II. The total cementitious material shall not exceed 600 lbs. per cubic yard of concrete. The Contractor shall test and submit results for the compressive strength of his proposed mix design for review and approval. The strength must be taken as the average of at least three cylinders made in the laboratory and meet the minimum 28 day strength requirements noted in the contract plans.

The Contractor shall provide and install a minimum of six temperature sensing devices in each mass concrete pour to monitor temperature differentials between the core and exterior surfaces. These devices shall have an accuracy of $\pm 2^{\circ}\text{F}$ within the temperature range of 40°F to 180°F . One temperature sensing probe shall be placed near the core of the pour, and the remaining temperature sensing probes shall be placed at approximately two inches clear from the surface of the concrete furthest from the core. The Engineer shall approve the locations of the temperature sensing probes.

Readings from the temperature sensing devices shall be recorded at one-hour intervals, from the time casting is complete until the maximum temperature is established. After the maximum temperature is established, record readings from temperature sensing devices at two-hour intervals until consecutive readings indicated the temperature difference between the core and all exterior surfaces is less than 35°F . At the option of the Contractor, the temperature may be recorded by an approved strip-chart recorder furnished by the Contractor.

If monitoring indicates the 35°F differential has been exceeded, the Contractor shall take immediate action to reduce the temperature differential to less than 35°F and revise the thermal plan to ensure future mass concrete pours meet the temperature limits. All revisions to the approved plan must be approved by the Engineer prior to implementation.

At the discretion of the Engineer, all temperature monitoring requirements may be waived provided the Contractor has proven to the satisfaction of the Engineer that the temperature after placement will not exceed 158°F and the temperature difference between the core and all exterior surfaces will not exceed 35°F .

Placement of mass concrete shall be continuous resulting in a footing, column or cap that is monolithic and homogeneous.

The entire cost of this work shall be included in the unit contract price bid for the class of concrete associated with the mass concrete.

ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES**(12-30-15)****1.0 INSPECTION FOR ASBESTOS CONTAINING MATERIAL**

Prior to conducting bridge demolition or renovation activities, the Contractor shall thoroughly inspect the bridge or affected components for the presence of asbestos containing material (ACM) using a firm prequalified by NCDOT to perform asbestos surveys. The inspection must be performed by a N.C. accredited asbestos inspector with experience inspecting bridges or other industrial structures. The N.C. accredited asbestos inspector must conduct a thorough inspection, identifying all asbestos-containing material as required by the Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants (NESHAP) Code of Federal Regulations (CFR) 40 CFR, Part 61, Subpart M.

The Contractor shall submit an inspection report to the Engineer, which at a minimum must include information required in 40 CFR 763.85 (a)(4) vi)(A)-(E), as well as a project location map, photos of existing structure, the date of inspection and the name, N.C. accreditation number, and signature of the N.C. accredited asbestos inspector who performed the inspection and completed the report. The cover sheet of the report shall include project identification information. Place the following notes on the cover sheet of the report and check the appropriate box:

☐ ACM was found
☐ ACM was not found

2.0 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

If ACM is found, notify the Engineer. Compensation for removal and disposal of ACM is considered extra work in accordance with Article 104-7 of the Standard Specifications.

An Asbestos Removal Permit must be obtained from the Health Hazards Control Unit (HHCU) of the N.C. Department of Health & Human Services, Division of Public Health, if more than 35 cubic feet, 160 square feet, or 260 linear feet of regulated ACM (RACM) is to be removed from a structure and this work must be completed by a contractor prequalified by NCDOT to perform asbestos abatement. RACM is defined in 40 CFR, Part 61, Subpart M. Note: 40 CFR 763.85 (a)(4) vi)(D) defines ACM as surfacing, TSI and Miscellaneous which does not meet the NESHAP RACM.

3.0 DEMOLITION NOTIFICATION

Even if no ACM is found (or if quantities are less than those required for a permit), a Demolition Notification (DHHS-3768) must be submitted to the HHCU. Notifications and Asbestos Permit applications require an original signature and must be submitted to the HHCU 10 working days prior to beginning demolition activities. The 10 working day period starts based on the post-marked date or date of hand delivery. Demolition that does not begin as originally notified requires submission of a separate revision form HHCU 3768-R to HHCU. Reference the North Carolina Administrative Code, Chapter 10A, Subchapter 41C, Article .0605 for directives on revision submissions.

Contact Information

Health Hazards Control Unit (HHCU)
N.C. Department of Health and Human Services
1912 Mail Service Center
Raleigh, NC 27699-1912
Telephone: (919) 707-5950
Fax: (919) 870-4808

4.0 SPECIAL CONSIDERATIONS

Buncombe, Forsyth, and Mecklenburg counties also have asbestos permitting and NESHAP requirements must be followed. For projects involving permitted RACM removals, both the applicable county and the state (HHCU) must be notified.

For demolitions with no RACM, only the local environmental agencies must be notified. Contact information is as follows:

Buncombe County

WNC Regional Air Pollution Control Agency
49 Mt. Carmel Road
Asheville, NC 28806
(828) 250-6777

Forsyth County

Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101
(336) 703-2440

Mecklenburg County

Land Use and Environmental Services Agency
Mecklenburg Air Quality
700 N. Tryon Street
Charlotte, NC 28202
(704) 336-5430

5.0 ADDITIONAL INFORMATION

Additional information may be found on N.C. asbestos rules, regulations, procedures and N.C. accredited inspectors, as well as associated forms for demolition notifications and asbestos permit applications at the N.C. Asbestos Hazard Management Program website:

www.epi.state.nc.us/epi/asbestos/ahmp.html

6.0 BASIS OF PAYMENT

Payment for the work required in this provision will be at the lump sum contract unit price for “Asbestos Assessment”. Such payment will be full compensation for all asbestos inspections, reports, permitting and notifications.

6000 PSI CONCRETE**(SPECIAL)**

6000 PSI concrete shall be in accordance with the Sections 1000 and 1078 of the Standard Specifications.

Payment will be made under:

6000 PSI Concrete**Cu. Yds.**

POST-TENSIONING TENDONS:**(SPECIAL)****1.0 DESCRIPTION**

- 1.1 General:** Post-Tensioning Tendons consists of the furnishing, installing, stressing and grouting of prestressing tendons. In this process, prestressing steel consisting of strand tendons is installed through ducts in the girder webs and concrete, stressed up to a predetermined load and anchored directly against the girder webs and hardened concrete, imparting stresses through end bearing and deviations. Grout is then injected into the ducts to completely fill all remaining voids and to seal the permanently stressed tendons.

Post-Tensioning Tendons also includes furnishing and installing all the hardware and any other appurtenant items necessary for the particular prestressing system used, including but not limited to ducts, anchorage assemblies, supplementary steel, reinforcing bars, grout, and labor used for pressure grouting ducts and all associated operations.

- 1.2 Qualified Personnel:** The installation, stressing and grouting of post-tensioning tendons shall be supervised, performed and inspected by personnel with qualifications and experience as described in Appendix B of the "Post-Tensioning Tendon Installation and Grouting Manual" published by the Federal Highway Administration. Documentation of the qualifications and experience shall be submitted to the Engineer for approval.

1.3 Working Drawings:

- 1.3.1** The Contractor shall submit signed and sealed Working Drawings and Calculations showing complete details and designs for the post-tensioning system to the Engineer for approval. Submittal of the Working drawings and Calculations shall meet the requirements outlined in the Special Provision "Submittal of Working Drawings." Designs and details shall be sealed by a Professional Engineer registered in the State of North Carolina.
- 1.3.2** The Working Drawings shall detail the installation and support of the ducts; location of grout inlets, outlets, and high point outlet inspection details; tendon geometry and locations complying with the plans and particular tendon system limitations; and other related details. The Working Drawings shall indicate the approved post-tensioning system to be used and shall include integrated drawings of the post-tensioning system. Due to the congestion around the post-tensioning anchors, integrated drawings shall include anchorages and mild reinforcing required by the design shown on the bent drawings. Show complete details of the anchorage system, anchorage protection, and any appurtenances for accommodating stressing equipment. Show anchorage inspection details and permanent grout caps, protection system materials, and application limits. Show anchorage zone reinforcement as designed by the post-tensioning supplier. The Contractor shall be responsible for

resolving conflicts between the different elements in the anchorage zone. Any shifting of the design reinforcing steel shall be approved by the Engineer.

- 1.3.3 The Working Drawings and Calculations shall show complete details of tendon stressing. These details shall include sequence of stressing, jacking forces, calculated tendon elongations, gauge pressures, jack calibrations, friction and wobble coefficients, and anchor set loss. All of these shall be based on the actual post-tensioning system and hardware proposed for installation in the bent caps.
- 1.3.4 The Working Drawings shall include complete details of grouting materials, equipment, and procedures for approval by the Engineer.
- 1.3.5 The Working Drawings shall include details and calculations for the temporary falsework. The details shall include temporary support or bearings for the girders, support locations and how those supports will keep the girders in proper horizontal and vertical alignment, and allow for expansion and contraction of girders. The design of the temporary falsework shall follow the AASHTO Guide Design Specifications for Bridge Temporary Works, 2017, with 2020 Interim Revisions.

2.0 TERMINOLOGY

Anchorage: An assembly of various hardware components which secures a tendon at its ends after it has been stressed, and imparts the tendon force into the concrete.

Anchor Plate or Bearing Plate: That part of the anchorage which transfers the tendon force directly into the structure.

Anticipated Set: The wedge set assumed to occur in the design calculation of the post-tensioning forces at the time of load transfer.

Bleed: The autogenous flow of mixing water within, or its emergence from, newly placed grout, caused by the settlement of the solid materials within the mass.

Coupler: A device used to transfer the prestressing force from one partial length prestressing tendon to another. (Strand couplers are not permitted.)

Duct: Material forming a conduit to accommodate prestressing steel installation and provide an annular space for the grout which protects the prestressing steel.

Fluidity: A measure of time, expressed in seconds necessary for a stated quantity of grout to pass through the orifice of a flow cone.

Grout: A mixture of cementitious materials and water, with or without mineral additives or admixtures, proportioned to produce a pumpable consistency without segregation of the constituents when injected into the duct to fill the space around the prestressing steel.

Grout Cap: A device that contains the grout and forms a protective cover sealing the post-tensioning steel at the anchorage.

Inlet: Tubing or duct used for injection of the grout into the duct.

Outlet: Tubing or duct to allow the escape of air, water, grout, and bleed water from the duct.

Post-Tensioning: A method of prestressing where tensioning of the tendons occurs after the concrete has been cast and cured. The force in the stressed tendons is transferred to the concrete by means of anchorages.

Post-Tensioning Scheme or Layout: The pattern, size, and locations of post-tensioning tendons provided by the Designer on the Contract Plans.

Post-Tensioning System: An assembly of proprietary hardware, including but not limited to anchorage assembly, local zone reinforcement, wedge plate, wedges, inlet, outlet, couplers, duct, duct connections, and grout cap, used to install a tendon of a particular size and type, and supplied by a particular manufacturer or manufacturers of post-tensioning components.

Pressure Rating: The estimated maximum pressure that water in a duct or in a duct component can exert continuously with a high degree of certainty that failure of the duct or duct component will not occur (commonly referred to as working pressure).

Set (Also Anchor Set or Wedge Set): Set is the total movement of a point on the strand just behind the anchoring wedges during load transfer from the jack to the permanent anchorages. Set movement is the sum of slippage of the wedges with respect to the anchorage head and the elastic deformation of the anchor components.

Strand: An assembly of several high strength steel wires wound together. Strands usually have six outer wires helically wound around a single straight wire of a similar diameter.

Tendon: A single or group of prestressing steel elements and their anchorage assemblies imparting prestress forces to a structural member or the ground. Also, included are ducts, grouting attachments, grout, and corrosion protection filler materials or coatings.

Tendon Size: The number of individual strands of a specified diameter in a tendon.

Tendon Type: The relative location of the tendon to the concrete shape, internal or external.

Thixotropic: The property of a material that enables it to stiffen in a short time while at rest, but to acquire a lower viscosity when mechanically agitated.

Wedge Plate: The hardware that holds the wedges of a multi-strand tendon and transfers the tendon force to the anchorage assembly. (Commonly referred to as anchor head)

Wedge: A conically shaped device that anchors the strand in the wedge plate.

3.0 ALTERNATE POST-TENSIONING DESIGNS

Alternate designs using a post-tensioning scheme other than that shown on the plans may be submitted by the Contractor for the Engineer's approval provided that the proposed alternate scheme fulfills the following requirements:

- (1) The prestress system is a type described in Section 4 of this Special Provision.
- (2) The net compressive stress in the concrete after all losses is no less than that provided by the post-tensioning scheme shown on the Plans, and no more than 110% greater than that provided by the scheme shown on the Plans.
- (3) The distribution of individual tendons at each cross section generally conforms to the distribution shown on the Plans.
- (4) The ultimate strength of the structure with the proposed post-tensioning scheme meets the requirements of Section 5 of the "AASHTO LRFD Bridge Design Specifications, Eighth Edition" and shall be equivalent to or greater than the ultimate strength provided by the original design.
- (5) Stresses in the concrete and prestressing steel at all sections and at all stages of construction meet the requirements of the Design Criteria noted on the Plans.
- (6) All provisions of the Design Criteria noted on the Plans shall be satisfied.
- (7) The Contractor fully redesigns and details, as required, the elements where the alternate post-tensioning scheme is proposed to be used.
- (8) The Special Provision of 6000 PSI Concrete shall be satisfied.
- (9) The Contractor submits complete shop drawings including post-tensioning scheme and system, reinforcing steel, and concrete cover, and design calculations (including short and long term prestress losses) consistent with Section 1.3 Working Drawings for the Engineer's approval.
- (10) Any alternate post-tensioning scheme or system approved by the Engineer will result in no additional costs to the Department.
- (11) Any alternative post-tensioning scheme or system shall be designed and sealed by a responsible Specialty Engineer, licensed in the State of North Carolina.

4.0 MATERIALS

4.1 Prestressing Material:

4.1.1 Prestressing Steel: Unless otherwise noted on the plans, strand shall be uncoated, Grade 270, low relaxation 7-wire strands conforming to the requirements of ASTM A416.

The proper use of strand is predicated upon the use of suitable accessory materials. Details for the use of these materials shall be furnished by the manufacturer in connection with shop and working drawing submittals.

4.1.2 Tendon Couplers: Tendon couplers shall not be used. Contractor shall furnish and use tendons of appropriate length for each installation.

4.1.3 Prestress Anchorages: All prestressing steel shall be secured at the ends by anchoring devices meeting the approval of the Engineer. The anchorages shall develop at least 95% of the minimum specified ultimate tensile strength of the prestressing steel, tested in an unbonded state without exceeding the anticipated set. Certified copies of test results for the anchorage system shall be supplied to the Engineer at no additional cost. The anchorage and stressing system shall be so arranged that the prestressing force in the tendon may be verified prior to the removal of the stressing equipment.

Galvanize the embedded body of the anchorage in accordance with ASTM A123. Other components of the anchorage including wedges, wedge plate and local zone reinforcement are not required to be galvanized. Construct the bearing plate and wedge plate from ferrous metal. Equip all anchorages with a permanent grout cap that is vented and bolted to the anchorage.

Cast anchorages with grout outlets suitable for inspection from either the top or front of the anchorage. The grout outlet will serve a dual function of grout outlet and post-grouting inspection access. The geometry of the grout outlets must facilitate being drilled using a 3/8" diameter straight bit to facilitate borescope inspection directly behind the anchor plate. Anchorages may be fabricated to facilitate both inspection locations or may be two separate anchorages of the same type each providing singular inspection entry locations.

The Contractor shall furnish and use acceptable two-part or three-part wedges with appropriate anchorage plates for anchoring post-tensioning strands. Provide wedge plates with centering lugs or shoulders to facilitate alignment with the bearing plate.

The anchoring devices shall effectively distribute tendon forces to the concrete. Such devices shall conform to the following requirements:

- a) Article 5.8.4.4.2 of the AASHTO LRFD Bridge Design Specifications. The nominal concrete compressive strength at time of application of the post-tensioning tendon force used to determine bearing resistance shall be limited

to 4,500 psi as the absolute maximum value, even if the actual concrete strength determined through testing is in excess of 4,500 psi at the time of transfer (load application).

- b) Bending stresses in the plates or assemblies induced by the pull of the prestressing steel shall not exceed the yield point of the material or cause visible distortion of the anchorage plate when 95% of the ultimate strength of the tendon is applied. Certified test reports from an approved independent testing laboratory, verifying compliance with this requirement, shall be provided to the Engineer for each type and/or size of anchoring device.

Alternatively, anchorage devices which do not meet with either or both of the above requirements [(a) and (b)] may be accepted based upon previously approved usage in the State of North Carolina or on the basis of a new or previous test performed in accordance with and meeting the requirements of articles 10.3.2 and 10.3.2.3.10 of the AASHTO LRFD Bridge Construction Specifications, all at no cost to the Department. Also, in such cases, any additional confinement reinforcement or modification to existing reinforcement required for satisfactory performance of the anchorage devices shall be incorporated in the structure at no additional cost.

4.1.4 Inlets, Outlets, Valves and Plugs: Provide permanent grout inlets, outlets, and threaded plugs made of ASTM A240 Type 316 stainless steel, nylon or polyolefin materials. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141 (weather resistant), S-PA0231 or S-PA0401 (ultimate strength not less than 10,000 psi with UV stabilizer added). Products made from polyolefin shall contain antioxidant(s) with a minimum Oxidation Induction Time (OIT) according to ASTM D 3895 of not less than 20 minutes. Perform OIT test on samples taken from the finished product. Test the remolded finished polyolefin material for stress crack resistance using ASTM F2136 at an applied stress of 348 psi resulting in a minimum failure time of 3 hours.

All inlets and outlets will be equipped with pressure rated mechanical shut-off valves or plugs. Inlets, outlets, valves and plugs will be rated for a minimum pressure rating of 150 psi. Use inlets and outlets with a minimum inside diameter of 3/4 inch for strand and 3/8 inch for single bar tendons and four-strand duct.

All grout vents, injection and ejection pipes, and temporary items not part of the permanent structure shall be shown on working drawings.

4.1.5 Permanent Grout Caps: Use permanent grout caps made from approved polymer or ASTM A240 Type 316L stainless steel. The approved resins used in the polymer shall be nylon, Acrylonitrile Butadiene Styrene (ABS), or polyester. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141 (weather resistant), S-PA0231, or S-PA0401 (ultimate strength not less than 10,000 psi with UV stabilizer added). Seal the cap with "O" ring seals or precision fitted flat gaskets placed against the bearing plate. Place a grout vent on

the top of the cap. Grout caps must be rated for a minimum pressure rating of 150 psi. Use ASTM F593 Type 316L stainless steel bolts to attach the cap to the anchorage. When stainless steel grout caps are supplied, provide certified test reports documenting the chemical analysis of the steel. Use O-ring seals or precision fitted flat gaskets which meet the requirements of this section.

4.1.6 Ducts:

- a) **General:** Unless specifically noted on the Plans or otherwise approved by the Engineer, ducts for post-tensioning shall conform to the requirements of this specification. Ducts embedded in the concrete for prestressing steel shall be corrugated galvanized ferrous metal or corrugated plastic. Ensure that all connectors, connections and components of post-tensioning system hardware are air and water tight and pass the pressure test requirements herein.

Joins in ducts shall not be used. Ducts shall be one continuous piece between connections to anchor plates.

- b) **Size of Ducts:** Ducts for multi-strand tendons shall have a minimum size which provides an inside area at least 2.5 times the net cross-sectional area of the prestressing steel.
- c) **Corrugated Metal Ducts:** Corrugated metal ducts shall be galvanized. Rigid metal ducts may be fabricated with either welded or interlocked seams. Ducts shall bend without crimping or flattening and shall have sufficient strength to maintain their correct alignment during placing of concrete. Make connections to anchorages with devices or methods producing a smooth interior alignment with no lips or kinks. Design all connections and fittings to be airtight. Duct tape is not permitted to join or repair duct connections.
- d) **Epoxy Coated Metal Ducts:** Epoxy Coated Metal Ducts shall not be used.
- e) **Corrugated Plastic Duct:** Corrugated plastic duct shall be manufactured from virgin, unfilled, non-colored polypropylene meeting the requirements of ASTM D4101 with a cell classification range of PP0340B44541 to PP0340B67884 or polyethylene fabricated from resins meeting or exceeding the requirements of ASTM D3350 with a cell classification range of PE344434D to PE445574D. Cell classification testing shall be performed by an independent laboratory and material certifications shall be submitted for each batch of material used on the project.

Corrugated plastic duct shall contain antioxidants with a minimum oxidation induction time according to ASTM D3895 of 20 minutes and containing a non-yellowing light stabilizer. Environmental stress cracking of the corrugated plastic duct shall be in accordance with ASTM F2136 at 348 psi for three hours.

Seamless fabrication methods shall be used to manufacture the duct. Ducts shall be capable of being curved to the proper configuration without crimping or flattening. The minimum wall thickness shall meet the requirements in the table below:

Duct Shape	Size (Ø), in	Wall Thickness, in
Round	$2.375 < \text{Ø} \leq 3.35$	≥ 0.10
Round	$3.35 < \text{Ø} \leq 4.0$	≥ 0.12
Round	$4.0 < \text{Ø} \leq 4.5$	≥ 0.14
Round	$4.5 < \text{Ø} \leq 5.75$	≥ 0.16

- f) **Grout Vents, Injection and Ejection Pipes:** Vents shall be 19 mm ($\frac{3}{4}$ in.) minimum, inside diameter standard pipe or suitable plastic pipe. Neither metallic nor plastic components, if selected and approved, shall react with the concrete or enhance corrosion of the prestressing steel. Plastic components shall be free of water soluble chlorides.

Grout injection pipes shall be fitted with positive mechanical shut-off valves. Vents and ejection pipes shall be fitted with valves or other devices capable of withstanding the grout pumping pressures.

- g) **Shipping and Storage of Ducts:** Furnish duct with end caps to seal the duct interior from contamination. Ship in bundles which are capped and covered during shipping and storage. Protect ducts against ultraviolet degradation, crushing, excessive bending, dirt contamination and corrosive elements during transportation, storage and handling. Do not remove end caps supplied with the duct until the duct is incorporated into the bridge component. Store duct in a location that is dry and protected from the sun. Storage shall be on a raised platform and completely covered to prevent contamination. If necessary, wash duct before use to remove any contamination.

4.1.7 Grout:

- a) General: The Contractor shall use a Department-approved pre-packaged grout that exhibits thixotropic properties and is stored in moisture-proof containers. Grout bags shall indicate application, date of manufacture, LOT number, and mixing instructions. Any change of materials or material sources requires new testing and certification of the conformance of the grout with this specification. A copy of the Quality Control Data Sheet for each lot number and shipment sent to the job site shall be provided to the Contractor by the grout supplier and furnished to the Engineer. Pre-packaged grout shall be used within a maximum of six months from the date of manufacture. It is the Contractor's responsibility to consult the manufacturer to determine if the pre-packaged grout selected is suitable for grouting post-tensioning ducts. Maintain grout fluidity in strict compliance with the grout manufacturer's recommendations and test with a flow cone.

- b) Materials: Contractor shall contact the Materials and Test Unit for a list of approved pre-packaged grouts.

Water shall comply with Section 1024 of the Standard Specifications and shall be potable, clean, and free of injurious quantities of substances known to be harmful to the prestressing steel or pre-packaged grout.

Admixtures, if approved by the grout manufacturer and the Department, shall impart the properties of low water content, good flowability, minimum bleed and expansion if desired. Its formulation shall contain no chemicals in quantities that may have harmful effects on the prestressing steel or grout. Admixtures containing chlorides in excess of 0.5% by weight of admixture (assuming 1.0 lb. of admixture per sack (95 lb.) of grout), fluorides, sulfites and nitrates shall not be used.

Aluminum powder of proper fineness and quantity or other approved gas evolving material that is well dispersed through the mixture may be used to obtain expansion of the grout.

All admixtures shall be used in accordance with the instructions of the manufacturer. The date of manufacture shall be clearly stamped on each container. No admixture for which the shelf life recommended by the manufacturer has expired shall be used.

- c) Requirements: The grout shall not contain aluminum or other components which produce hydrogen, carbon dioxide or oxygen gas. A testing laboratory approved by the Department shall be used to test pre-packaged grout. Provide laboratory test results for setting time, volume change, compressive strength and fluidity with the grouting of each post-tensioning duct. Submit compressive strength for at least two 50 mm (2 in.) cube specimens at the age of 3, 7, 14, and 28 days for a total of at least eight cube specimens tested. Grout shall meet or exceed the specified physical properties stated in the table below as determined by the specified standard and modified ASTM test methods conducted at normal laboratory temperature (65-78°F) and conditions. Conduct all grout tests with grout mixed to produce the minimum time of efflux. Establish the water content to produce the minimum and maximum time of efflux. Perform laboratory tests in accordance with the following:

Property	Requirements	Test Method
Total Chloride Ions	Max. 0.03% by weight of mixed grout	ASTM C1152
Hardened Height Change @ 24 hours and 28 days	0.0% to +0.5%	ASTM C1090**
Expansion	≤2.0% for up to 3 hours	ASTM C940
Wet Density – Laboratory	Report maximum and minimum obtained test value 1b/cu ft	ASTM C138

Wet Density – Field	Report maximum and minimum obtained test value lb/cu ft	ASTM C138 or D4380
Compressive Strength 28 day (Average of 3 cubes)	≥3,000 psi (7 days) ≥5,000 psi (28 days)	ASTM C942*****
Initial Set of Grout	Min. 3 hours Max. 12 hours	ASTM C953
Time of Efflux*** Immediately after mixing	Min. 20 sec Max. 30 sec	ASTM C939
	or Min. 9 sec Max. 20 sec	ASTM C939****
Time of Efflux*** 30 minutes after mixing with remixing for 30 sec	Max. 30 sec	ASTM C939
	or Max. 30 sec	ASTM C939****
Bleeding @ 3 hours and 68°F	Max. 0.0%	ASTM C940*****
Pressure induced bleeding	Max. 0.0%	ASTM C1741
Inclined tube bleed test	Max. 0.3% after 3 hours at rest; all bleed water reabsorbed after 72 hours; grout below bleed water shall be resistant to indentation	EN 445
Permeability @ 28 days	Max. 2,500 coulombs at 30 V for 6 hours	ASTM C1202

**Modify ASTM C1090 to include verification at both 24 hours and 28 days.

***Adjustments to flow rates will be achieved by strict compliance with the manufacturer's recommendations. The time of efflux is the time to fill a one liter container placed directly under the flow cone.

****Modify the ASTM C939 test by filling the cone to the top instead of to the standard level.

*****Modify ASTM C940 to conform with the wick induced bleed test as follows:

1. Use a wick made of a 20 inch length of ASTM A416 seven wire 0.5 inch diameter strand. Wrap the strand with 2 inch wide duct or electrical tape at each end prior to cutting to avoid splaying of the wires when it is cut. Degrease (with acetone or hexane solvent) and wire brush to remove any surface rust on the strand before temperature conditioning.
2. Condition the dry ingredients, mixing water, prestressing strand and test apparatus overnight at 65°F to 75°F.
3. Mix the conditioned dry ingredients with the conditioned mixing water and place 800 ml of the resulting grout into the 1,000 ml graduate cylinder. Measure and record the level of the top of the grout.
4. Completely insert the strand into the graduated cylinder. Center and fasten the strand so it remains essentially parallel to the vertical axis of the cylinder. Measure and record the level of the top of the grout.
5. Store the mixed grout at the temperature range listed above in (b).
6. Measure the level of the bleed water every 15 minutes for the first hour and hourly for two successive readings thereafter.
7. Calculate the bleed water, if any, at the end of the three hour test period and the resulting expansion per the procedures outlined in ASTM C940, with the quantity of bleed water expressed as a percent of the initial grout volume. Note if the bleed

water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.

*****Modify ASTM C109 (referenced by ASTM C942) to allow non-metal (plastic) 2” molds for forming grout compressive strength test cubes.

Unless otherwise required in the Contract or by the Engineer, a grout mix design submittal is not required when using an approved pre-packaged grout. The contractor shall not use the pre-packaged grout until written acceptance has been received. Acceptance of approved pre-packaged grout does not relieve the Contractor of the responsibility to furnish a product that meets the Contract requirements.

- d) Accelerated Corrosion Test Method (ACTM): Perform the ACTM as outlined in Appendix B of the “Specification for Grouting of Post-Tensioning Structures” published by the Post-Tensioning Institute. Report the time to corrosion for both the grout being tested and the control sample using a 0.45 water-cement ratio neat grout.
- e) A grout that shows a longer average time to corrosion in the ACTM than the control sample and the time to corrosion exceed 1,000 hours is considered satisfactory.
- f) Sampling and Placement: The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. Use API RP 13B-1 for field testing grout flow and density of neat cement grout. 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.

The Contractor is responsible for the placement of grout in accordance with the manufacturer’s recommendations unless directed otherwise by the Engineer.

Grout samples for testing shall be furnished by the Contractor at no cost to the Department.

4.2. Samples for Testing:

4.2.1 General: Testing shall conform to the applicable ASTM Specifications for the prestressing material used.

All material samples for testing shall be furnished by the Contractor at no cost to the Department.

Job site or site referred to herein shall be considered the location where the prestressing steel is to be installed whether at the bridge site or a removed casting yard.

- 4.2.2 Prestressing Steel and Components:** Samples for testing shall be furnished as described below for each manufacturer of prestressing strand and anchorage assemblies to be used on the project.

With each sample of prestressing steel strand furnished for testing there shall be submitted a certification stating the manufacturer's minimum guaranteed ultimate tensile strength of the sample furnished.

The following samples of materials selected by the Engineer at the plant or job site from the prestressing steel used for post-tensioning operations shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

- (a) For strand: two randomly selected samples, 5 ft. long, per manufacturer, per size of stand, per shipment, with a minimum of one sample for every ten reels delivered.
- (b) For anchorage assemblies: two samples of each size, per manufacturer, per heat of steel.

One of each of the samples furnished to represent a lot shall be tested. The remaining sample(s), properly identified and tagged, shall be stored by the Engineer for future testing in the event of loss or failure of the component represented to meet minimum strength requirements. For acceptance of the lot represented, test results shall show that 100% of the guaranteed ultimate tensile strength has been met.

- 4.2.3 Lots and Identification:** A lot is that parcel of components as described herein. All anchorage assemblies of each size from each mill heat of steel and all strand from each manufactured reel to be shipped shall be assigned an individual lot number and shall be tagged in such a manner that each such lot can be accurately identified at the job site. Records shall be submitted to the Engineer identifying assigned lot numbers with the heat or reel of material represented. All unidentified prestressing steel or anchorage assemblies received at the site will be rejected. Also, loss of positive identification of these items at any time will be cause for rejection.

Provide a copy of the grout Quality Control Data Sheet to the Engineer, from the manufacturer, for each lot number and shipment sent to the job site.

- 4.3 Approval of Materials:** The approval of any material by the Engineer shall not preclude subsequent rejection if the material is damaged in transit or later damaged or found to be defective.

5.0 Testing by the Contractor

- 5.1 Tendon Modulus of Elasticity:** This test will not be required if the Contractor can demonstrate, to the satisfaction of the Engineer, valid results for the tendon modulus of elasticity from previous projects or based on results from manufacturer tests. Such results must be for the same type of strand, size, material, and complement of strands per tendon as required for this project and must have been performed under test conditions equal to or better than those described below.

If testing is required, for the purpose of accurately determining the tendon elongations while stressing, the Contractor shall bench test two samples of each size and type of tendon to determine the modulus of elasticity prior to stressing the initial tendon.

For the purpose of this test, the bench length between anchorages shall be at least 30 feet and the tendon duct shall be at least 2 inches clear of the tendon all around. The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. The test specimen shall be tensioned to 80% of ultimate in ten increments and then detensioned from 80% of ultimate to zero in ten decrements. For each increment and decrement, the gauge pressure, elongations and load cell force shall be recorded. Elongations of the tendon shall be noted for both ends and the central 26 feet and shall be measured to an accuracy of 1/32 inch. The elongations shall be corrected for the actual anchorage set of the dead end.

The modulus shall be calculated as follows:

$$E = \frac{PL}{A\Delta l}$$

where;

P = force in tendon,

L = distance between pulling wedges and dead end wedges or exact length in center 26 feet of the tendon.

A = cross sectional area of the tendon based on nominal area.

Δl = strand elongation for load P.

The theoretical elongation shown on the post-tensioning shop or working drawings shall be reevaluated by the Contractor using the results of the test and corrected when the modulus of elasticity from the bench test varies from the modulus of elasticity used for shop or working drawings by more than 1%. Revisions to the theoretical elongations shall be submitted to the Engineer for approval.

When the observed elongations of the tendons in the erected structure fall outside the acceptable tolerances or to otherwise settle disputes, additional Tendon Modulus of Elasticity Tests may be required to the satisfaction of the Engineer.

If the source of prestressing steel changes during the project, additional test series or substantiation from previous projects, not to exceed two per source, shall be required.

The apparatus and methods used to perform the test shall be proposed by the Contractor and be subject to the approval of the Engineer. Furthermore, this test shall be conducted by the Contractor in the presence of the Engineer.

5.2 In Place Friction Test: This test is intended to demonstrate that the friction characteristics, losses, and resulting tendon forces are in agreement with the design assumptions.

For the purpose of verifying friction loss the Contractor shall test, in place, the first tendon installed of each size and type which is at least 30 feet long. Size is defined as the size and number of strands in each tendon. Type is defined as to both prestressing and duct material and to the tendon function within the structure. Function is the general category of the tendon whether it is a cantilever tendon, continuity tendon, draped external tendon or continuous profiled tendon passing through one or more spans, etc. In this respect, the function of two or more tendons may be the same even though their actual profiles and lengths differ.

The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. The test specimen shall be tensioned to 80% of ultimate tendon strength in eight equal increments and detensioned in eight equal decrements. For each increment and decrement, the gauge pressure, elongations and load cell force shall be recorded. Account shall be taken of any wedge seating in both the live end (i.e., back of jack) and the dead end (i.e., back of load cell) and of any friction within the anchorages, wedge plates, and jack as a result of slight deviations of the strands through these assemblies. For long tendons requiring multiple jack pulls with intermediate temporary anchoring, care shall be taken to keep an accurate account of the elongation at the jacking end allowing for intermediate wedge seating and slip of the jacks' wedges.

The test shall be conducted using Engineer-approved lubricants required, if any, to meet the expected friction coefficient.

If, for the Contractor's expected friction coefficients, the elongations fall outside the $\pm 7\%$ range, the Contractor will be required to investigate the reason and make revisions to his post-tensioning operations such that the final tendon forces are in agreement with the Plans.

In reconciling theoretical and actual elongations, the value of the expected friction and wobble coefficients shall not be varied by more than $\pm 10\%$. Significant shortfall in elongations is indicative of poor duct alignments and/or obstructions which the Contractor shall be required to correct or compensate for in a manner to

be proposed by the Contractor and reviewed and approved by the Engineer at no additional cost to the Department.

One successful friction test for each type and size of tendon (tendon group) will be required for the project.

If, during the course of routine stressing operations, there are irreconcilable differences between forces and elongations, or other difficulties, the Engineer reserves the right to require additional in place friction tests.

The apparatus and methods used to perform the test shall be submitted by the Contractor to the Engineer for approval. This test shall be conducted by the Contractor in the presence of the Engineer.

Correction or adjustment of elongations as a consequence of the results of the friction test are the responsibility of the originator of the stressing and elongation calculations.

- 5.3 Test Reports Required:** Two test reports of the “Tendon Modulus of Elasticity Test” shall be submitted to the Engineer at least 30 days prior to installing the tendon.

Two test reports of the “In Place Friction Test” shall be submitted to the Engineer within 2 weeks after successful installation of the test tendon.

- 5.4 Payment for Testing:** Testing by the Contractor will not be paid for separately but shall be incidental to the price paid for the post-tensioning tendons.

- 5.5 Application of Test Results:** The theoretical elongations shown on the post-tensioning shop or working drawings shall be reevaluated by the Contractor using the results of the tests for Tendon Modulus of Elasticity and In Place Friction as appropriate and corrected as necessary. Revisions to the theoretical elongations shall be submitted to the Engineer for approval.

6.0 Protection of Prestressing Steel

- 6.1 Shipping, Handling and Storage:** All prestressing steel shall be protected against physical damage and corrosion at all times from manufacturer to final grouting or encasing in the concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. Any reel that is found to contain broken wires shall be carefully inspected during use and lengths of strand containing broken wires shall be removed and discarded. The wire shall be bright and uniformly colored, having no foreign matter or pitting on its surface.

Prestressing steel shall be packaged in containers or shipping forms for protection of the steel against physical damage and corrosion during shipping and storage and

shall be stored in a weatherproof building, shed, or container until time of use. A corrosion inhibitor which prevents rust or other results of corrosion shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or the concrete or bond strength of steel to concrete. Inhibitor carrier type packaging material shall conform to the provisions of Federal Specification MIL-P-3420. Packaging or forms damaged from any cause shall be immediately replaced or restored to the original condition.

The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, the care to be used in handling, and the type, kind, and amount of corrosion inhibitor used, including the date when placed, safety orders, and instructions for use. Low relaxation (stabilized) strand shall be specifically designated per requirements of ASTM A416. All such strand not so designated shall be rejected.

- 6.2 During Installation in the Structure:** When acceptable prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing and if stressing and grouting are completed within 15 calendar days after the installation of the prestressing steel, light surface corrosion which may form during these 15 days will not be cause for rejection of the steel. Post-tensioning steel installed, tensioned and grouted in this manner, all within 15 calendar days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel.

Post-tensioning steel installed as above but not grouted within 15 calendar days shall be protected from corrosion. The method of protection shall be determined by the Contractor and shall be approved by the Engineer prior to the start of construction. Approved corrosion protection measures shall be applied on site prior to exceeding the stipulated time limit. Water soluble oil shall not be allowed as a corrosion inhibitor or friction reducer.

Within 30 calendar days after installation of the post-tensioning steel, ducts shall be grouted in accordance with these specifications. Except when approved by the Engineer in writing, failure to grout tendons within the 30 calendar days specified shall result in stoppage of the affected work in accordance with Article 108-7 of the Standard Specifications and no invoices shall be processed for payment of that affected work.

7.0 Fabrication

- 7.1 General:** All post-tensioning anchorages, ducts, vent pipes, miscellaneous hardware, reinforcing bars, and other embedments shall be accurately and securely fastened at the locations shown on the Plans or on the approved Shop or Working Drawings or as otherwise approved by the Engineer.

- 7.2 Ducts:** Ducts shall be accurately aligned and positioned at the locations shown on the Plans or according to the approved Shop or Working Drawings or as otherwise approved by the Engineer. All internal ducts shall be securely fastened in position at regular intervals not exceeding 1'-6" to prevent movement, displacement or damage from concrete placement and consolidation operations. The method and spacing of duct supports shall be shown on appropriate Shop Drawings.

All alignments, including curves and straight portions, shall be smooth and continuous with no lips, kinks or dents.

All ducts shall be carefully checked and repaired as necessary before the placing of any concrete commences. If a duct requires repair, the repair method shall be subject to approval by the Engineer. The use of any tape to repair or seal a duct shall not be permitted.

The tolerance on the location of the ducts for the tendons shall be as specified in Section 7.5 below.

After installing the ducts in the forms and until final tendon grouting is complete, all ends of ducts, connections to anchorages, splices, inlets, outlets, and the like shall be sealed at all times to prevent the entry of water and debris. An absolute seal of anchorage and duct termination locations shall be provided by using plumber's plugs or equal. Grout inlets and outlets shall be installed with plugs or valves in the closed position, but low point outlets may be open. Briefly open low point drains just prior to tendon installation and again just prior to grout injection to allow for drainage of any water that may be present within the duct. The use of duct tape shall not be permitted.

- 7.3 Splices and Joints:** All splices, joints, couplings, connections (inlet and outlet) and valves shall be part of the approved post-tensioning system. At connections to anchorages, ducts shall be smoothly aligned and secured with no lips or kinks. They shall be joined in a manner which positively prevents the entrance of cement paste and water from the concrete or unwanted leakage of grout during subsequent grouting operations. The use of any tape shall not be permitted as a method to seal or join splices, joints, or connections.
- 7.4 Grout Vents, Injection and Ejection Pipes:** All ducts or anchorage assemblies for permanent post-tensioning shall be provided with pipes or other suitable connections at each end for the injection of grout after prestressing. As a minimum, ducts shall be vented at the following positions:
- a) Top of the tendon anchorage
 - b) Top of the grout cap
 - c) At the high points of the duct when the vertical distance between the highest and lowest point is more than 6 inches
 - d) At all low points

- e) At a distance not to exceed 36" from high points in both directions
- f) At other locations required by the Engineer

The Contractor may use additional injection and vent pipes when shown on the shop drawings.

Locate drains, inlets, and outlets serving as drains at the bottom of the duct section.

All connections to ducts shall be made with metallic or plastic structural fasteners.

Vent and grouting pipes shall be mortar tight and shall provide means for injection of grout through the vents and for sealing the vents. Duct tape shall not be used to join or repair ducts or make connections.

Extend grout tubes a sufficient distance out of the concrete member to allow for proper closing of the valves. Grout tubes shall be properly tagged for identification of associated tendons for grouting purposes.

Grout injection pipes shall be fitted with positive mechanical shut-off valves. Vents and ejection pipes shall be fitted with valves, caps or other devices capable of withstanding the grout pumping pressures.

All ducts shall be pressure tested before concrete is placed in the forms. In the presence of the Engineer, pressurize duct to 7.5 psi and lock-off outside air source. Record pressure loss for one minute. If the pressure loss exceeds 0.75 psi, or 10%, find and repair leaks in the duct assembly using repair methods approved by the Engineer and retest.

All grout caps used must be installed to prevent entrapment of air or water voids and must provide 100% coverage of all tendons.

7.5 Tolerances: Post-tensioning duct tolerance shall be $\pm\frac{1}{4}$ inch in the horizontal direction and $\pm\frac{1}{2}$ inch in the vertical direction.

Entrance and exit angles of tendon paths at anchorages and/or at faces of concrete shall be within ± 2 degrees of desired angle measured in any direction. Any deviations in the alignment must be accomplished with smooth transitions without any kinks.

Anchorages shall be located within $\pm\frac{1}{4}$ inch of desired position laterally and 1 inch along the tendon except that all minimum cover requirements must be maintained.

Anchorage confinement reinforcement in the form of spirals, multiple U shaped bars, or links, shall be positioned to start within $\frac{1}{2}$ inch of the inside face of the girder web and shall be properly centered around the duct.

In the event of conflicts between the reinforcement and post-tensioning duct, in general, the position of the post-tensioning duct shall prevail, and the reinforcement shall be adjusted locally to the approval of the Engineer.

8.0 Placing Concrete

- 8.1 Precautions:** The Contractor shall exercise great care when placing and consolidating concrete so as not to displace or damage any of the post-tensioning ducts, anchorage assemblies, connections, reinforcement, or other embedments.
- 8.2 Proving of Post-Tensioning Ducts:** Upon completion of concrete placement the Contractor shall prove that the post-tensioning ducts are free and clear of any obstructions or damage and will be able to accept the intended post-tensioning tendons by passing a torpedo through the ducts. The torpedo shall have the same cross-sectional shape as the duct, be $\frac{1}{4}$ inch smaller all around than the clear, nominal inside dimensions of the duct. No deductions to the torpedo section dimensions shall be made for tolerances allowed in the manufacture or fixing of the ducts. For curved ducts, the length shall be determined by the Contractor such that when both ends touch the outermost wall of the duct, the torpedo is $\frac{1}{4}$ inch clear of the innermost wall; but it need not be longer than 2 feet. If the torpedo will not travel completely through the duct, the integral cap shall be rejected, unless a workable repair can be made to clear the duct, all to the satisfaction of the Engineer. The torpedo shall be passed through the duct easily, by hand, without resorting to excessive effort or mechanical assistance.
- 8.3 Problems and Remedies:** If the ducts or any part of the integral cap work is found to be deficient, it will be rejected. No remedial or repair work will be permitted without the approval of the Engineer.

9.0 Installing Tendons

Post-tensioning strands may be pushed or pulled through the ducts to make up a tendon. Pushing shall be done with care so as to avoid snagging on any lips or joints in the ducts. The Contractor shall take precautions by rounding off the end of the strand or fitting it with a smooth protective cap for this purpose. During the installation of the post-tensioning strand into the duct, the strand shall not be intentionally rotated by any mechanical device.

Alternatively, strands may be assembled into the tendon which then may be pulled through the duct together using a special steel wire sock ("Chinese finger") or other device attached to the end. The ends of the strands may not be electric arc welded together for this purpose. Strands may be brazed together for pulling as long as 3 feet of strand from the brazed end is removed after installation. The end of the pre-assembled tendon shall be rounded for smooth passage through the duct. Cutting shall be done with an abrasive saw or similar. Flame cutting shall not be allowed.

Installation of tendons in ducts prior to concrete placement shall not be allowed.

No permanent tendons shall be installed prior to the completion of testing as required by these specifications or Plans, except for the "In Place Friction Test" where only the tendon to be tested shall be installed prior to successful completion of the test.

10.0 Post-Tensioning Operations

10.1 General: Post-tensioning forces shall not be applied until the concrete has attained the specified compressive strength as determined by cylinder tests. Conduct all stressing operations in the presence of the Engineer.

10.2 Stressing Tendons: All post-tensioning steel shall be tensioned by means of hydraulic jacks so that the post-tensioning force shall not be less than that required by the plans or approved shop drawings, or as otherwise approved by the Engineer. Monostrand jacks shall not be utilized for stressing tendons.

10.2.1 Maximum Stress at Jacking: The maximum temporary stress (jacking stress) in the post-tensioning steel shall not exceed 81% of its specified minimum ultimate tensile strength. Tendons shall not be overstressed to achieve the expected elongation

10.2.2 Initial and Permanent Stresses: The post-tensioning steel shall be anchored at initial stresses that will result in the long term retention of permanent stresses or forces of not less than those shown on the Plans or the approved shop drawings. Unless otherwise approved by the Engineer, the initial stress in the post-tensioning steel after anchor set shall not exceed 70% of the specified minimum ultimate tensile strength at anchorages and 74% of the specified minimum ultimate tensile strength at all other locations between anchorages.

Permanent stress and permanent force are the stress and force remaining in the post-tensioning steel after all losses, including long term creep and shrinkage of concrete, elastic shortening of concrete, relaxation of steel, losses in the post-tensioning steel from the sequence of stressing, friction and unintentional wobble of the ducts, anchor set, friction in the anchorages and all other losses peculiar to the post-tensioning system.

10.2.3 Stressing Sequence: Stressing of all tendons shall take place from the same end of the bent cap. Any exception must be approved by the Engineer. The sequence of installation and stressing shall be in accordance with the Plans or approved shop drawings or as otherwise approved by the Engineer.

10.3 Stressing Equipment: Equipment for tensioning the tendons shall be furnished by the manufacturer of the post-tensioning system (tendons, hardware, anchorages, etc.).

- 10.3.1 Stressing Jacks and Gauges:** Each jack used to stress tendons shall be equipped with a pressure gauge for determining the jacking pressure. The pressure gauge shall have an accurately reading dial at least 6 inches in diameter.
- 10.3.2 Calibration of Jacks and Gauges:** Each jack and its gauge shall be calibrated as a unit with the cylinder extension in the approximate position it will be in at the final jacking force. Calibration shall be done when the jack is connected to the equipment (pumps and gauges) in the identical configuration as will be used on the job site, e.g. with the same length hydraulic lines. Initial calibration of the jacks and gauges shall be performed by an independent laboratory using a proven load cell. For each jack and gauge unit used on the project, the Contractor shall furnish certified calibration charts and curves to the Engineer prior to stressing the first tendon. Supply documentation denoting the load cell(s) calibration date and tractability to NIST (National Institute of Standards and Technology) along with the jack/gauge calibration.

Certified calibration charts and curves shall be provided to the Engineer prior to the start of the work and at every 6 months thereafter, or as requested by the Engineer. At the option of the Contractor, calibrations subsequent to the initial calibration with a load cell may be accomplished by the use of a master gauge. The master gauge shall be supplied by the Contractor in a protective waterproof container capable of protecting the calibration of the master gauge during shipment to a laboratory. The Contractor shall provide a quick-attach coupler next to the permanent gauge in the hydraulic lines which enables the quick and easy installation of the master gauge to verify the permanent gauge readings. The master gauge shall be calibrated by and shall remain in the possession of the Engineer for the duration of the project.

Any repair of the jacks, such as replacing seals or changing the length of the hydraulic lines, is cause for recalibration of the jacks using a load cell.

No extra compensation shall be allowed for the initial or subsequent calibrations or for the use and required calibrations of the master gauge.

- 10.4 Stand-by Equipment:** During post-tensioning operations, the Contractor shall provide a stand-by stressing jack with gauges located on the job site. The stand-by stressing jack and gauges shall be calibrated as described in Section 10.3 of this Special Provision. The stand-by equipment will be provided at no additional cost to the Department.
- 10.5 Elongations and Agreement with Forces:** The post-tensioning operation shall be so conducted that the forces being applied to the tendon and the elongation of the post-tensioning tendon can be measured at all times.

Elongations shall be measured to the nearest 1/16 inch.

For the required tendon force, the observed elongation shall agree within 7% of the theoretical elongation or the entire operation shall be halted, checked, and the source of error determined and remedied to the satisfaction of the Engineer before proceeding further. The tendon shall not be overstressed to achieve the theoretical elongation.

In the event that agreement between the observed and theoretical elongations at the required force falls outside the acceptable tolerances, the Engineer may, at his discretion and without additional compensation to the Contractor, require additional test for "Tendon Modulus of Elasticity" and/or "In-Place Friction" in accordance with 5.1 and 5.2 of this Special Provision.

- 10.6 Friction:** The Contract Plans were prepared based on the assumed friction and wobble coefficients and anchor set noted on the Plans. The Contractor shall submit calculations and show a typical tendon force diagram, after friction, wobble and anchor set losses, on the shop drawings based upon the expected actual coefficients and values for the post-tensioning system to be used. These coefficients and values shall be given on the shop drawings.

If, in the opinion of the Engineer, the actual friction significantly varies from the expected friction, the Contractor shall revise the post-tensioning operation such that the final tendon force is in agreement with the Plans.

When friction shall be reduced, graphite may be used as a lubricant, subject to the approval of the Engineer.

- 10.7 Wire Failures in Post-Tensioning Tendons:** Multi strand post-tensioning tendons having wires which failed by breaking or slippage during stressing may be accepted provided the following conditions are met:

- (a) The completed structure shall have a final post-tensioning force of at least 98% of the design total post-tensioning force.
- (b) Any single tendon shall have no more than 5% reduction in cross-sectional area of post-tensioning steel due to wire failure.

As an exception, any of the above conditions may be waived as approved by the Engineer, when conditions permit the Contractor to propose acceptable alternative means of restoring the post-tensioning force lost due to wire failure.

- 10.8 Cutting of Post-Tensioning Steel:** Post-tensioning steel shall be cut by an abrasive saw within $\frac{3}{4}$ inches to $1\frac{1}{2}$ inches away from the anchoring device. Flame cutting of post-tensioning steel is not allowed. Do not cut tendon to final length prior to acceptance by the Engineer.
- 10.9 Record of Stressing Operations:** The Contractor shall keep a record of the following post-tensioning operations for each tendon installed:
- a) Project name, number.
 - b) Contractor and/or subcontractor.
 - c) Tendon location, size and type
 - d) Date tendon was first installed in ducts.
 - e) Reel number for strands
 - f) Assumed and actual cross-sectional area.
 - g) Assumed and actual Modulus of elasticity.
 - h) Date Stressed.
 - i) Jack and Gauge numbers per end of tendon.
 - j) Required jacking force.
 - k) Gauge pressures
 - l) Elongations (anticipated and actual)
 - m) Anchor sets (anticipated and actual)
 - n) Stressing sequence (i.e. tendons before and after this).
 - o) Stressing mode (one end/ two ends/ simultaneous).
 - p) Witnesses to stressing operation (Contractor and inspector).
 - q) Date grouted, days from stressing to grouting, grouting pressure applied and injection end.

Any other relevant information shall also be recorded. The Contractor shall provide the Engineer with a complete copy of all stressing and grouting operations.

- 10.10 Tendon Protection:** Seal all other duct openings other than installing anchorage caps within four hours after stressing. Install anchorage caps after the tendon has been accepted. If acceptance of tendon will be delayed more than four hours after stressing, immediately provide temporary weatherproofing of tendons at open ends of anchorages. If tendons and anchorages are temporarily weatherproofed, install anchorage caps within 1 day of tendon being accepted. If tendon contamination occurs and if directed by the Engineer, remove and replace the tendon.

11.0 Grouting Operations

- 11.1 General:** Within 30 calendar days after installation of the post-tensioning steel, ducts shall be grouted in accordance with these specifications. Except when approved by the Engineer in writing, failure to grout tendons within the 30 calendar days specified shall result in stoppage of the affected work and no invoices shall be processed for payment of that affected work.

After stressing and prior to grouting, tendons shall be protected against corrosion or harmful effects of debris by temporarily plugging or sealing all openings and vents until the tendon is grouted.

When stressing has been completed and the stressed tendons have been accepted by the Engineer, the annular space between the tendons and the duct shall be grouted.

11.2 Grouting Operations Plan: Submit a grouting operations plan for approval at least six weeks in advance of any scheduled grouting operations. Written approval of the grouting operations plan by the Engineer is required before any grouting of the permanent structure takes place. At a minimum, the plan will address and provide procedures for the following items:

1. Names and proof of training for the grouting crew and the crew supervisor in conformance with this specification;
2. Type, quantity, and brand of materials used in grouting including all certifications required;
3. Type of equipment furnished, including capacity in relation to demand and working condition, as well as back-up equipment and spare parts;
4. General grouting procedure; Duct pressure test and repair procedures;
5. Method to be used to control the rate of flow within ducts;
6. Theoretical grout volume calculations;
7. Mixing and pumping procedures;
8. Direction of grouting;
9. Sequence of use of the inlets and outlet pipes;
10. Procedures for handling blockages;
11. Procedures for possible post grouting repair.

Before grouting operations begin, a joint meeting of the Construction Team, grouting crew and the Engineer will be conducted. At the meeting the grouting operation plan, required testing, corrective procedures and any other relevant issues will be discussed.

11.3 Grout Inlets and Outlets: Ensure the connections from the grout pump hose to inlets are free of dirt and are air- tight. Inspect valves to be sure that they can be opened and closed properly.

- 11.4 Supplies:** Before grouting operations start, provide an adequate supply of water and compressed air for clearing and testing the ducts, mixing, and pumping the grout. Where water is not supplied through the public water supply system, a water storage tank of sufficient capacity shall be provided.

11.5 Equipment:

11.5.1 General: Provide grouting equipment consisting of measuring devices for water, a high-speed shear colloidal mixer, a storage hopper (holding reservoir) and a pump with all the necessary connecting hoses, valves, and pressure gauge. Provide pumping equipment with sufficient capacity to ensure that the post-tensioning ducts to be grouted can be filled and vented without interruption at the required rate of injection in not more than 30 minutes. The equipment shall be able to pump mix grout in a manner which will comply with all the provisions specified herein. Provide an air compressor and hoses with sufficient output to perform the required functions. Provide vacuum grouting equipment (volumetric measuring type) and experienced operators within 48 hours notice.

11.5.2 Mixer and Storage Hopper: Provide a high speed shear colloidal mixer capable of continuous mechanical mixing producing a homogeneous and stable grout free of lumps and un-dispersed cement. The colloidal grout machinery will have a charging tank for blending and a holding tank. The blending tank shall be equipped with a high shear colloidal mixer. The holding tank shall be kept agitated and at least partially full at all times during the pumping operation to prevent air from being drawn into the post-tensioning duct.

Accessory equipment which will provide for accurate solid and liquid measures shall be provided to batch all materials. Add water during the initial mixing by use of a flow meter or calibrated water reservoir with a measuring accuracy equal to one percent of the total water volume.

11.5.3 Grout Pumping Equipment: Provide pumping equipment capable of continuous operation which will include a system for circulating the grout when actual grouting is not in progress. The equipment will be capable of maintaining pressure on completely grouted ducts and will be fitted with a valve that can be closed off without loss of pressure in the duct.

Grout pumps shall be positive displacement type, shall provide a continuous flow of grout, and shall be able to produce an outlet pressure of at least 145 psi. Pumps shall have seals adequate to prevent oil, air or other foreign substances from entering into the grout and to prevent loss of grout or water. The capacity will be such that an optimal rate of grouting can be achieved.

A pressure gauge having a full scale reading of no more than 300 psi shall be placed at some point in the grout line between the pumping outlet and the duct inlet. If long hoses (in excess of 100 ft) are used, place two gauges, one at the pump and one at the inlet. The diameter and rated pressure capacity of the grout hoses shall be compatible with the pump output.

The grouting equipment shall contain a screen having clear opening of 1/8 inch maximum size to screen the grout prior to its introduction into the grout pump. If grout with an additive is used, a screen opening of 3/16 inch is satisfactory. This screen shall be easily accessible for inspection and cleaning. The grouting equipment shall utilize a gravity feed to the pump inlet from a hopper attached to and directly over it. The hopper must be kept at least partially full at all times during the pumping operation to prevent air from being drawn into the post-tensioning duct. Under normal conditions, the grout equipment shall be capable of continuously grouting the longest tendon on the project in not more than 20 minutes.

11.5.4 Vacuum Grouting Equipment: Provide vacuum grouting equipment meeting these minimum requirements:

- a. Volumeter for the measurement of void volume.
- b. Vacuum pump with a minimum capacity of 10 cfm and equipped with flow-meter capable of measuring amount of grout being injected.
- c. Manual colloidal mixers and/or dissolvers (manual high speed shear mixers) approved by the grout manufacturer, for voids less than 5.5 gal. in volume. Mix a minimum of one full bag of grout regardless of the size void to be grouted.
- d. Standard colloidal mixers, for voids 5.5 gal. and greater in volume.

11.6 Stand-by Equipment: During grouting operations, the Contractor shall provide a stand-by colloidal grout mixer and pump. Where water is not supplied through the public water supply system, a water storage tank of sufficient capacity must be provided.

Stand-by equipment shall be provided at no additional cost to the Department.

11.7 Field Trial Tests: Field trial batching and testing shall be performed with the same materials, personnel, and equipment used in production grouting. Field trial tests shall be conducted at least 1 week prior to initiation of production grouting.

11.7.1 Chloride Ion Content: Chloride ion content shall be independently tested on a trial batch to be shown it is below 0.03% by weight of the mixed grout.

All materials, including the water, shall be the same source as will be used for the production grouting.

One chloride ion concentration test shall be performed on the mixed grout per project at a minimum prior to start of grouting operations, with an additional test for each 40,000 lb. of dry weight material.

11.7.2 Grout Strength Test: Grout cube specimens shall be prepared and tested in accordance with ASTM C942 using molds compliant with ASTM C109. Minimum compressive strength shall be as specified in Section 4.1.7 (c) of this specification.

11.7.3 Volume Change Test: Volume change tests shall be performed in accordance with ASTM C1090. The vertical height change shall be within the limits specified in Section 4.1.7 (c) of this specification.

11.7.4 Pumpability and Fluidity Tests: Fluidity tests during field mockups are used to establish a target range of flow times that are preferable for the grout and particular conditions before pumping grout into the tendons. Fluidity tests shall be performed in accordance with ASTM C939 (modified). This modification is as follows: the flow cone shall be filled to the top instead of the standard level. The efflux time of grout, when thoroughly mixed, shall be measured as the time to fill a 1 liter (0.262 gal.) container, placed directly under the flow cone. A working time shall be measured after 30 minutes and then remixed for 30 seconds. This flow shall be within 10 second of the originally established flow. Efflux time shall be within the limits specified in Section 4.1.7 (c) of this specification.

11.7.5 Schupack Pressure Bleed Test: Perform test per ASTM C1741. Acceptable bleed values for Class C (packaged) grout is 0.0%

Vertical Rise, x (ft)	Gelman Pressure, psi	Max % Bleed (% of sample value)
$0 \leq x \leq 2$	20	4
$2 < x \leq 6$	30	2
$6 < x \leq 20$	50	0
$X > 20$	100	0

11.8 Mixing: The material shall be mixed in accordance with the manufacturer's recommendations. A metered amount of water shall be added to the mixer first, followed by pre-packaged grout and admixture, or as required by the admixture manufacturer. Mixing shall be of such duration as to obtain a uniform thoroughly blended, homogenous grout, without excessive temperature increase or loss of properties of the admixture. The grout shall be continuously agitated until it is pumped. Water shall not be added to increase flowability that has decreased by delayed use of the grout. Proportions of the materials shall be based on

manufacturer's recommendations. The water content shall be the minimum necessary for proper placement and shall not exceed the water-cement ratio of 0.45 or approximately 5 gal. of water per sack (95 lb.) of grout. The pumpability of the grout may be determined by the Engineer in accordance with ASTM C939 "Standard Test Method for Flow of Grout." When this method is used, the efflux time of the grout sample immediately after mixing should be within the limits specified in Section 4.1.7 (c) of this specification. The flow cone test may not be suitable for a grout that incorporates a thixotropic additive.

Reject all bags of grout that contain clumps.

The weight of the grout bags shall be verified prior to beginning grouting operations and monitored throughout. After initial approval of an average weight by the Engineer, grout bags may be monitored at the frequency of one bag per day of grouting operations. If irregularities are determined during the initial weighing or monitoring, the water content of the grout should be adjusted accordingly. If the weight of a grout bag varies by more than 1%, then weigh another bag from the same pallet. If that bag varies by more 1% then weigh every bag used in that day's production; if not, then reject that single bag and continue the operation.

11.9 Grout Production Tests: The testing of production grout shall be performed with the minimum number of tests as described in the following subsections.

11.9.1 Bleed Tests: A minimum of one bleed test shall be performed per project during field trial testing. Additional tests are required for each truck load of prepackaged grout. The sample of grout for the test is to be taken at the mixer after it is mixed with water.

11.9.2 Wet Density Tests: A wet density test shall be performed for the initial batch of grout and every 2 hours at the mixer, and at the last outlet of each tendon. The value shall be within the limits prescribed by the grout manufacturer.

11.9.3 Fluidity Tests: A minimum of two fluidity tests (flow cone) – one at the mixer and one at the duct outlet – shall be performed in accordance with ASTM C939 (modified) as described in previous sections of this specification. This testing shall be repeated every 2 hours of grouting operations. The efflux time shall be within 5 seconds of the values established during laboratory testing.

11.9.4 Chloride Ion Tests: A minimum of one chloride ion test shall be performed per project during field trial testing. Additional tests are required for each truck load of prepackaged grout. The sample of grout for the test is to be taken at the mixer, after it is mixed with water.

- 11.10 Preparation for Grouting:** Immediately prior to grouting, ducts shall be blown with oil-free compressed air to remove water and debris blockages that may interfere with the injection. All inlets and outlets shall be checked to ensure they are capable of accepting injection of the grout by blowing through the system with oil-free compressed air and proving each inlet and outlet in turn.
- 11.11 Grout Injection:** All grout vents and high point vent openings shall be open and drains closed when grouting starts. Injection and ejection vents shall be provided with positive shut-offs. Grout shall be injected from the tendon lowest point or lowest end of the tendon in an uphill direction. Grout shall be allowed to flow from the first vent after the injection vent until any residual water or entrapped air has been removed, at which time the vent shall be closed. Remaining vents shall be closed in sequence in the same manner.

A continuous, one-way flow of grout shall be maintained within a grouting stage and grouting of a tendon shall be performed in one operation. The grout shall be used within 30 minutes of the first addition of water to ensure the flowability of the grout.

The grout injection shall be performed at a rate between 16 ft and 49 ft of duct per minute. The grouting rate shall be slow enough to avoid air entrapment and segregation of the grout and ensure complete filling of the duct.

The pumping pressure at the injection vent shall not exceed 145 psi. Normal operations shall be performed at approximately 75 psi. If the actual grouting pressure exceeds the maximum allowed, the injection vent shall be closed and the grout shall be injected at the next vent which has been, or is ready to be, closed as long as a one-way flow is maintained. Grout shall not be injected into a succeeding vent from which grout has not yet flowed. If this procedure is used, then the vent which is to be used for injection shall be fitted with a positive shut-off. When one-way flow of grout cannot be maintained as outlined above, or when grouting is interrupted, the grouting must be stopped and continued immediately from the next available drain or outlet with adequate grout flow. Flushing of the PT system with water is not permitted.

Grout shall be pumped through the duct and continuously wasted at the ejection vent until no visible slugs of water or air are ejected. The outlet at the end of the tendon shall not be permanently closed until the wet density passes the previously established wet density range. To ensure that the tendon remains filled with grout, the ejection and injection vents shall be closed in sequence, respectively, under pressure when the tendon duct is completely filled with grout. If no leaks are present, bleed the pressure to 5 psi and wait a minimum of ten minutes for any entrapped air to flow to the high points. After the minimum ten minute period has expired, increase the pressure as needed and discharge grout at each high point outlet to eliminate any entrapped air or water. The ejection and injection vents shall

then be reclosed in sequence. The positive shut-offs at the injection and ejection vents shall not be removed or opened until the grout has set.

- 11.12 Temperature Restrictions:** Cold climate conditions shall be in effect whenever the ambient temperature is 40°F and falling; in these conditions mixing and protection measures shall be employed. In temperatures below 32°F, ducts shall be kept free of water to avoid damage due to freezing. When the ambient temperature may be expected to fall below 40 °F, accurate temperature records shall be kept covering maximum and minimum air temperatures and the temperatures of the concrete element containing ducts to be grouted. No materials in which frost or ice is present shall be used and ducts and equipment shall be kept completely free of frost and ice.

Grouting operations shall be postponed if frost is expected or ambient temperatures are anticipated to fall below 35°F within the next 48 hours. If grouting has been performed, the temperature of the grout and concrete shall be kept above 35°F for 3 consecutive days after grouting or until job-cured 2 in. cubes of grout reach a minimum compressive strength of 800 psi. All methods of heating or insulating shall be subject to the approval of the Engineer.

Grout shall not be above 90°F during mixing or pumping. If necessary, a thermal insulation or cooling circulation system may be installed or the grout may be batched using cold water.

- 11.13 Finishing:** Valves, caps and vent pipes shall not be removed or opened until the grout has set. The ends of steel vents shall be removed at least 1 in. below the concrete surface after the grout has set. Ends of plastic vents shall be removed to the surface of the concrete after the grout has set. All miscellaneous material used for sealing grout caps shall be removed prior to carrying out further work to protect end anchorages or filling in concrete anchorage blockouts and the like. Miscellaneous materials include paper, tie wire, etc.

- 11.14 Post-Grouting Operations and Inspection:** Do not remove or open inlets and outlets until the grout has cured for 24 to 48 hours. Remove all outlets located at anchorages and high points along the tendon to facilitate inspection and perform inspections within one hour after the removal of the inlet/outlet. Drill and inspect all inlets or outlets located at the anchorages. Depending on the geometry of the grout inlets, drilling may be required to penetrate to the inner steel surface of the trumpet or duct. Use drilling equipment that will automatically shut-off when steel is encountered. Unless grout caps are determined to have voids by sounding, do not drill into the cap. Perform inspections in the presence of the Engineer using borescopes or probes. If unsuitable grout is observed by the Engineer, the Contractor shall submit a repair procedure for approval by the Engineer. Within four hours of completion of the inspections or repairs, fill all duct and anchorage voids using the volumetric measuring vacuum grouting process. Seal and repair all anchorage and inlet/outlet voids that are produced by drilling for inspection purposes using repair methods approved by the Engineer. Remove inlets and outlets to a minimum depth of 1 inch below the surface of the concrete and permanently

seal and fill with epoxy flush to the concrete surface using procedures approved by the Engineer.

If tendon grouting operations were prematurely terminated prior to filling the tendon, drill into inlets, outlets, and/or drains to explore the voided areas with a borescope. Probing is not allowed. Determine the location and extent of all voided areas. Install grout inlets as necessary using a method approved by the Engineer and fill the voids using volumetric measuring vacuum grouting equipment.

Post-grouting inspection shall be performed for all tendons.

11.15 Grouting Report: Provide a grouting report signed by the contractor within 72 hours of each grouting operation for review by the Engineer.

Report the theoretical quantity of grout anticipated as compared to the actual quantity of grout used to fill the duct. Notify the Engineer immediately of shortages or overages.

Information to be noted in the records shall include but not necessarily be limited to the following: identification of the tendon; date grouted; number of days from tendon installation to grouting; type of grout; injection end and applied grouting pressure, ratio of actual to theoretical grout quantity; number of bags of grout mixed; total quantity of water used to mix the grout; summary of any problems encountered and corrective action taken.

12.0 PROTECTION OF END ANCHORAGES (POST-TENSIONING ENCASEMENT)

After tendons have been stressed, inspected, grouted, and approved, exposed end anchorages, strands and other metal accessories, and girder web and flange surfaces within the limits of the post-tensioning encasement shall be cleaned of rust, misplaced mortar, grout and other such materials. All cleaned surfaces shall be dried as part of the cleaning operation. Immediately following the cleaning operation, a heavy unbroken coating of an epoxy bonding compound shall be applied to all such metal surfaces. The cleaning of the girder surfaces and application of epoxy bonding compound to the girder surfaces shall be done in neat lines matching the final dimensions of the encasement. Epoxy bonding compound shall conform to AASHTO M 235, Type III. Within 24 hours following the cleaning and application of epoxy bonding compound, and within the recommended tack-time of the epoxy bonding compound application, encapsulate anchorage with post-tensioning encasement pour-back using an approved, high-strength, high-bond, low-shrinkage, sand-filled epoxy grout. Only non-chloride bearing non-shrink grout mixes shall be used for anchorage protection.

13.0 BASIS OF PAYMENT

- 13.1** Unless otherwise specified on the Plans, post-tensioning tendons will be paid for at the contract unit price for “Post-Tensioning Tendons” - lump sum, of steel tendon, complete and in place. Payment shall be full compensation for furnishing, installing, stressing and grouting all post-tensioning tendons. Payment shall also include anchorage assemblies and any other post-tensioning system hardware required to complete the work, grout and grouting, all testing, and all labor, materials, tools, equipment and incidentals necessary for completing the work in accordance with these specifications and the Plans. This payment shall also include Engineer-approved lubricants in the tendon ducts for friction control and flushing the lubricant from the tendon ducts after stressing.

Post Tensioning Tendons

Lump Sum

- 13.2** Payment for “Post-Tensioning Encasement” shall be full compensation for all labor, materials, tools and equipment necessary for the work listed in the section “Protection of End Anchorages (Post-Tensioning Encasement). Payment will be made under:

Post-Tensioning Encasement

Lump Sum

6000 PSI CONCRETE**(SPECIAL)**

6000 PSI concrete shall be in accordance with the Sections 1000 and 1078 of the Standard Specifications.

Payment will be made under:

6000 PSI Concrete

Cu. Yds.

BRIDGE JOINT DEMOLITION**(SPECIAL)****DESCRIPTION**

This special provision addresses the removal of existing joint material and adjacent concrete headers to facilitate the installation of new elastomeric concrete headers and bridge joint seals at the locations noted in the contract plans.

EQUIPMENT

Use the following surface preparation equipment:

- (A) Sawing equipment capable of sawing concrete to a specified depth.
- (B) Power driven hand tools for removal of concrete are required that meet the following requirements:
- (C) Pneumatic hammers weighing a nominal 15 lbs. (7 kg) or less
- (D) Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width.
- (E) Hand tools such as hammers and chisels for removal of final particles of concrete.

REMOVAL AND PREPARATION

Prior to any construction, take the necessary precautions to ensure debris from joint construction is not allowed to fall below the bridge deck.

Remove existing joint material by methods approved by the Engineer. Provide a 1" deep saw cut around the perimeter of areas noted for bridge deck removal.

Remove by chipping with hand tools elastomeric concrete headers adjacent to the joint to the limits shown on the contract plans. Use a small chipping hammer (15 lb. class) to prepare the edges of the repair area to limit micro fractures. In addition, all loose and unsound concrete shall be removed.

In overhangs, removing concrete areas greater than 0.60 ft²/ft length of bridge will require overhang support. Submit the overhang support method to the Engineer for approval.

Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel. Dispose of the removed concrete.

If the condition of the concrete is such that deep spalls or sheer faces result, notify the Engineer for the proper course of action.

Clean, repair or replace rusted or loose reinforcing steel. Thoroughly clean the newly exposed surface to be free of all grease, oil, curing compounds, acids, dirt, or loose debris.

MEASUREMENT AND PAYMENT

Bridge Joint Demolition will be measured and paid for at the contract unit price bid per square foot and will be full compensation for removal, containment and disposal of existing joint material and concrete and shall include the cost of labor, tools, equipment and incidentals necessary to complete the work.

Pay Item

Bridge Joint Demolition

Pay Unit

Square Feet

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 3-21-17)

Z-1a

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, DEQ 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 *2018 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 restricted waters, wetlands or buffer zones, provided that activities outside those areas is done in such a manner as to not affect the restricted waters, wetlands or buffer zones.



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

August 3, 2022

MEMORANDUM TO: Mr. Pat Ivey, P.E.
Division 9 Engineer

FROM: *mat* for Philip S. Harris, III, P.E., Manager
Environmental Analysis Unit

SUBJECT: Environmental Permits for the Winston-Salem Northern Beltway in
Forsyth County, Division 9, **TIP U-2579AA**.

Please find enclosed the following permits for this project:

Agency	Permit Type	Permit Expiration
US Army Corps of Engineers Section 404 Clean Water Act Permit	Individual Permit, dated 7/29/2022 <i>Replaces previous January 22, 2018 Preliminary Approval for this [AA] Section</i>	Dec. 31, 2028
NC Division of Water Resources Section 401 Water Quality Certification	Individual Cert. No. 4131, dated 1/10/2022 <i>Previous Certifications remain applicable except where superseded by this modification</i> Original Water Quality Certification, dated November 14, 2017 for R-2247 B Phase 2, CA, CB, CD, D, EA, EB, and EC, U-2579 C Phase 2, D, E, and F, and U-2579 AA and AB and subsequently modified Revision 2 dated December 21, 2017; Revision 3 dated February 7, 2019; Revision 4 dated August 13, 2019; Revision 5 dated November 14, 2019; Revision 6, dated November 30, 2020; In-Field Modification dated January 14, 2021; and, Revision 7 dated February 9, 2021	Dec. 31, 2028

Please feel free to contact our Unit for any questions.

ec:

NCDOT Permit Website (<https://xfer.services.ncdot.gov/pdea/PermIssued/>)

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL ANALYSIS UNIT
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

Telephone: (919) 707-6000
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Website: www.ncdot.gov

Location:
1000 BIRCH RIDGE DRIVE
RALEIGH NC 27610



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

**Original Phased
404 Permit**

January 22, 2018

Regulatory Division

Action ID: SAW-2017-02112

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:

In accordance with the written request of 2 October 2017, and the ensuing administrative record, enclosed is a Department of the Army (DA) Permit to construct a 34.5 mile long portion of new location roadway known as the Winston-Salem Northern Beltway, TIPs R-2247 (Western Section), U-2579 (Eastern Section), and U-2579A (Eastern Section Extension), in Forsyth County.

Any deviation in the authorized work will likely require modification of this permit. If a change in the authorized work is necessary, you should promptly submit revised plans to the Corps showing the proposed changes. You may not undertake the proposed changes until the Corps notified you that your permit has been modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant general conditions require that:


- a. You must complete construction before December 31, 2028.
- b. You must notify this office in advance as to when you intend to commence and complete work.
- c. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

You should address all questions regarding this authorization to Mr. James Lastinger in the Raleigh Regulatory Field Office, telephone number (919) 554-4884 ext. 32.

-2-

Thank you in advance for completing our Customer Survey Form. This can be accomplished by visiting our web-site at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0 and completing the survey on-line. We value your comments and appreciate your taking the time to complete a survey each time you interact with our office.

Sincerely,


for / Robert J. Clark
Colonel, U.S. Army
District Commander

Enclosures

Copy Furnished (with enclosures):

Chief, Source Data Unit
NOAA/National Ocean Service
Attn: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, Maryland 20910-3282

Copies Furnished with special conditions and plans:

Mr. Pete Benjamin
U.S. Fish and Wildlife Service
Raleigh Ecological Service Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Mr. Kenneth Riley, Ph.D.
Habitat Conservation Division
National Marine Fisheries Service Southeast Region
101 Pivers Island Road
Beaufort, North Carolina 28516

DEPARTMENT OF THE ARMY PERMIT

Permittee **NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**
ATTN: MR. PHILIP S. HARRIS III, P.E., C.P.M.

Permit No. **SAW-2017-02112**

Issuing Office **CESAW-RG-R**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The project involves construction of 34.5 mile long portion of new location roadway known as the Winston-Salem Northern Beltway in Forsyth County, TIPS R-2247 (Western Section), U-2579 (Eastern Section), and U-2579A (Eastern Section Extension). The project involves the permanent discharge of dredged or fill material into 59,395 linear feet of stream channel, and 9.41 acre of riparian wetlands.

Project Location: The project area is a new alignment linear transportation corridor from I-40 near the Town of Clemmons to US 311 North near the town of Walkertown and from I-40 Business to US 311 South around Winston-Salem, Forsyth County, North Carolina.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2028**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit,

Special Conditions:

SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

- ☐ Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
- ☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).
- ☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:


- a. You fail to comply with the terms and conditions of this permit.
- b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

- c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.


6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit, Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.


 (PERMITTEE) NC DEPARTMENT OF TRANSPORTATION
 ATTN: MR. PHILIP S. HARRIS III

01-22-2018
 (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.


 (DISTRICT COMMANDER) ROBERT J. CLARK, COLONEL

22 Jan 2018
 (DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

 (TRANSFeree)

 (DATE)

SPECIAL CONDITIONS
ACTION ID. SAW-2017-02112
NC DEPARTMENT OF TRANSPORTATION
WINSTON-SALEM NORTHERN BELTWAY
TIP NO.'S R-2247EC, R-2247CD AND U-2579C PHASE 2

Work Limits

1. CONSTRUCTION PLANS: All work authorized by this permit must be performed in strict compliance with the attached plans for U-2579C phase 2, R-2247EC, and R-2247CD, Wetland Surface Water Impacts Permit, dated October 2, 2017, Any modification to these plans must be approved by the US Army Corps of Engineers (Corps) prior to implementation.
2. PHASED PERMIT: This permit only authorizes work on Sections U-2579C phase 2, R-2247EC, and R-2247CD. Construction on any other phase of the Winston-Salem Northern Beltway shall not commence until final design has been completed for those sections, 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 USACE.
3. UNAUTHORIZED DREDGE OR FILL: Except as authorized by this permit or any Corps approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with this project.
4. MAINTAIN CIRCULATION AND FLOW OF WATERS: Except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within waters or wetlands or to reduce the reach of waters or wetlands.
5. DEVIATION FROM PERMITTED PLANS: The permittee shall ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers, Mr. James Lastinger of the Raleigh Regulatory Field Office prior to any active construction in waters or wetlands.
6. PRECONSTRUCTION MEETING: The Permittee shall schedule an onsite preconstruction meeting between its representatives, the contractor's representatives and the appropriate Corps of Engineers Project Manager prior to undertaking any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all terms and conditions contained within the Department of the Army permit. The Permittee shall notify the Corps of Engineers Project Manager a minimum of thirty (30) days

SPECIAL CONDITIONS
ACTION ID. SAW-2017-02112
NC DEPARTMENT OF TRANSPORTATION
WINSTON-SALEM NORTHERN BELTWAY
TIP NO.'S R-2247EC, R-2247CD AND U-2579C PHASE 2

in advance of the scheduled meeting in order to provide that individual with ample opportunity to schedule and participate in the required meeting.

7. BORROW AND WASTE: To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall provide the Corps with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the permittee has that information. The permittee will coordinate with the Corps before approving any borrow or waste sites that are within 400 feet of any streams or wetlands.

Related Laws

8. WATER CONTAMINATION: All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Quality at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

9. The North Carolina Division of Environmental Quality (DEQ) permit/certification number 4131 was issued for this project on December 21, 2017. Special conditions were issued associated with this water quality permit/certification and a copy of these conditions is attached as Exhibit A. These referenced conditions are hereby incorporated as special conditions of this permit.

Project Maintenance

10. NOTIFICATION OF CONSTRUCTION COMMENCEMENT AND COMPLETION: The permittee shall advise the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

11. PERMIT DISTRIBUTION: The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, shall be available at the project site during construction and maintenance of this project.

12. PERMIT REVOCATION: The permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

SPECIAL CONDITIONS
ACTION ID. SAW-2017-02112
NC DEPARTMENT OF TRANSPORTATION
WINSTON-SALEM NORTHERN BELTWAY
TIP NO.'S R-2247EC, R-2247CD AND U-2579C PHASE 2

13. CLEAN FILL: Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act.

14. SILT-FENCING: The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Fescue will not be planted within wetland areas.

15. EROSION CONTROL MEASURES IN JURISDICTIONAL WATERS:

A. During the clearing phase of the project, heavy equipment must not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

B. No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the plan drawings and specifically authorized by this permit.

C. The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

16. PROHIBITION ON CONCRETE: The permittee shall take measures to prevent live or fresh concrete, including bags of uncured concrete, from coming into contact with any water in or entering into waters of the United States. Water inside coffer dams or casings that has been in contact with concrete shall only be returned to waters of the United States when it no longer poses a threat to aquatic organisms (i.e. concrete is set and cured).

17. INSTALLATION OF CULVERTS: Unless otherwise requested in the applicant's application and depicted on the approved work plans, culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert must be placed at a depth below the natural

SPECIAL CONDITIONS
ACTION ID. SAW-2017-02112
NC DEPARTMENT OF TRANSPORTATION
WINSTON-SALEM NORTHERN BELTWAY
TIP NO.'S R-2247EC, R-2247CD AND U-2579C PHASE 2

stream bottom to provide for passage during drought or low flow conditions. Destabilizing the channel and head cutting upstream should be considered in the placement of the culvert. The following pipes are exempt from this condition:

R-2247CD			
Pipe Location	Size & Material	Impact Site	Pipe Invert Burial Depth (feet)
-Y17- 54+96	48" WSP	4, 5	0.0
-DW1- 15+46	54" RCP	5	0.0
-Y17- 63+32	60" WSP	7	0.0
R-2247EC			
Pipe Location	Size & Material	Impact Site	Pipe Invert Burial Depth (feet)
-L- 108+08	48" WSP	1	0.0
-Y1- 26+19	60" RCP	2	0.0
-L- 111+69	66" WSP	3	0.0
-Y62LPA- INT 13+91	42" RCP/WSP	4, 6	0.0
-Y62RPB- INT 19+95	42" RCP	6	0.0
-L- 141+03	42" WSP	7	0.0

18. AQUATIC PASSAGE: Measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening should be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

ESA

19. THREATENED AND ENDANGERED SPECIES: All necessary precautions and measures will be implemented so that any activity will not kill, injure, capture, harass, or otherwise harm any protected federally listed species. While accomplishing the authorized work, if the permittee discovers or observes a damaged or hurt listed endangered or threatened species, the District Engineer will be immediately notified to initiate the required Federal coordination.

SPECIAL CONDITIONS
ACTION ID. SAW-2017-02112
NC DEPARTMENT OF TRANSPORTATION
WINSTON-SALEM NORTHERN BELTWAY
TIP NO.'S R-2247EC, R-2247CD AND U-2579C PHASE 2

Section 103

20. CULTURAL RESOURCES: The Permittee shall fully implement the Memorandum of Agreement between the Permittee, the North Carolina State Historic Preservation Officer, and the Federal Highway Administration, dated March 15, 2006, which is incorporated herein by reference. (See Exhibit B)

21. UNKNOWN CULTURAL RESOURCES: While accomplishing the authorized work, if the permittee discovers any previously unknown cultural resources, the District Engineer will be immediately notified so that required coordination can be initiated with the North Carolina Division of Cultural Resources.

Enforcement

22. REPORTING ADDRESS: All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Raleigh Regulatory Field Office, c/o Mr. James Lastinger, 3331 Heritage Trade Drive, Suite 105, Wake Forest, North Carolina 27587, and by telephone at: 919-554-4884, extension 32. The Permittee shall reference the following permit number, SAW-2017-02112, on all submittals.

23. REPORTING VIOLATIONS OF THE CLEAN WATER ACT AND RIVERS AND HARBORS ACT: Violation of these conditions or violation of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act must be reported in writing to the Wilmington District U.S. Army Corps of Engineers within 24 hours of the permittee's discovery of the violation.

24. COMPLIANCE INSPECTION: A representative of the Corps of Engineers will periodically and randomly inspect the work for compliance with these conditions. Deviations from these procedures may result in an administrative financial penalty and/or directive to cease work until the problem is resolved to the satisfaction of the Corps.

Compensatory Mitigation

25. 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. (See Exhibit C)



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

404 Phased
Modification

July 29, 2022

Regulatory Division

Action ID. SAW-2017-02112

NC DOT TIP No.: U-2579AA and U-2579AB

Philip S. Harris III, P.E., C.P.M.
Environmental Analysis Unit Head
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Reference the Department of the Army (DA) phased permit issued on January 22, 2018, and subsequent modifications dated March 4, 2019, August 13, 2019, January 29, 2020, December 9, 2020, and February 10, 2021, for the impacts associated with the new location project (TIPs R-2247 and U-2579), the Winston-Salem Beltway, in Forsyth County, North Carolina. Reference is also made to your Section U-2579 AB and AA permit modification request dated November 3, 2021. This modification requests the following:

1) To revise the previously permitted U-2579AB section (USACE 404 Permit Modification for U-2579AB dated February 10, 2021; NCDWR 401 WQC Revision 7, dated February 9, 2021) with impacts associated with the inclusion of the construction of a noise wall, and

2) To provide final design and impact calculations for the Winston-Salem Northern Beltway (Eastern Section of Future I-74), from US 311 to I-40 (U-2579AA). This U-2579AA section was in preliminary design phase when the original permit application was submitted on October 2, 2017.

Impacts associated with the modifications are as follows:

U-2579AB—sites added					
Permit Site	Waters ID	Permanent Impact	Temporary Impact	Mechanized Clearing Impact	Impacts requiring mitigation

14B	ESE-W36 (wetland)	0.01 ac	0 acre	0.02 acre	0.02 acre
31	ESE-S48 (tributary)	15 lf	10 lf	NA	15 lf

U-2579AA —Changes from Preliminary to Final Design			
	Wetland Impacts	Stream Impacts	Open Water
<u>Preliminary Plans</u> (permitted January 22, 2018)	1.43 acre	3,019 lf	0 acres
<u>Final Plans</u> (with Mod)	1.56 acre	3,044 lf	3.04 acres

The Corps has completed the evaluation of your request and has determined that it is appropriate and reasonable, and a public notice is not required for this modification. Furthermore, we have determined the proposed project modifications described above are not contrary to the public interest and are consistent with the 404(b)(1) Guidelines and therefore, the DA permit is hereby modified with the additional Special Condition detailed below.

Additional Special Condition(s):

1. All work authorized by this permit modification shall be performed in strict compliance with the plans submitted with the November 3rd, 2021, modification request (TIP U-2579 Permit Drawings Sheets 1-79 and TIP U-2579AA Permit Drawing Sheets 1-32). These plans are now considered a part of this permit. The Permittee shall ensure that the construction design plans for this project do not deviate from these permit plans. Any modification to the submitted permit plans must be approved by the US Army Corps of Engineers prior to any active construction in waters or wetlands.

All other conditions of the original permit and previous modifications remain applicable, and the expiration date is unchanged. No additional compensatory mitigation is required for this specific request.

This approved modification should be attached to the original permit and will be utilized for future compliance reviews of the project. If you have questions, please contact Andy Williams of the Wilmington District Regulatory Division, at telephone (919) 554-4884.

FOR THE DISTRICT COMMANDER

*Monte
Matthews*

Date: 2022.07.29

14:59:34 -04'00'

Monte Matthews
Lead Project Manager
Wilmington District

cc. electronic

Amy Chapman, NCDEQ
Dave Wanucha, NCDEQ

Original Phased
401 Certification

EXHIBIT A

Environmental
QualityROY COOPER
GovernorMICHAEL S. REGAN
SecretaryLINDA CULPEPPER
Interim Director

December 21, 2017

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: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with
ADDITIONAL CONDITIONS for Proposed Winston Salem Northern Beltway from I-40 to US 52 (TIP
Nos. R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC); and from US 52 to US 311 north (U-2579C
Phase 2, D, E, and F); and, from I-40 Business to US 311 South (U-2579AA, and AB) in Forsyth County.
State Project Nos. 6.628001T and 8.2625101. NCDWR Project No. 19980260 v2. Revision 2.

Dear Mr. Harris:

Attached hereto is a copy of Certification No. WQC004131 issued to The North Carolina Department of
Transportation (NCDOT) dated December 21, 2017.

*The original Certification dated November 14, 2017 was revised (Revision 1) to include Table 7. Revision 1 was
signed and dated November 27, 2017.*

*This hereto is a revision to the November 27, 2017 Certification. This revision clarifies Condition No. 4 of
Condition(s) of Certification below with respect to culvert burial at Sites 2 and 3A of U-2579C Phase 2; adds a
General Condition 1 relative to culvert burial practices; clarifies the type of permanent impacts at Sites 4 and 5 of
R-2247CD as footnoted in Table 3 below; designates mitigation requirements to Sites 4 and 5 in Table 3; and,
accounts for additional mitigation in Condition 1 of Condition(s) of Certification relative to Sites 4 and 5.*

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Linda Culpepper, Interim Director
Division of Water Resources

Attachments

Electronic copy only distribution:

James Lastinger, US Army Corps of Engineers, Raleigh Field Office
Amy Euliss, Division 9 Environmental Officer
Carla Dagnino, NC Department of Transportation
Bill Barret, NC Department of Transportation
Chris Militscher, US Environmental Protection Agency
Marella Buncick, US Fish and Wildlife Service
Marla Chambers, NC Wildlife Resources Commission
Beth Harmon, Division of Mitigation Services
File Copy

**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 1.03 acres of jurisdictional wetlands and 5,519 linear feet of jurisdictional streams in Forsyth County as summarized in Tables 1 through 6 below. This portion of the phased project shall be constructed pursuant to the application dated received October 2, 2017.

This certification also authorizes future wetland and stream impacts for other Sections as summarized in Table 7 below.

Table 1. Stream Impacts in the Yadkin Pee Dee River Basin (U-2579C Phase 2)

Site	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)
	Roadway Fill		Roadway Fill/Culvert	Bank Stabilization			
1	-	-	1,148	40	31	1,219	1,148
2	-	-	552	45	35	632	552
3A	-	-	914	33	55	1,002	914
4	-	-	405	-	40	445	405
5	390	-	-	-	-	390	-
Total	390	-	3,019	118	161	3,688	3,019

Total Stream Impacts for this Section: 3,688 linear feet

Table 2. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (U-2579C Phase 2)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	0.57	-	-	0.57	0.57
3B	0.02	0.01	0.01	0.04	0.04
3C	0.06	-	-	0.06	0.06
5	0.02	-	-	0.02	0.02
Total	0.66	0.01	0.01	0.68	0.68

Total Wetland Impacts for this Section 0.68 acres.

Table 3. Stream Impacts in the Yadkin Pee Dee River Basin (R-2247CD)

Site	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)
	Fill	Ditch	Channel Change/Fill	Bank Stabilization/RipRap			
2	-	75	-	-	7	82	-
4	-	-	56*	-	4	60	56
5	160	-	15*	72*	-	247	247
6	-	-	-	-	45	45	-
7	17	-	216	-	26	259	-
8	-	-	-	16	10	26	-
9	-	-	-	55	15	70	-
10	-	-	-	17	14	31	-
Total	177	75	287	160	121	820	303

**Note: Impacts at Sites 4 and 5 include riprap in the stream bed which will require mitigation.*

Total Stream Impacts for this Section: 820 linear feet

Table 4. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (R-2247CD)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	<0.01	-	<0.01	<0.01	<0.01
2	<0.01	<0.01	-	<0.01	<0.01
3	0.01	-	-	0.01	0.01
7	-	-	0.01	0.01	0.01
Total	0.02	<0.01	0.02	0.04	0.04

Total Wetland Impacts for this Section: 0.04 acres.

Table 5. Stream Impacts in the Yadkin Pee Dee River Basin (R-2247EC)

Site	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)
	Pipe	Channel Change		Channel Change	Bank Stabilization			
1	-	-	-	112	15	20	147	-
2	-	-	-	156	21	25	202	156
3	-	-	-	165	15	19	199	165
4	54	-	10	-	-	-	64	-
6	-	275	44	-	-	-	319	-
7	-	-	-	22	-	11	33	-
8	-	-	-	30	-	17	47	-
Total	54	275	54	485	51	92	1,011	321

Total Stream Impacts for this Section: 1,011 linear feet

Table 6. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (R-2247EC)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	<0.01	<0.01	<0.01	<0.01	<0.01
4	0.04	-	0.02	0.06	0.06
5	0.22	-	0.01	0.24	0.24
Total	0.26	<0.01	0.04	0.31	0.31

Total Wetland Impacts for this Section: 0.31 acres.

Table 7. Summary of Preliminary Stream and Wetland Impacts for Future Sections

Section	Stream Impacts (linear feet)	Wetland Impacts (acres)	Impacts Requiring Mitigation	
			Streams (linear feet)	Wetlands (acres)
U-2579AA	3,019	1.43	3,019	1.43
U-2579AB	10,351	1.50	10,351	1.50
U-2579D	5,043	0.08	5,043	0.08
U-2579E	4,864	0.99	4,864	0.99
U-2579F	2,544	0.24	2,544	0.24
R-2247EA	6,536	0.57	6,536	0.57
R-2247EB	6,593	0.09	6,593	0.09
R-2247B Phase 2	862	0.27	862	0.27
R-2247CA	3,056	0.71	3,056	0.71
R-2247CB	5,674	1.98	5,674	1.98
R-2247D	5,762	0.52	5,762	0.52
Total	54,304	8.38	54,304	8.38

Notes: Mitigation totals are estimates. Mitigation is not required for intermittent streams. Final mitigation requirements will be determined once permit is modified and preliminary impacts are finalized for other Sections.

The application provides adequate assurance that the discharge of fill material into the waters of the Yadkin Pee Dee 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 October 2, 2017. 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 300 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:

1. Compensatory mitigation for 3,643 linear feet of impacts to streams and 1.03 acres of wetlands is required for Sections R-2247EC, R-2247CD and U-2579C Phase 2. 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 September 29, 2017 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 July 28, 2010.
2. When final design plans are completed for other Sections (in Table 7) of this phased project, 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 or surface waters, other than those referenced above in Tables 1 through 6 for U-2579C Phase 2, R-2247 CD and R-2247EC, shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality from the NC Division of Water Resources. [15A NCAC 02H. 0506(b)]
3. As discussed in Merger and restated in the above reference permit application, NCDWR will not require burial of pipes/culverts in the streambed at impact sites for R-2247CD and EC. However, design and placement of culverts and other structures shall be constructed in such a manner that the original stream profiles are not altered (i.e., the depth of the channel must not be reduced by a widening of the streambed). Existing stream dimensions (including pattern and profile) are to be maintained above and below locations of each culvert. The structures shall be designed and installed to allow for fish and other wildlife movement as well as prevent headcutting of the stream. The applicant may be required to provide evidence that the equilibrium has been maintained if requested in writing by the NCDWR. [15A NCAC 02H.0506(b)(2)]
4. For U-2579C Phase 2, the inlet invert of the 60-inch pipe crossing at Site 2 will not be buried to prevent head cutting. However, the outlet will be buried one foot. At Site 3A, the culvert will be buried 0.75 feet. 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)]
5. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species. [15A NCAC 02H .0506(b)(2)]
6. Bridge demolition and construction must be accomplished in strict compliance with the most recent version of NCDOT's Best Management Practices for Construction and Maintenance Activities. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]
7. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]

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 down stream 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)]

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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 shall be clearly marked by highly visible fencing/flagging 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 (or appointee) 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 02H.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)]

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. Bill F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center

This the 21st day of December 2017

DIVISION OF WATER RESOURCES

Linda Culpepper for:
Linda Culpepper, Interim Director

WQC No. WQ004131

401 Phased
Modification

ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

S. DANIEL SMITH
Director



January 10, 2022

Mr. Philip S. Harris, III, P.E., CPM
Environment Analysis Unit Head
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598


Subject: Modification to the 401 Water Quality Certification (WQC 004131) Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS, for additional portions of the Winston Salem Northern Beltway (Eastern Section of Future I-74) from US 311 to I-40 of which includes Sections **U-2579AB** and **U-2579AA** (I-40 Business to US 311 South); Federal Aid Project No. NHF-0918(14); WBS No. 34839.1.7; NCDWR Project No. 19980260 version 8.

Dear Mr. Harris:

Attached hereto is a modification of Certification No. 004131 issued to The North Carolina Department of Transportation (NCDOT) originally issued and dated November 14, 2017 for the Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 North (U-2579C Phase 2, D, E, and F), and from I-40 Business to US 311 South (U-2579AA and AB); Revision 2 dated December 21, 2017; Revision 3 dated February 7, 2019; Revision 4 dated August 13, 2019; Revision 5 dated November 14, 2019; Revision 6, dated November 30, 2020; In-Field Modification dated January 14, 2021; and, Revision 7 dated February 9, 2021.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

DocuSigned by:

S. L. 9C9886312DCD474...
Division of Water Resources

Attachments

Electronic copy only distribution:

Andrew Williams, US Army Corps of Engineers, Raleigh Field Office
Amy Euliss, NC Department of Transportation, Division 9
Colin Mellor, NC Department of Transportation
Carla Dagnino, NC Department of Transportation
Bill Barrett, NC Department of Transportation
Amanetta Somerville, US Environmental Protection Agency
Janet Mizzi, US Fish and Wildlife Service
Andrea Leslie, NC Wildlife Resources Commission
Beth Harmon, Division of Mitigation Services
401- R4notices@epa.gov
File Copy



North Carolina Department of Environmental Quality | Division of Water Resources
512 North Salisbury Street | 1617 Mail Service Center | Raleigh, North Carolina 27699-1617
919.707.9000

**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 3,491 linear feet of jurisdictional streams, 1.64 acres of wetlands and 3.04 acres of open water (ponds) in Forsyth County (for U-2579AA and AB). The project shall be constructed pursuant to the modification dated November 3, 2021. The authorized impacts are as described in Tables 1 through 7 below:

Table 1. New (Modified) Wetland Impacts in the Yadkin Pee Dee River Basin; U-2579AB.

New Permit Site	Permanent Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Impacts Requiring Mitigation (ac)
14B	<0.01	-	0.02	0.02
Previously Permitted Totals (for all Sites)	1.11	0.02	0.29	1.43

Notes: Data are rounded.

Table 2. New (Modified) Intermittent Stream Impacts in the Yadkin Pee Dee River Basin; U-2579AB.

New Permit Site	Impact Type	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Impacts Requiring Mitigation (linear ft)
	Roadway Fill			
31		15	10	-
Previously Permitted Totals (for all Sites)		9,180	824	5,222

Table 3. Stream Impacts in the Yadkin Pee Dee River Basin - U-2579AA.

Permit Site	Stream Type	Impact Type	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Impacts Requiring Mitigation (linear ft)
1	I	42-inch RCP-V (not buried)	392	0	--
		Channel armoring	14	24	--
		Bank Stabilization	15	9	--
2C	P		16	20	--
3		2 @ 9’X 9’ RCBC	240	0	240
		Channel Change	124	0	124
		Bank Stabilization	26	20	26
3A		Bank stabilization (detour-ditch outlets)	20	40	20
3B		Bank Stabilization - (detour bridge)	35	18	35
4		2 @ 10’X 9’ RCBC	418	0	418
		Channel Change	85	0	85
		Bank Stabilization	80	0	80
4A		Bank Stabilization – (culvert phasing)	67	10	67

Table 3. Stream Impacts in the Yadkin Pee Dee River Basin - U-2579AA.

Permit Site	Stream Type	Impact Type	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Impacts Requiring Mitigation (linear ft)
5A	P	Scour Hole Stabilization (assoc. w/ 60” CMP removal)	42	40	42
5B		Scour Hole Stabilization (assoc. w/ 60” CMP removal)	8	10	8
5C		Bank Stabilization	236	17	236
5D			173	0	173
6	I	36-inch Welded Steel Pipe / channel armoring	57	0	--
		Bank Stabilization	68	20	--
7	P	72-inch Alt/Welded Steel Pipe	26	0	--
		Bank Stabilization	23	15	--
72-inch Alt/Welded Steel Pipe		11	0	--	
Bank Stabilization		35	10	--	
		60	20	--	
		9	22	--	
		8	10	--	
		8	10	--	
		10	10	--	
	12A	I	Channel armoring (for Energy Dissipator Basin)	33	0
12B	Channel change		80	10	--
13	60-inch Alt/Welded Steel Pipe		32	0	--
	Channel Armoring		31	25	--
14	P	3 @ 8’X 8’ RCBC Extension	150	0	150
		Bank Stabilization	97	20	97
14A	I	3’ Base Ditch	50	10	--
15	P	36-inch RCP - III	249	0	--
		Bank Stabilization	16	32	--
Totals			3,044	422	1,801

Notes: For stream types; I = Intermittent, P = Perennial.

Table 4. Wetland Impacts in the Yadkin Pee Dee River Basin - U-2579AA.

Permit Site	Permanent Fill Impacts (ac)	Excavation Impacts (ac)	Mechanized Clearing Impacts (ac)	Impacts Requiring Mitigation (ac)
5	<0.01	0	0.02	0.02
8	0.04	0.04	0.02	0.10
9	0	0	0.06	0.06
11	0	0	0.03	0.03
14B	0.38	0	0.05	0.43
15A	0.64	0.07	0.20	0.92
Totals	1.07	0.11	0.38	1.56

Notes: Data are rounded.

Table 5. Open Water Impact (Ponds) in the Yadkin PeeDee River Basin - U-2579AA.

Permit Site	Pond Size (ac)	Permanent Fill (ac)	Impacts Requiring Mitigation (ac)
2	0.50	0.50	-
2A	0.12	0.12	-
2B	2.31	2.31	-
6A	0.11	0.11	-
Totals	3.04	3.04	-

Table 6. Wetland Impacts in the Yadkin PeeDee from Utilities - U-2579AA.

Utility Site	Impact Type	Excavation (ac)	Impacts Requiring Mitigation (ac)
	Gravity Sewer Line (inch)		
Site 5	30	0.02	0.02
Site 16	16	< 0.01	< 0.01
Site 17	16	0.03	0.03
Site 18	30	< 0.01	< 0.01
Totals		0.06	0.06

Notes: Impacts for Sites 5 and 18 are outside of permanent fill at Wetland Site 5. Data are rounded.

Table 7. Permit Sites where culvert/pipe inverts are to be buried vs. not buried – U-2579AA.

Yes	3	4	--				
No	1	6	7	7A	13	14	15

The application provides adequate assurance that the discharge of fill material into the waters of the Yadkin PeeDee and Roanoke River Basins 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 modification application dated November 3, 2021. All the authorized activities and conditions associated with the original Water Quality Certification dated November 14, 2017 for the Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 North (U-2579C Phase 2, D, E, and F), and from I-40 Business to US 311 South (U-2579AA and AB) and subsequently modified (Revision 2 dated December 21, 2017; Revision 3 dated February 7, 2019; Revision 4 dated August 13, 2019; Revision 5 dated November 14, 2019; Revision 6, dated November 30, 2020; In-Field Modification dated January 14, 2021; and, Revision 7 dated February 9, 2021) still apply except where superseded by this certification.

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 300 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:

1. This modification is applicable only to the additional proposed activities and design that you submitted in your request for modification dated November 3, 2021. All the authorized activities and conditions

associated with the original Water Quality Certification dated November 14, 2017 for the Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 North (U-2579C Phase 2, D, E, and F), and from I-40 Business to US 311 South (U-2579AA and AB) and subsequently modified (Revision 2 dated December 21, 2017; Revision 3 dated February 7, 2019; Revision 4 dated August 13, 2019; Revision 5 dated November 14, 2019; Revision 6, dated November 30, 2020; In-Field Modification dated January 14, 2021; and, Revision 7 dated February 9, 2021) still apply [15A NCAC 02H.0506(b) (1, 2)].

2. 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. Table 7 above lists those permit sites where culvert/pipe burial is exempt from this condition or not. 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)]

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. Bill F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center

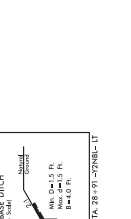
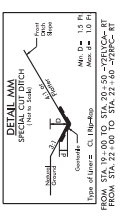
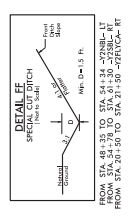
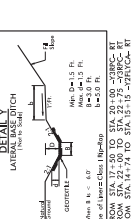
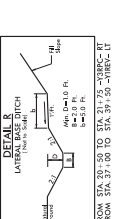
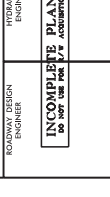
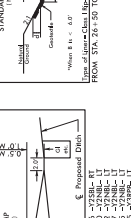
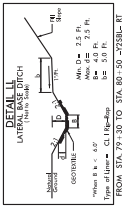
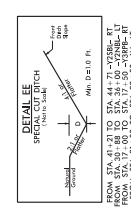
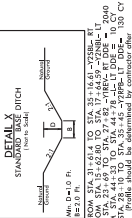
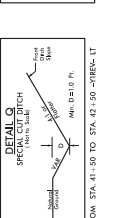
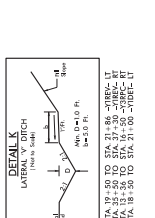
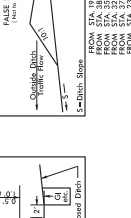
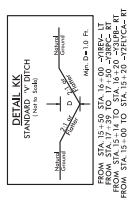
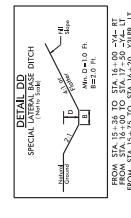
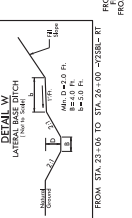
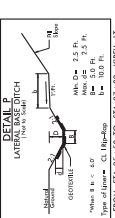
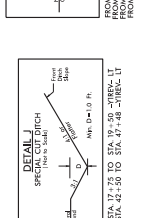
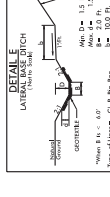
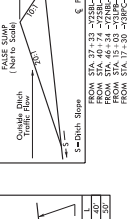
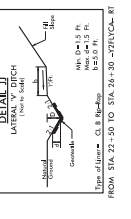
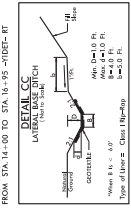
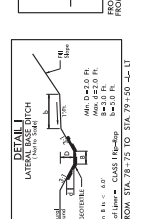
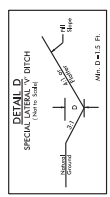
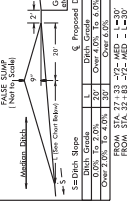
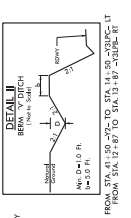
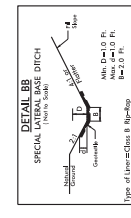
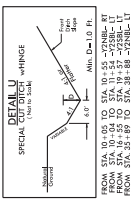
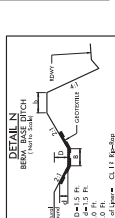
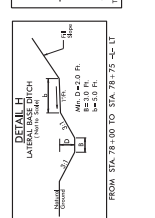
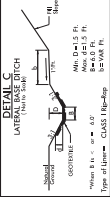
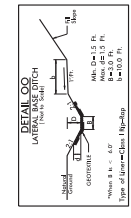
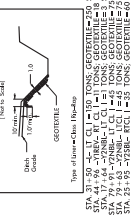
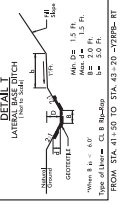
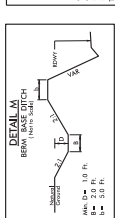
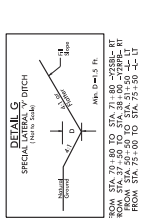
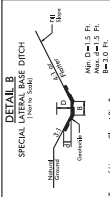
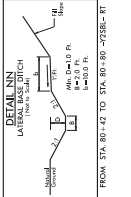
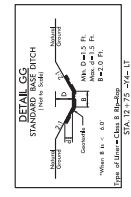
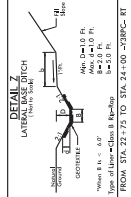
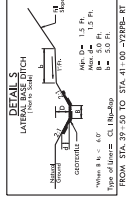
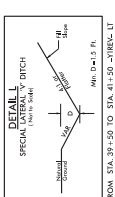
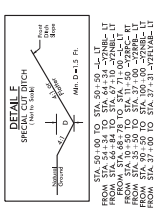
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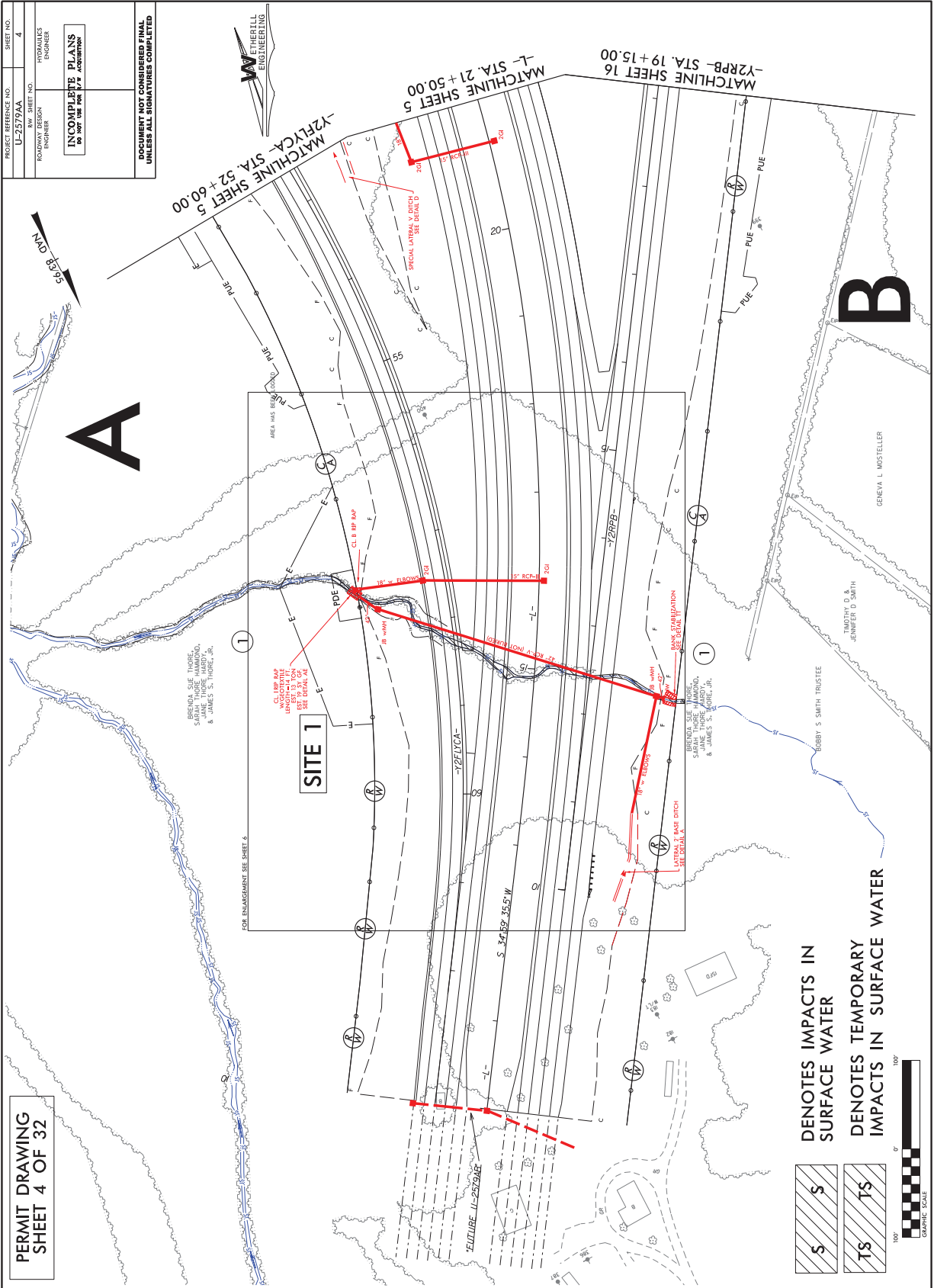
DIVISION OF WATER RESOURCES

DocuSigned by:

9C9886312DCD474...
S. Daniel Smith, Director

PROJECT REFERENCE NO.	SHEET NO.
RDW SHEET NO.	21-1
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PERMIT DRAWING
SHEET 2 OF 32

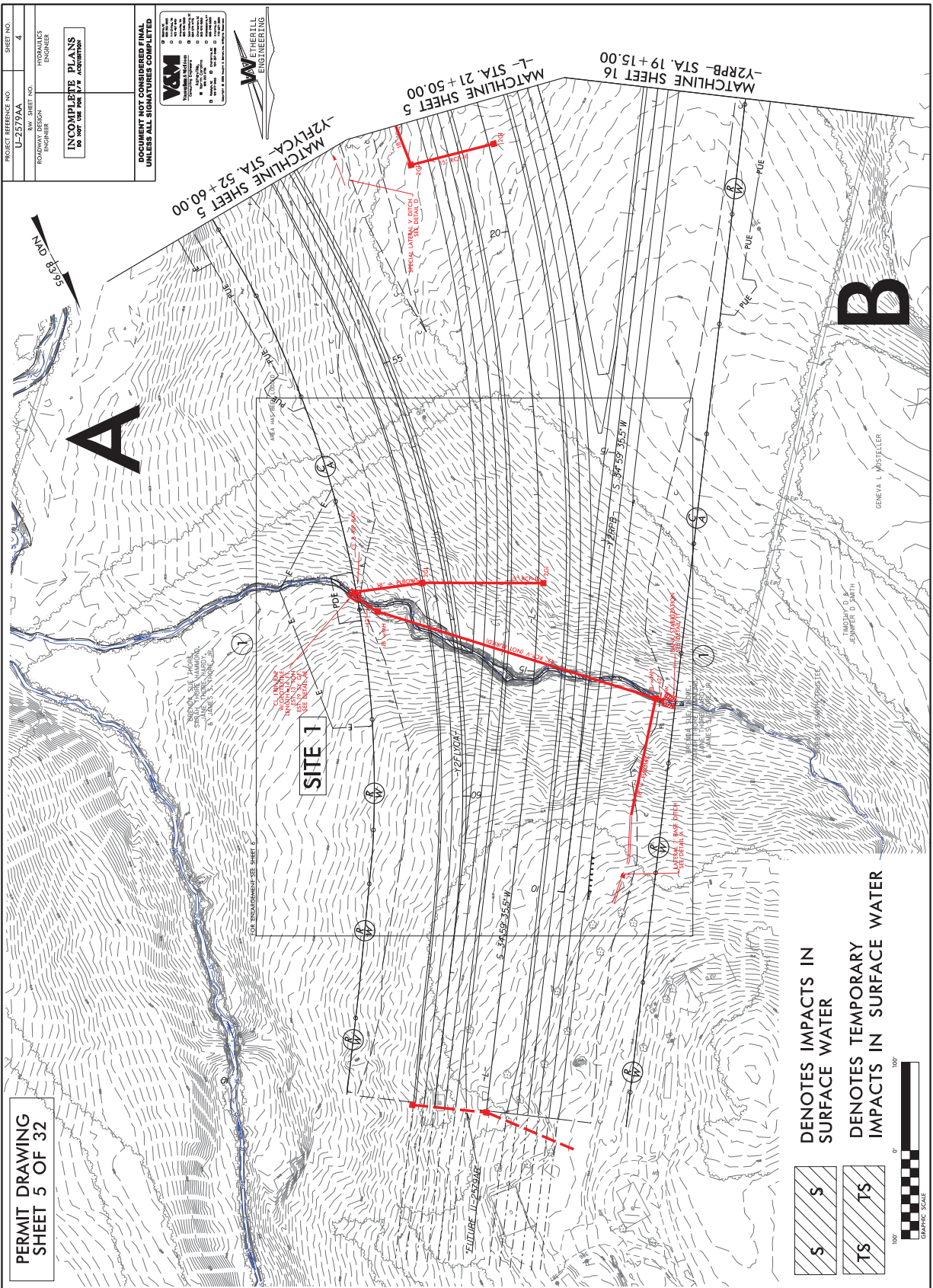


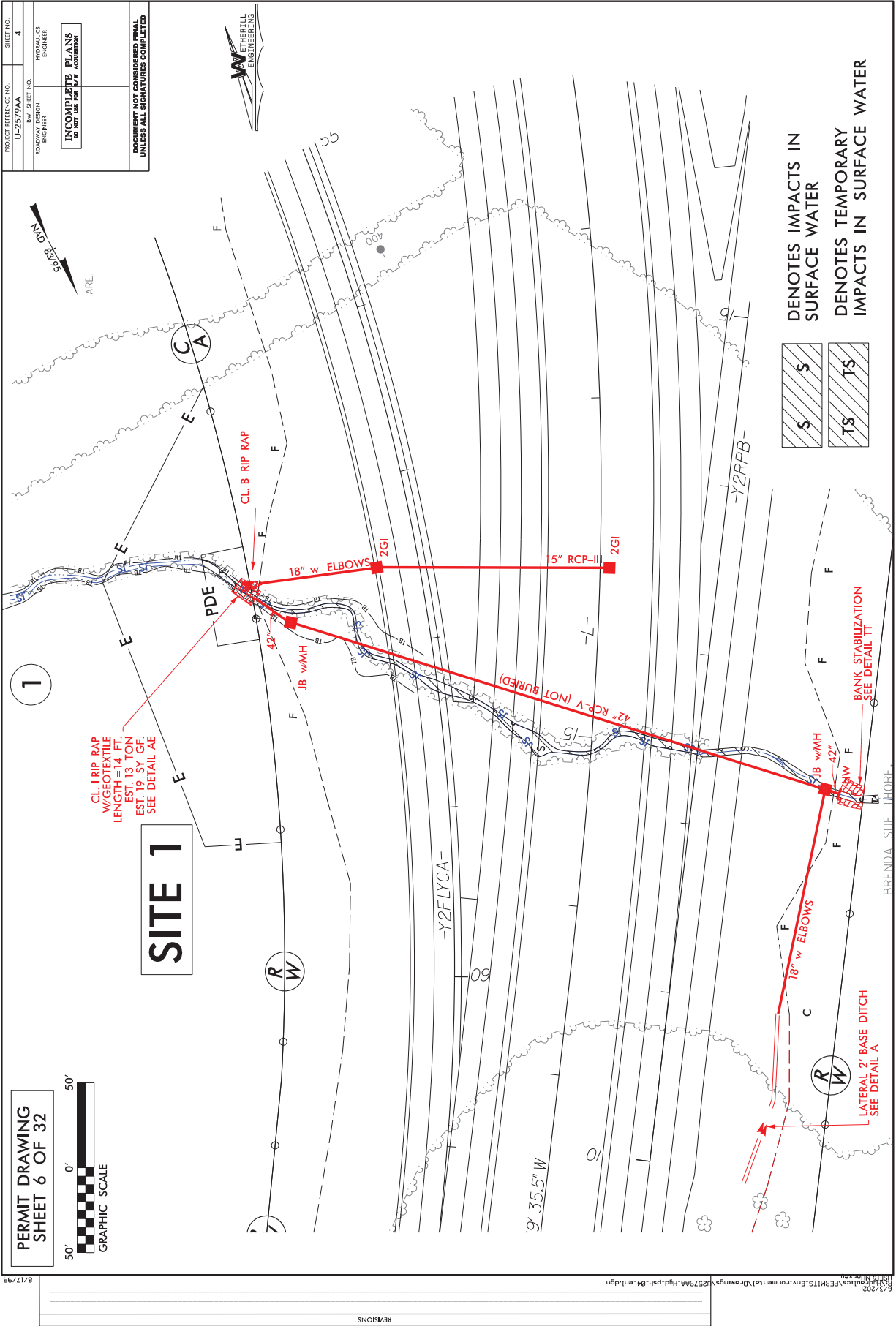


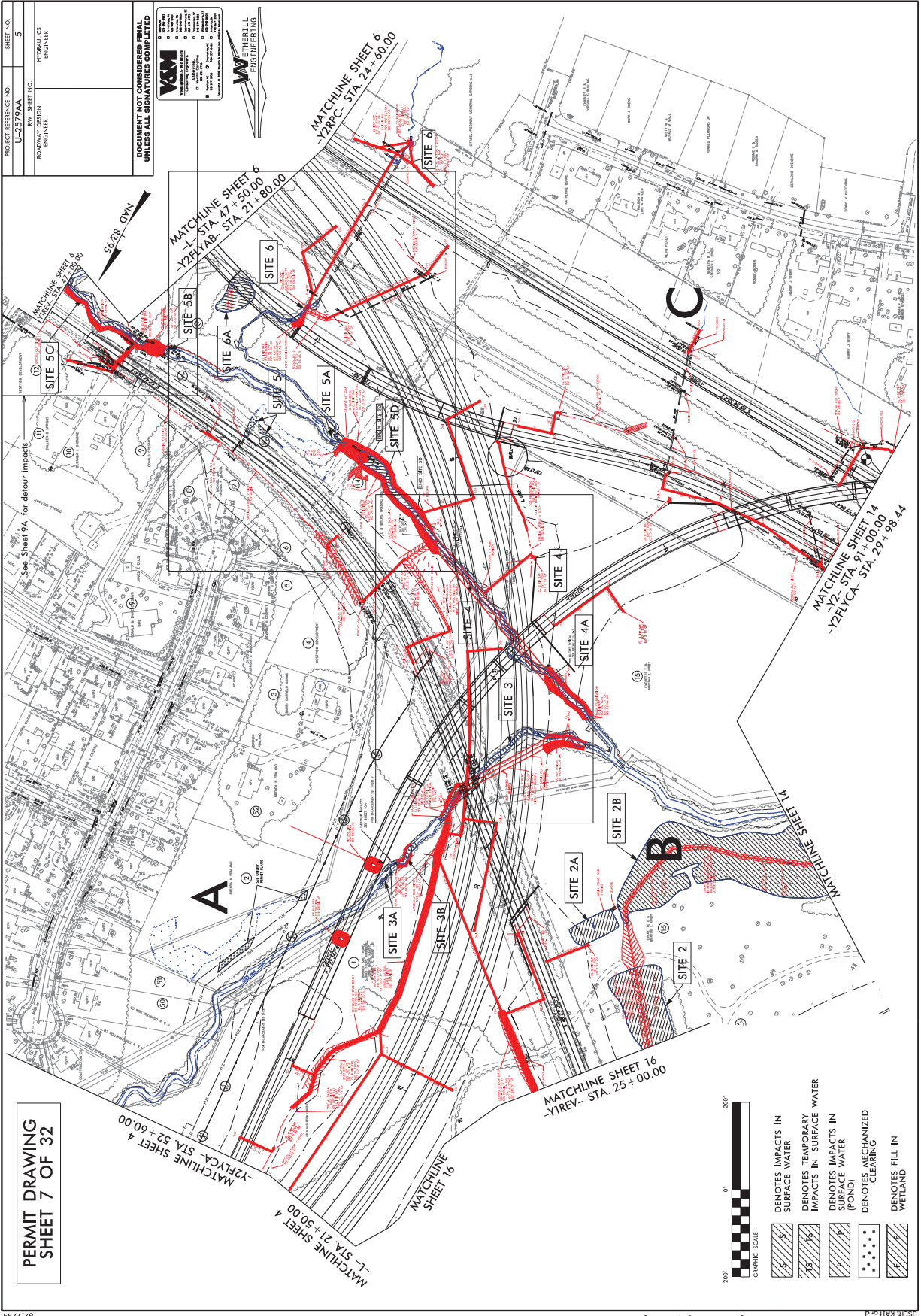
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SHEET 5 OF 32

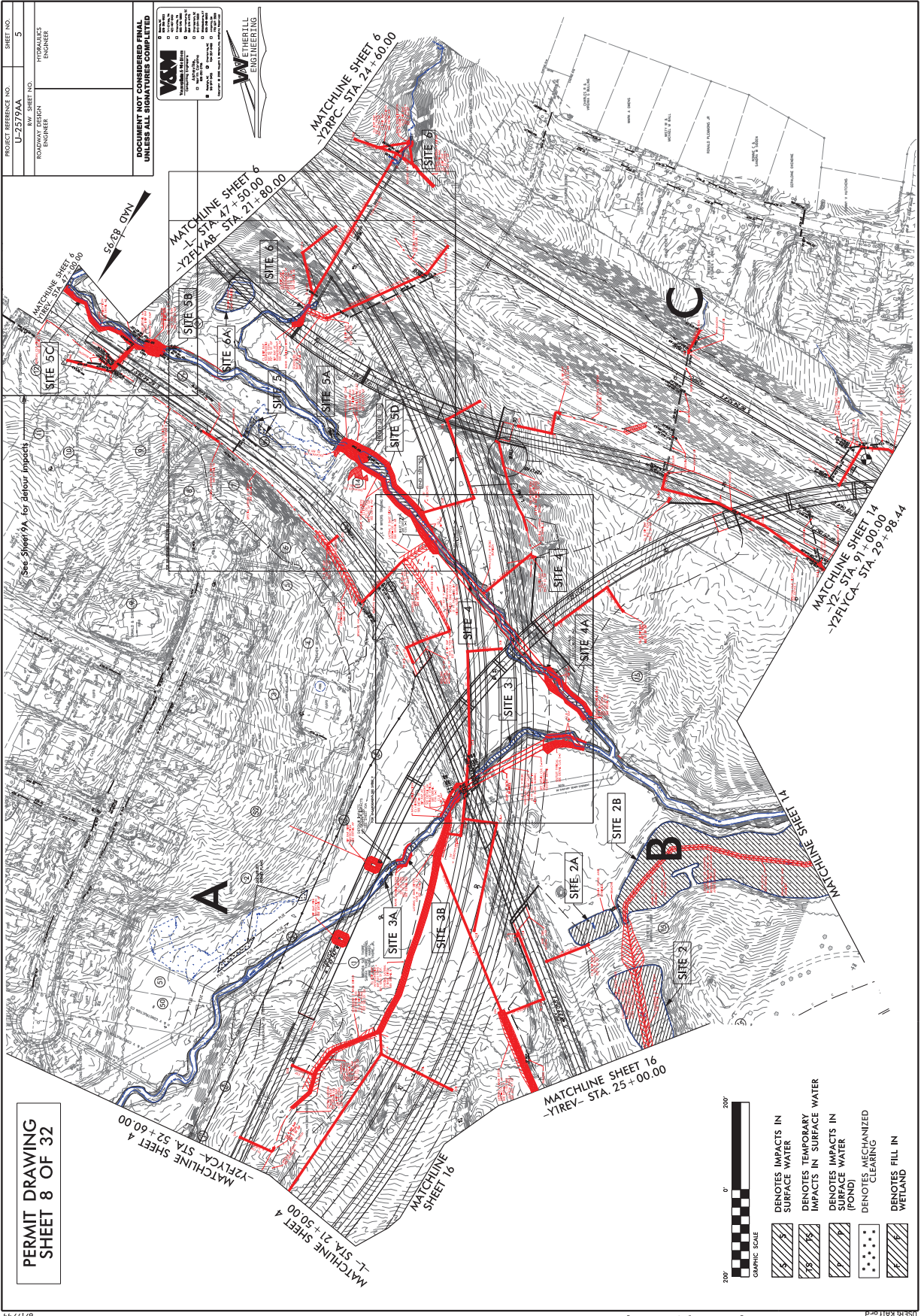
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U-3579AA	ROADWAY DESIGN ENGINEER	4
HYDRAULICS ENGINEER		
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		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

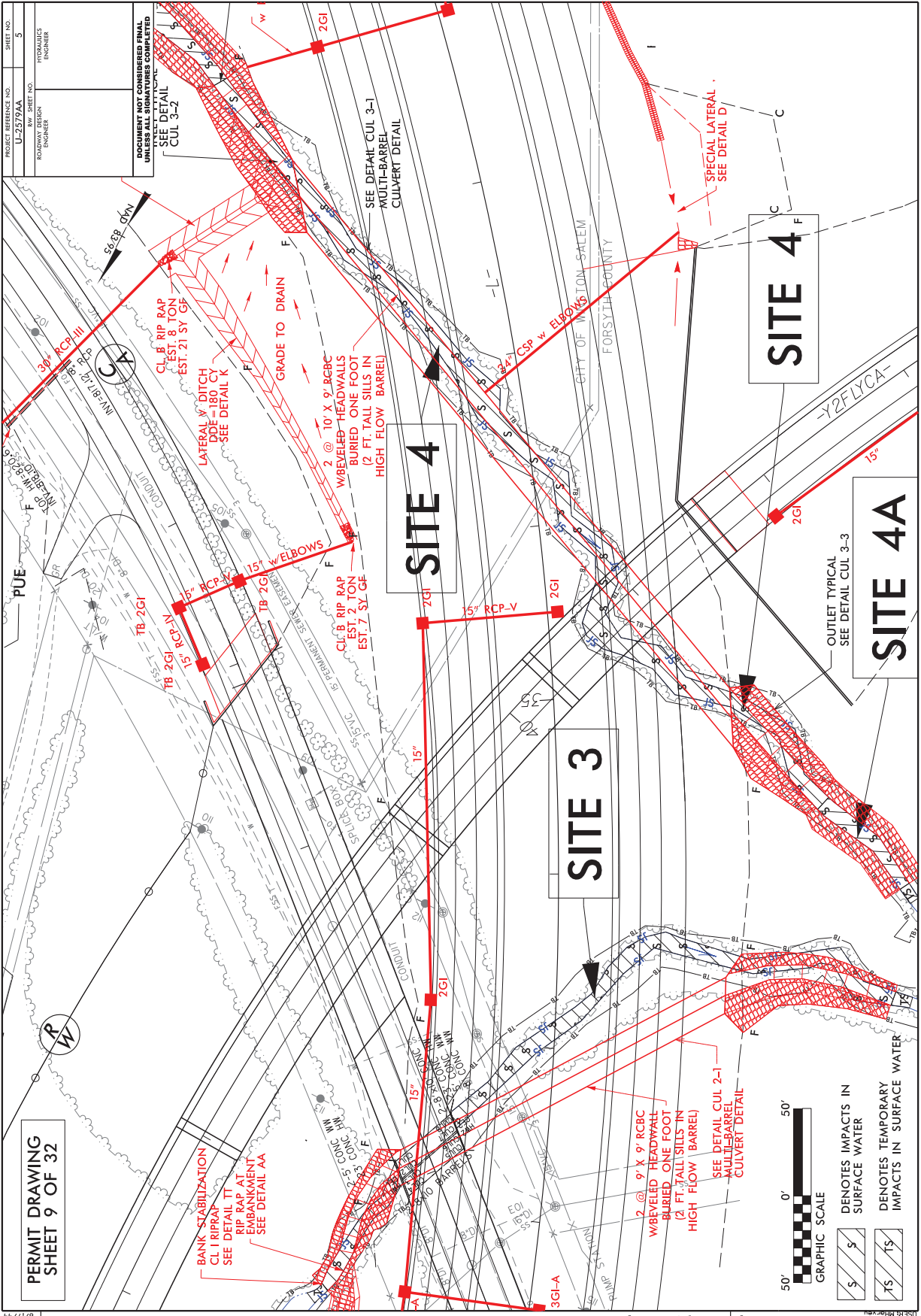
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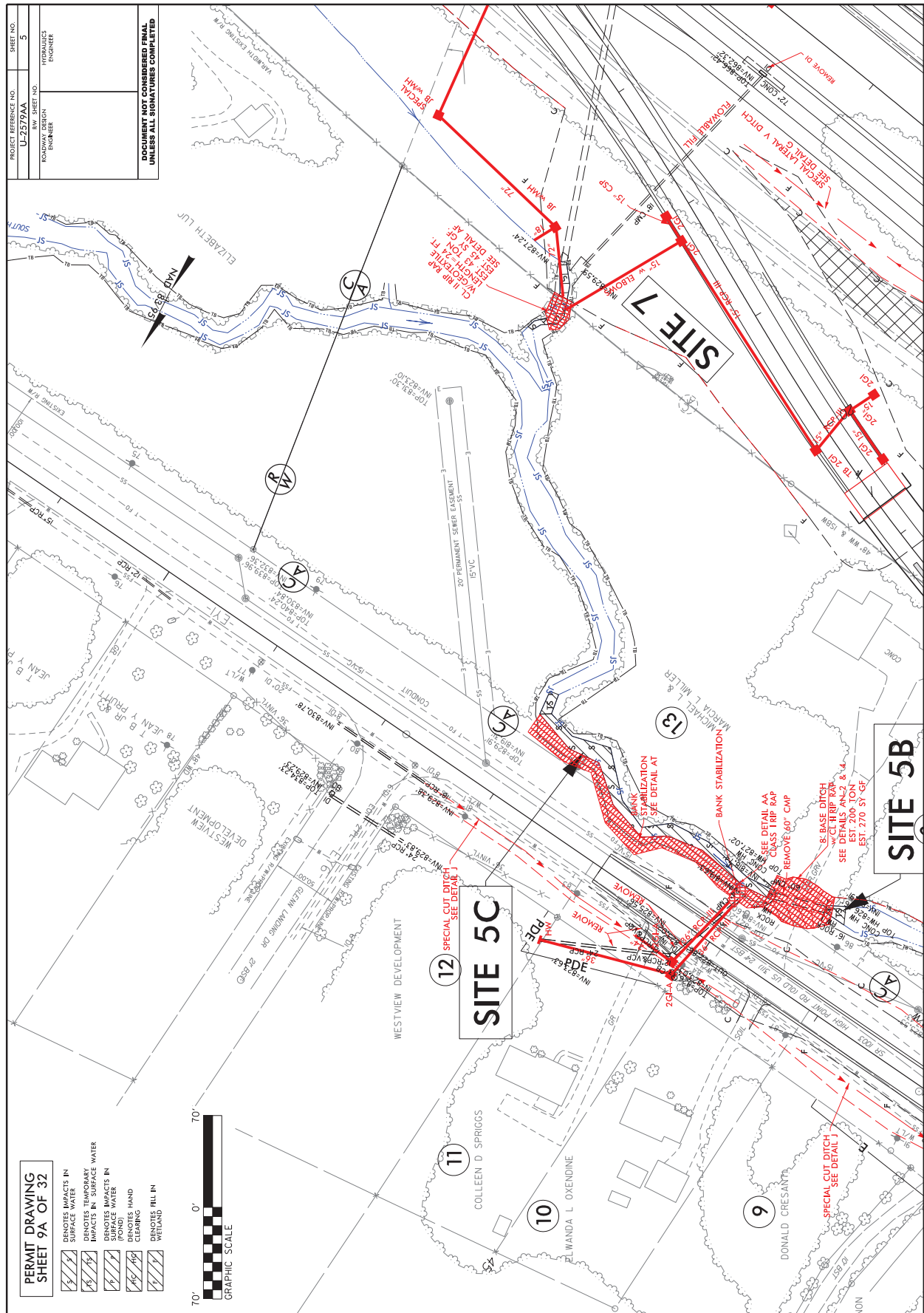




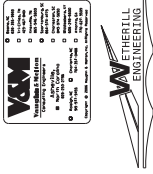








PROJECT REFERENCE NO.	U-2579AA	SHEET NO.	2E-2
DESIGNER	ROADWAY DESIGN	HYDRAULICS	ENGINEER
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**DETAIL FOR HIGH POINT RD
ON-SITE DETOUR (-YIDET-)**

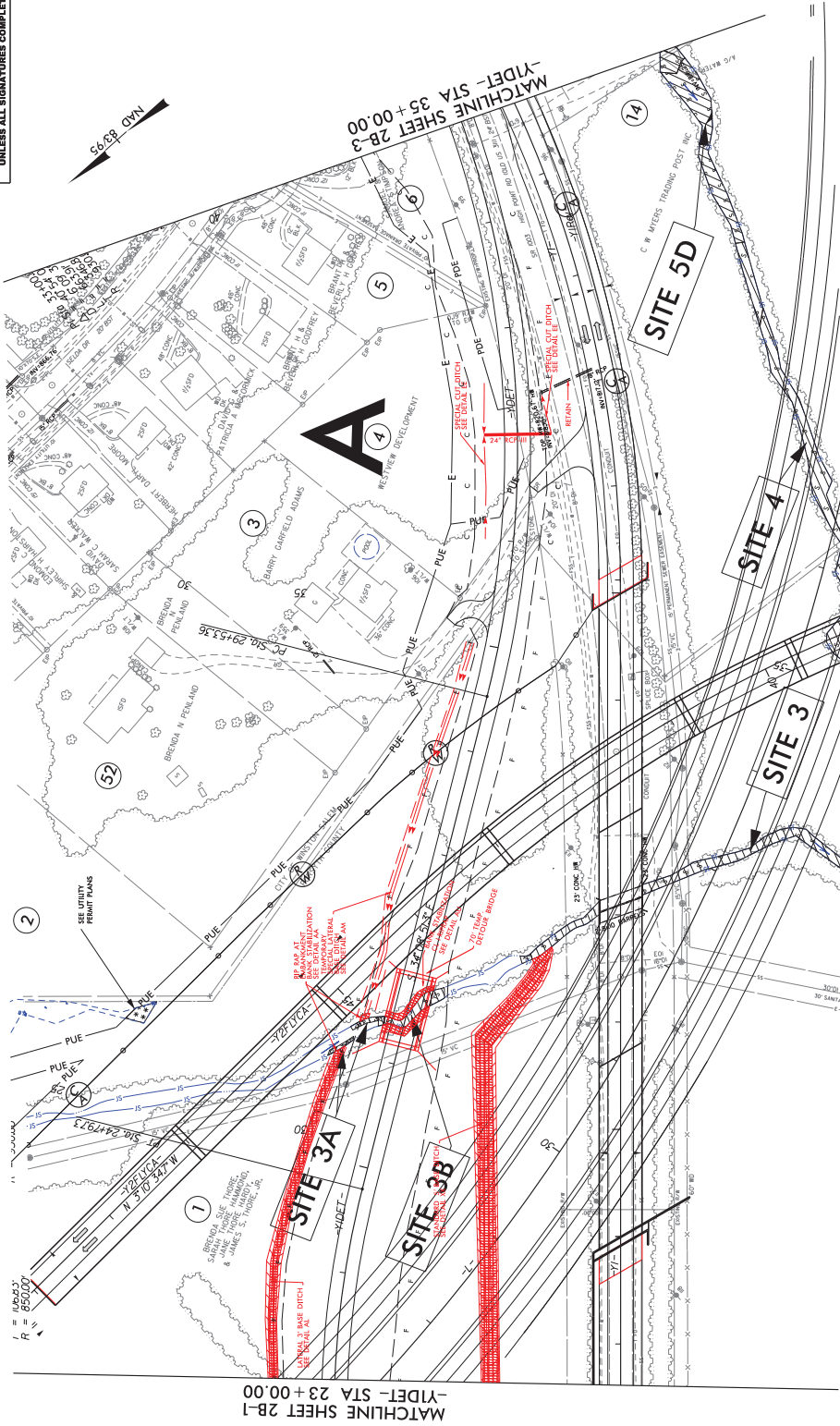


PERMIT DRAWING
SHEET 10A OF 32

DENOTES IMPACTS IN
SURFACE WATER



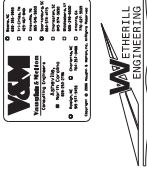
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



SEE PERMIT SHEET 31 FOR
PROFILE OF -YIDET- BRIDGE

NOTES:
SEE SHEETS 41 & 42 FOR -YIDET- PROFILE
SEE SHEETS 5, 15 & 16 FOR -Y1- PLANS AND CURVE DATA

PROJECT REFERENCE NO.	U-2579AA	SHEET NO.	2B-2
ROADWAY DESIGN ENGINEER	R/W SHEET NO.	HYDRAULICS ENGINEER	
<div>INCOMPLETE PLANS DO NOT USE FOR P/W ACQUISITION</div>			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			



**DETAIL FOR HIGH POINT RD
ON-SITE DETOUR (-YIDET-)**

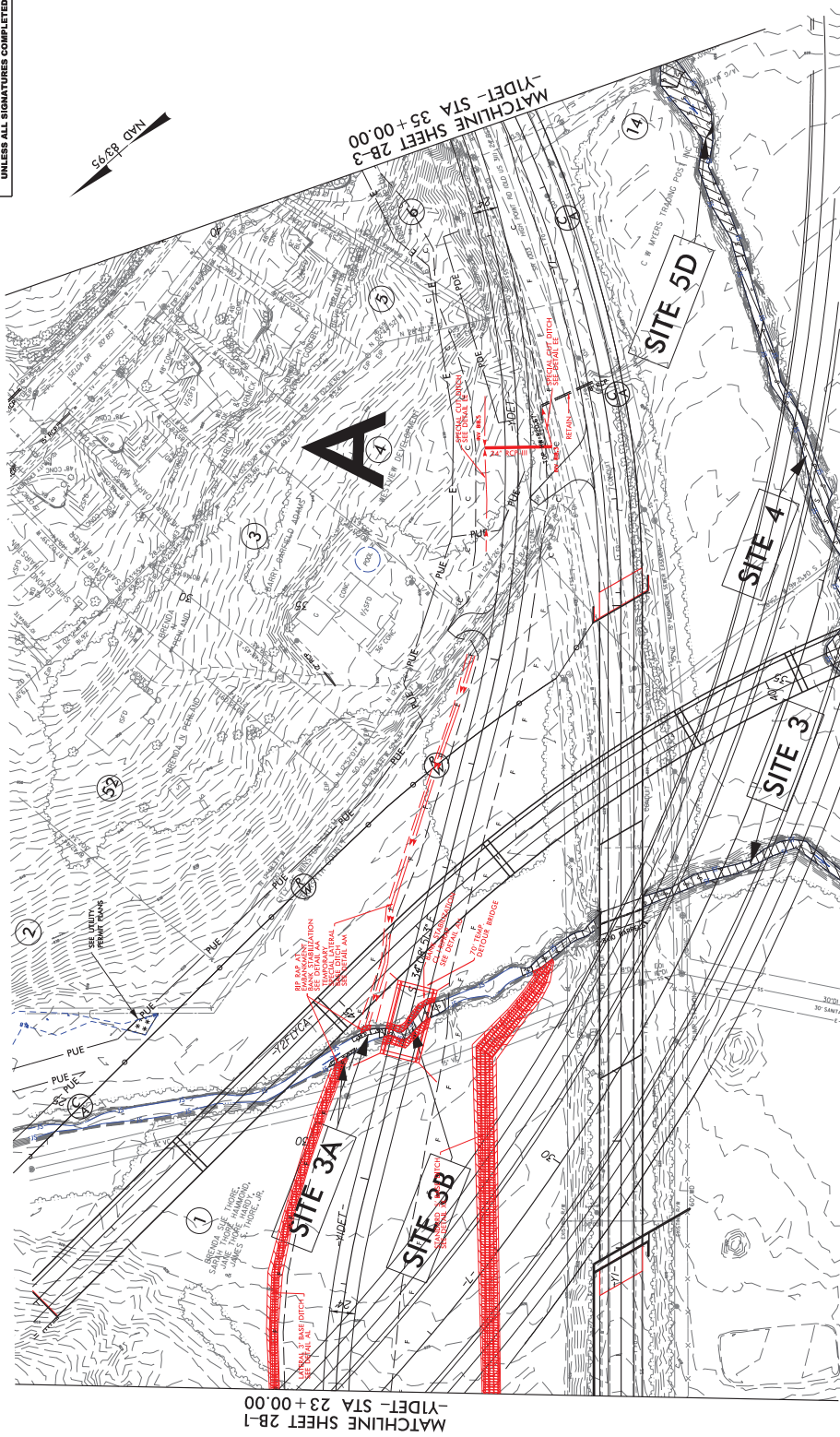


PERMIT DRAWING
SHEET 10B OF 32

DENOTES IMPACTS IN
SURFACE WATER



DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



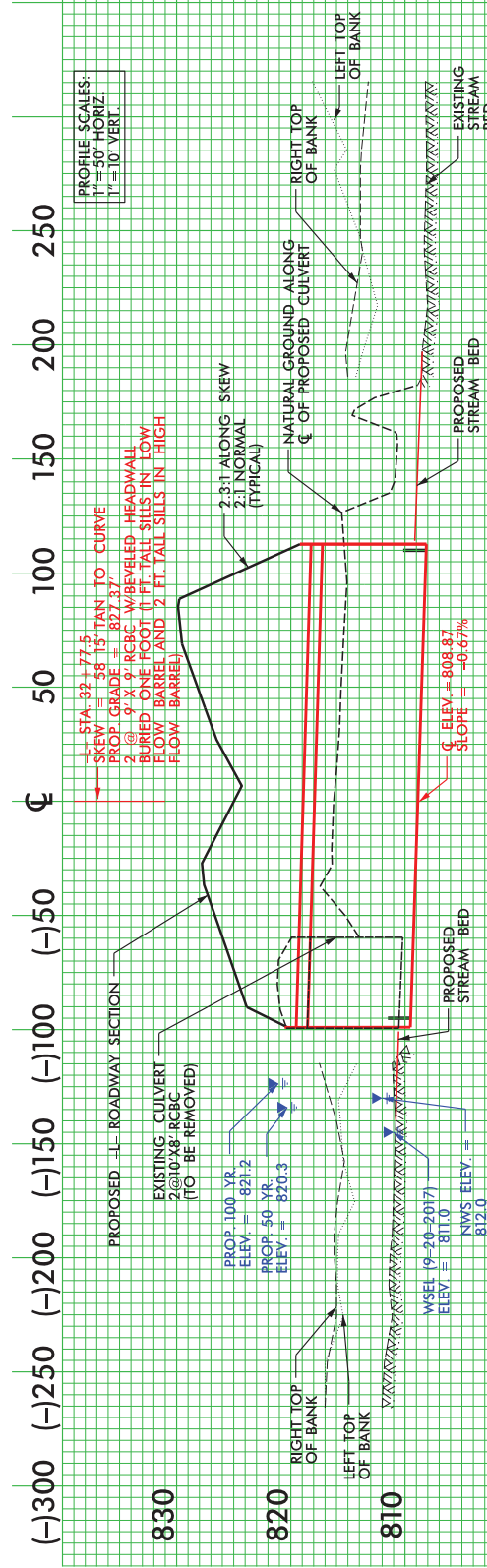
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SEE SHEETS 5, 15 & 16 FOR -Y1- PLANS AND CURVE DATA

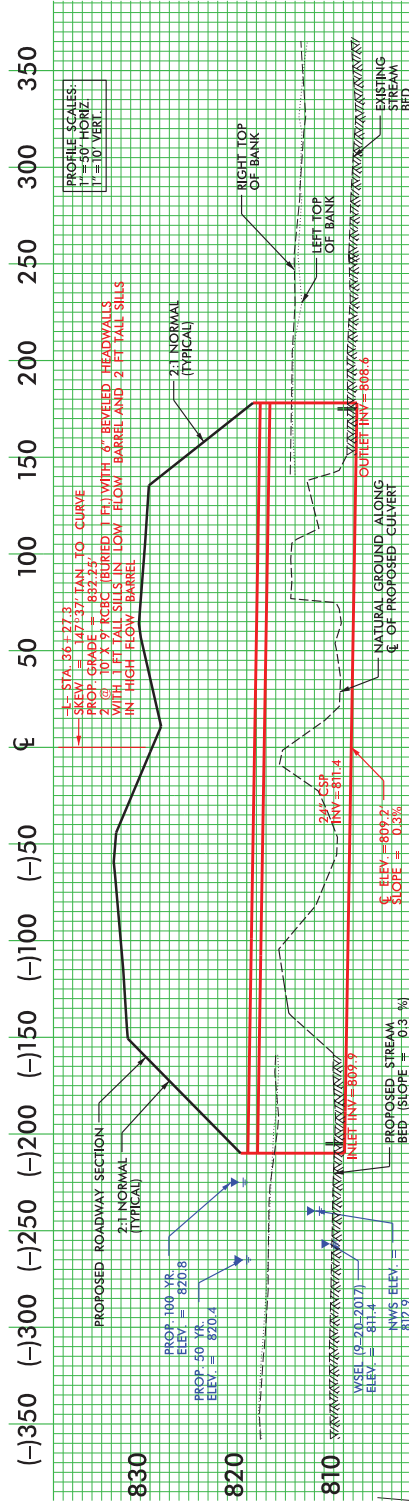
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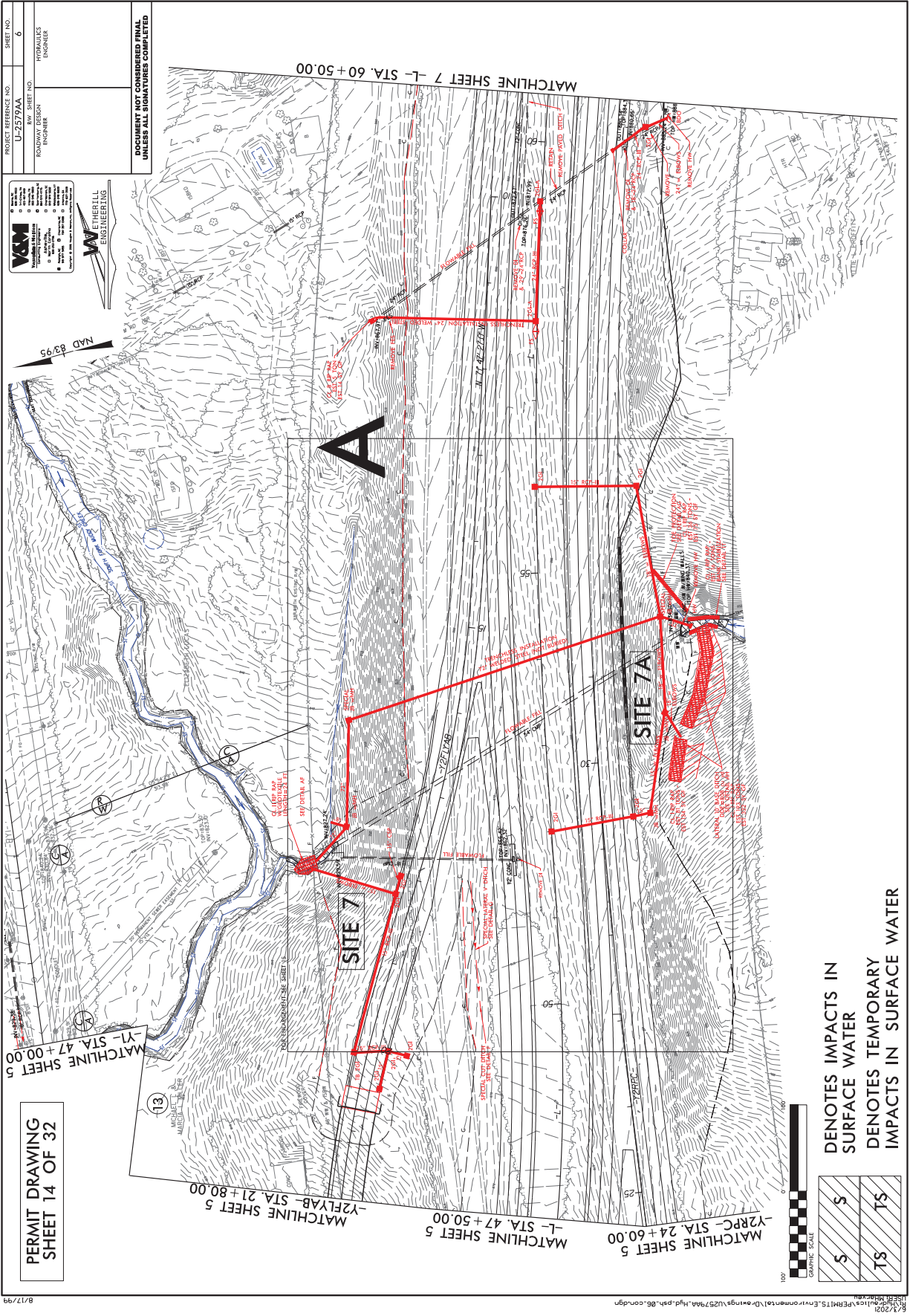
PERMIT DRAWING
SHEET 11 OF 32

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	
RAW SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



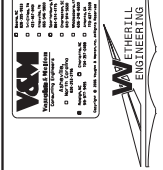
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SHEET 12 OF 32

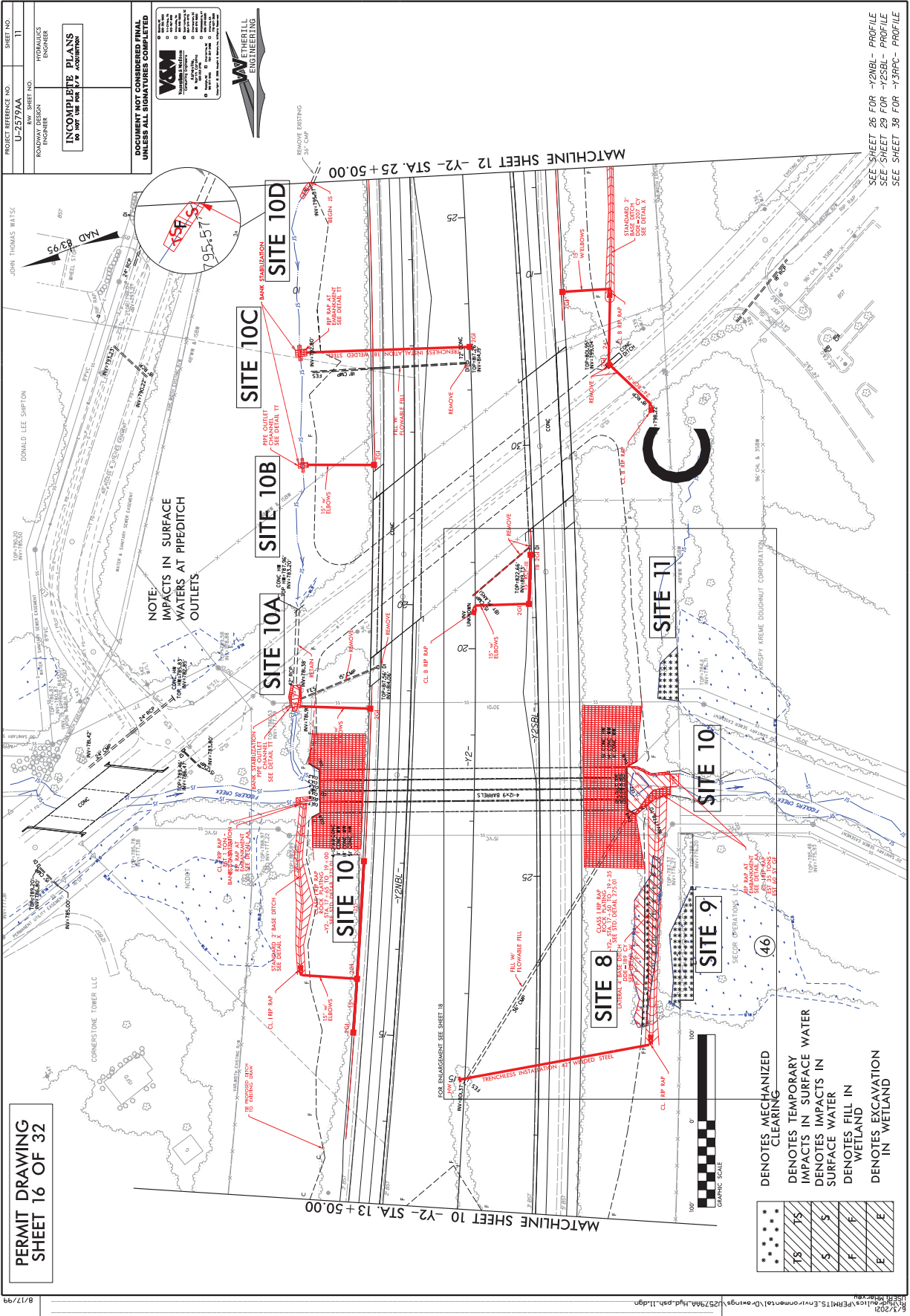




PROJECT REFERENCE NO.	U-2579AA	SHEET NO.	6
BY	HYDRAULICS	DATE	
CHECKED BY	HYDRAULICS	DATE	
DESIGNED BY	HYDRAULICS	DATE	
ENGINEER	HYDRAULICS	DATE	

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

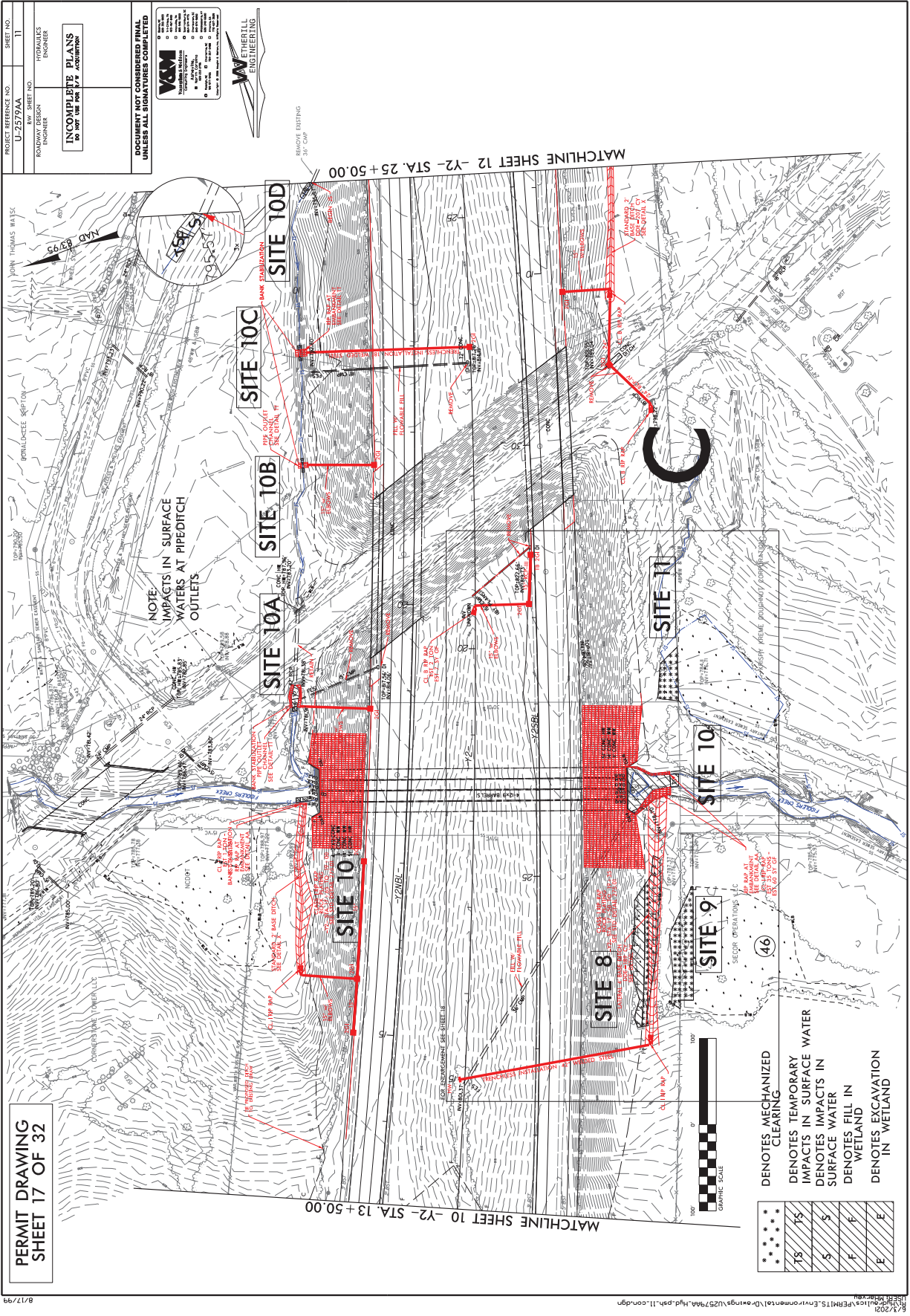


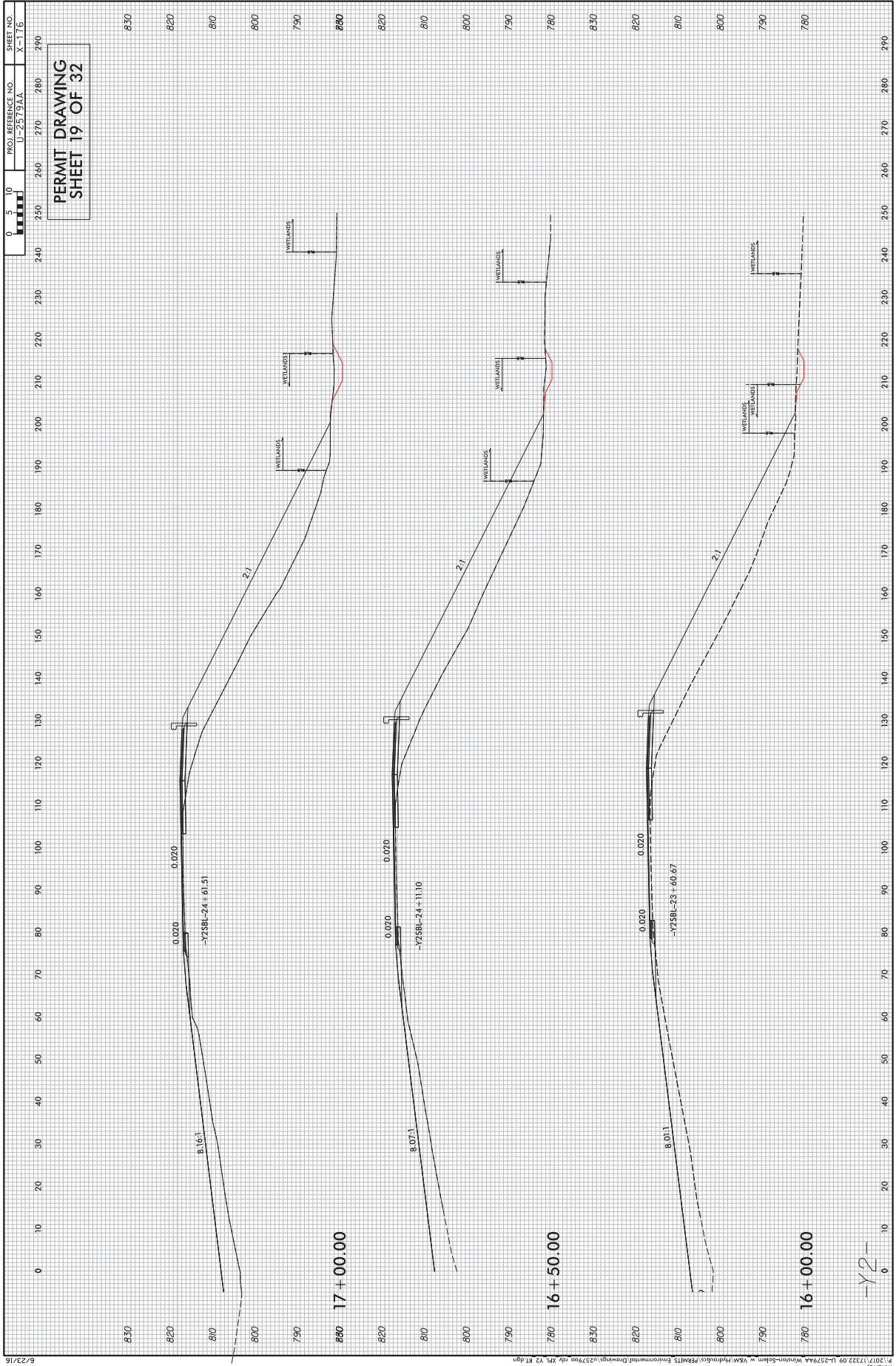


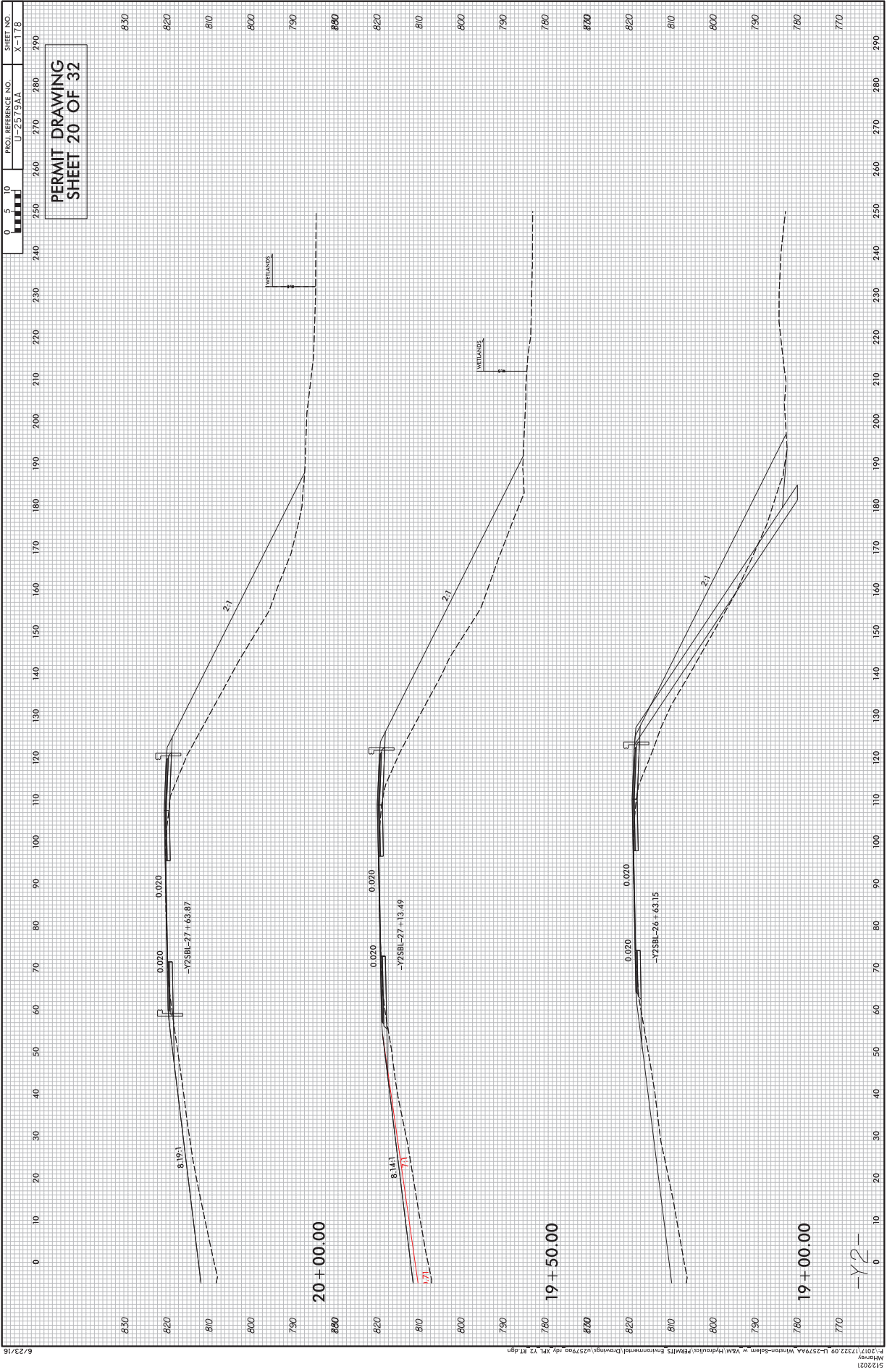
SEE SHEET 26 FOR -Y2NBL- PROFILE
SEE SHEET 29 FOR -Y2SBL- PROFILE
SEE SHEET 36 FOR -Y3PC- PROFILE

TS	TS	TS	TS	TS
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F	F	F	F	F
F	F	F	F	F

DENOTES MECHANIZED CLEARING
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND





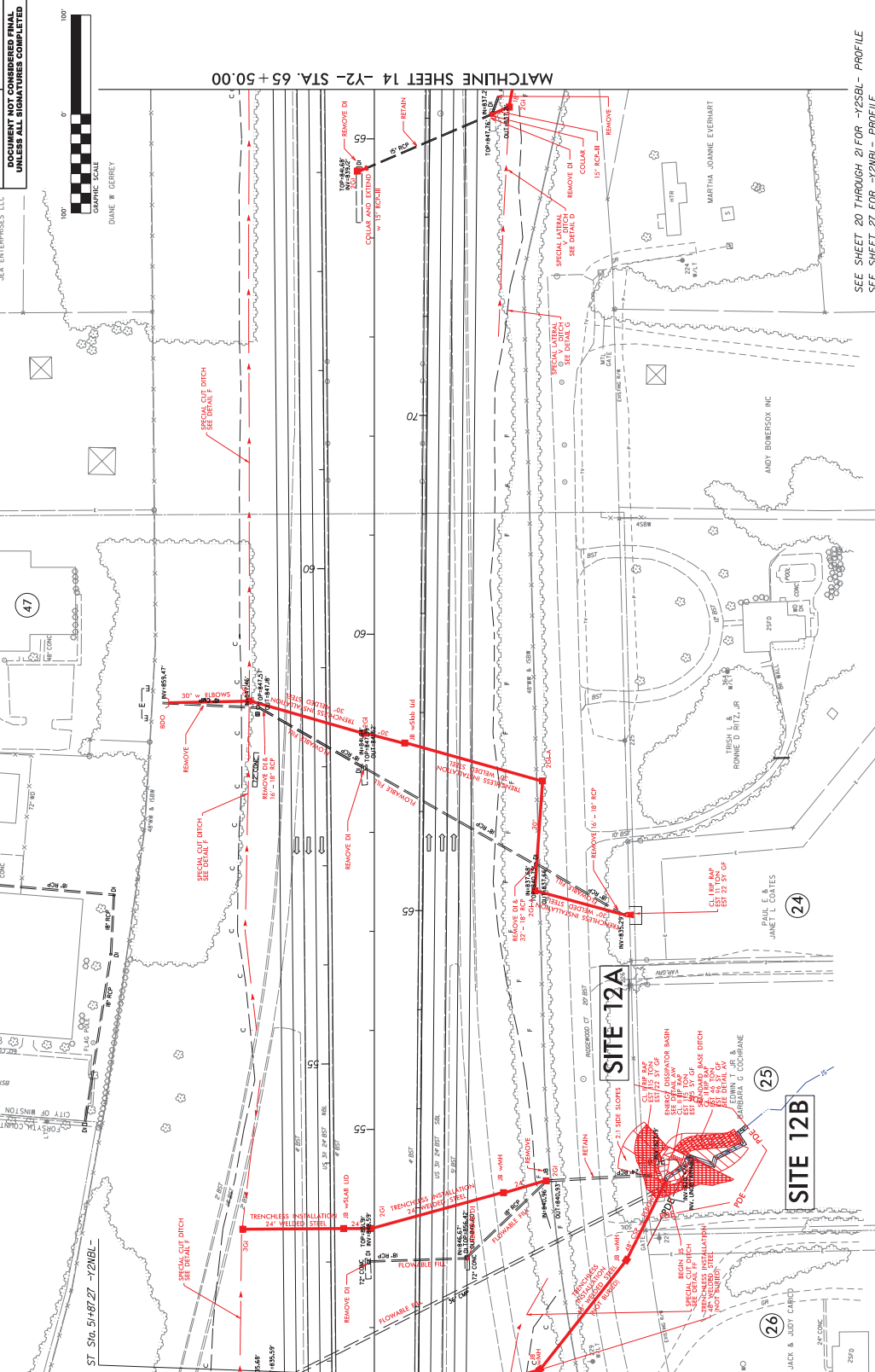


PERMIT DRAWING
SHEET 20 OF 32

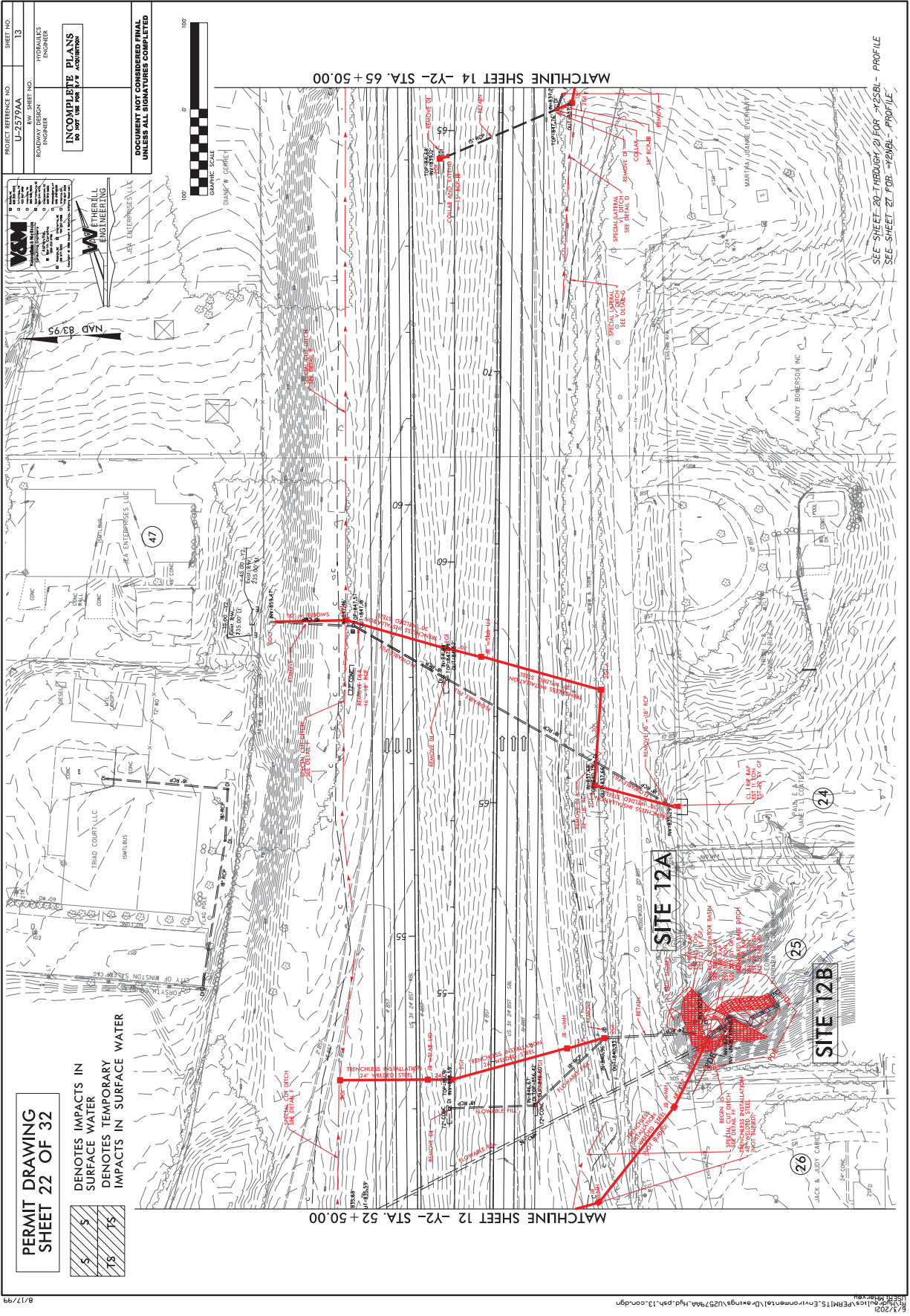
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U-2579AA	X-178

DENOTES IMPACTS IN SURFACE WATER

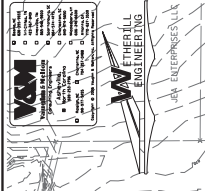
MATCHLINE SHEET 14 -Y2- STA. 65+50.00



SEE SHEET 20 THROUGH 21 FOR -Y2SBL- PROFILE
SEE SHEET 27 FOR -Y2NBL- PROFILE



PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	13
BY: SHEET NO.	HYDRAULICS
ROADWAY DESIGN	ENGINEER
INCOMPLETE PLANS	
DO NOT USE FOR P/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL	
UNLESS ALL SIGNATURES COMPLETED	



NAD 83/95

TRAD COURT LLC

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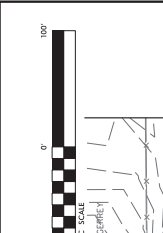
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GRAPHIC SCALE

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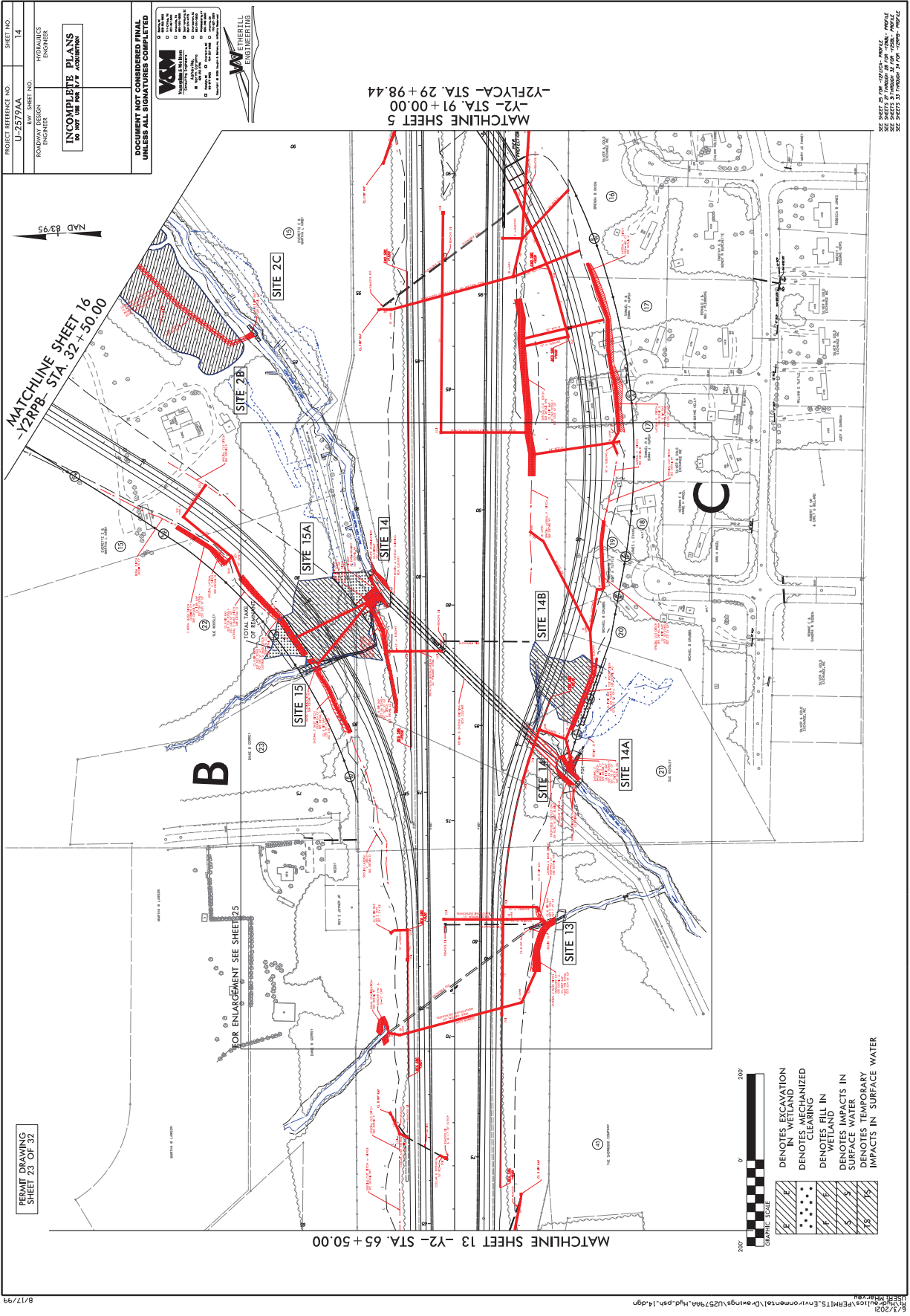
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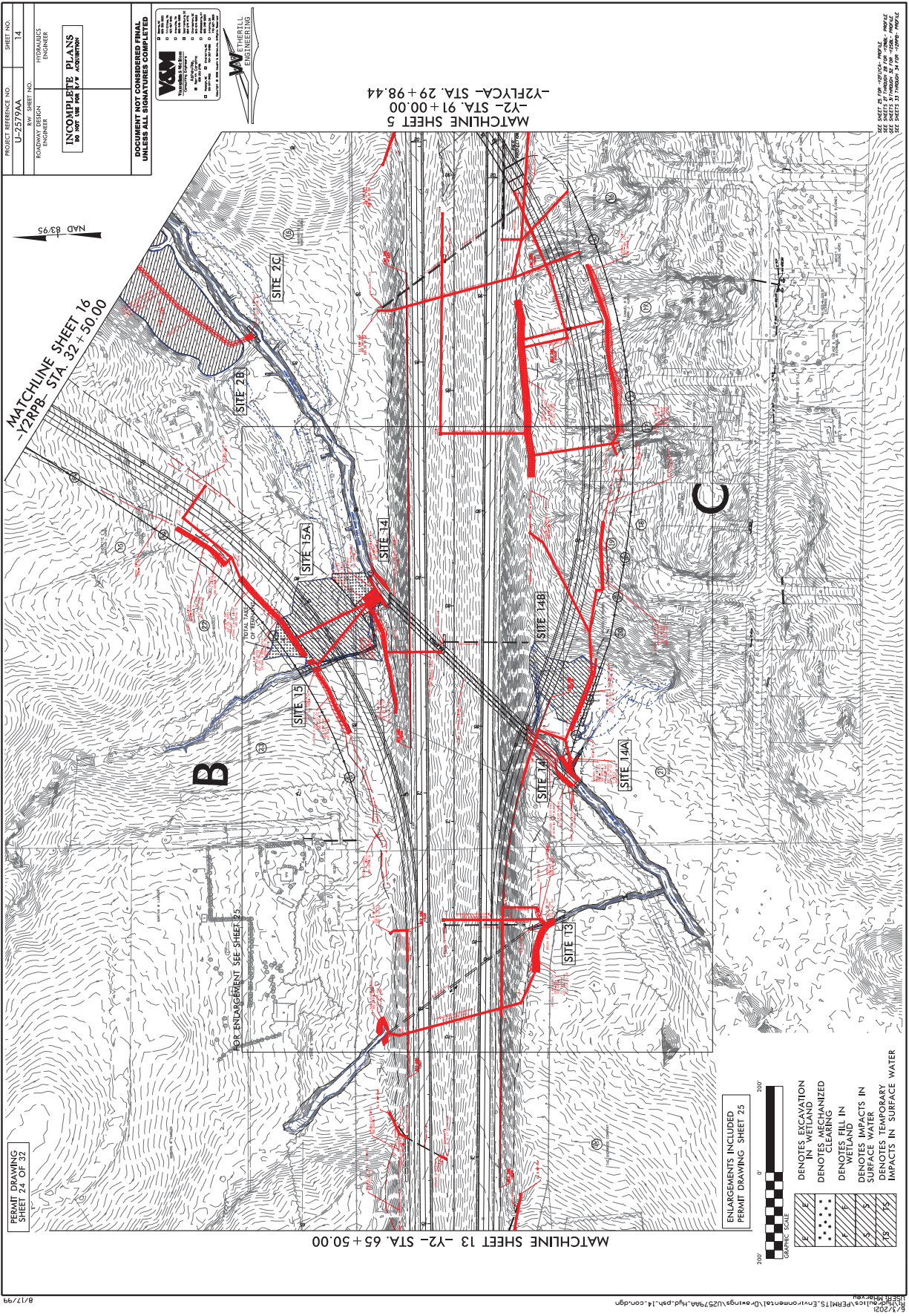
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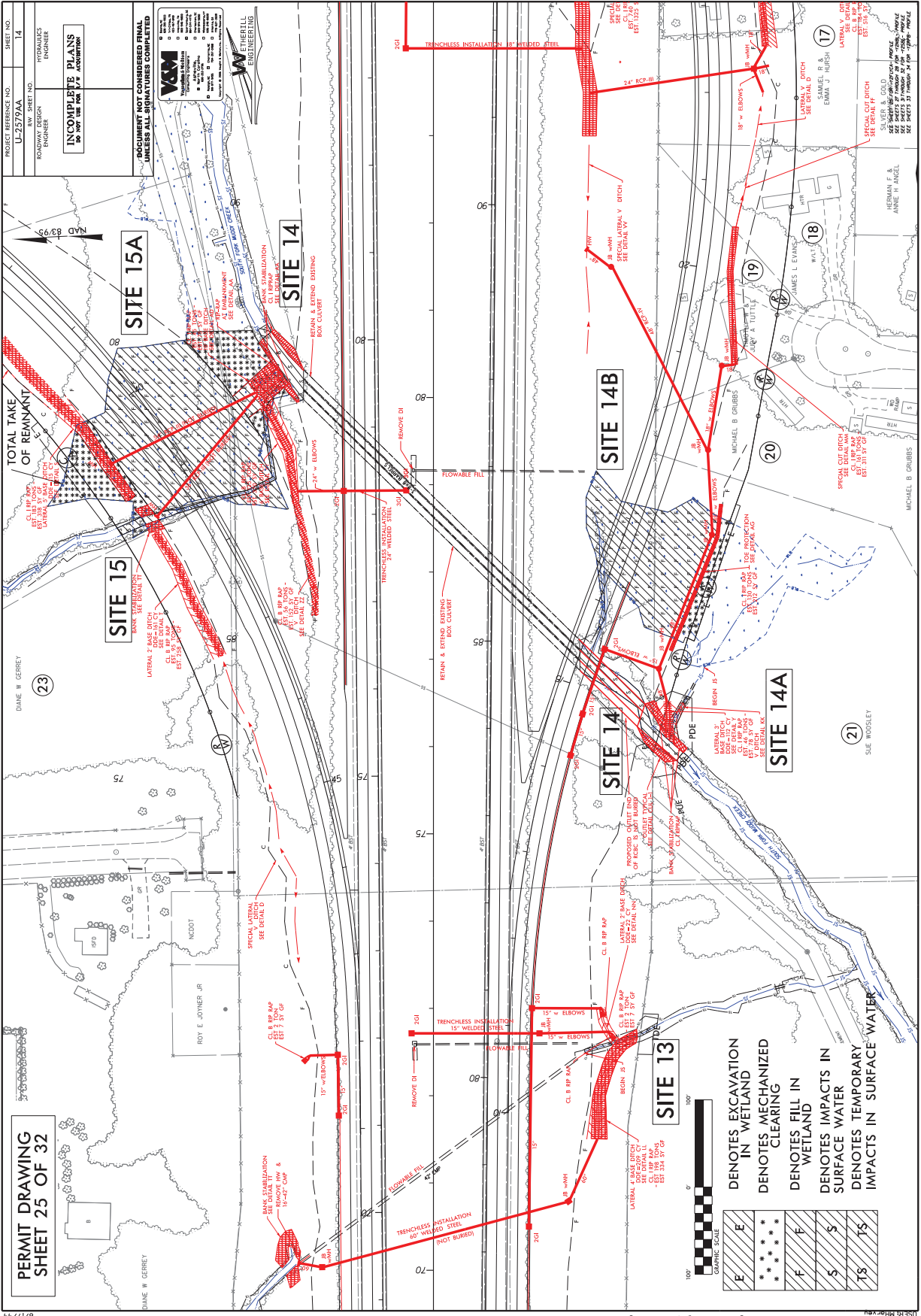
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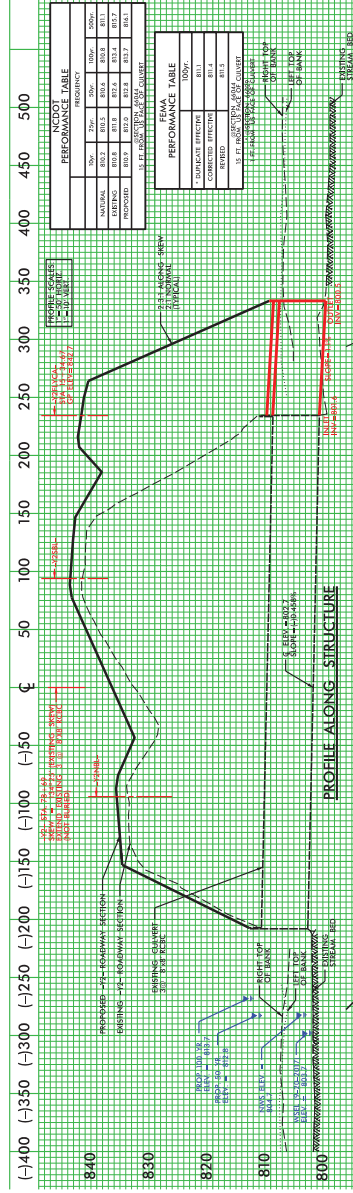
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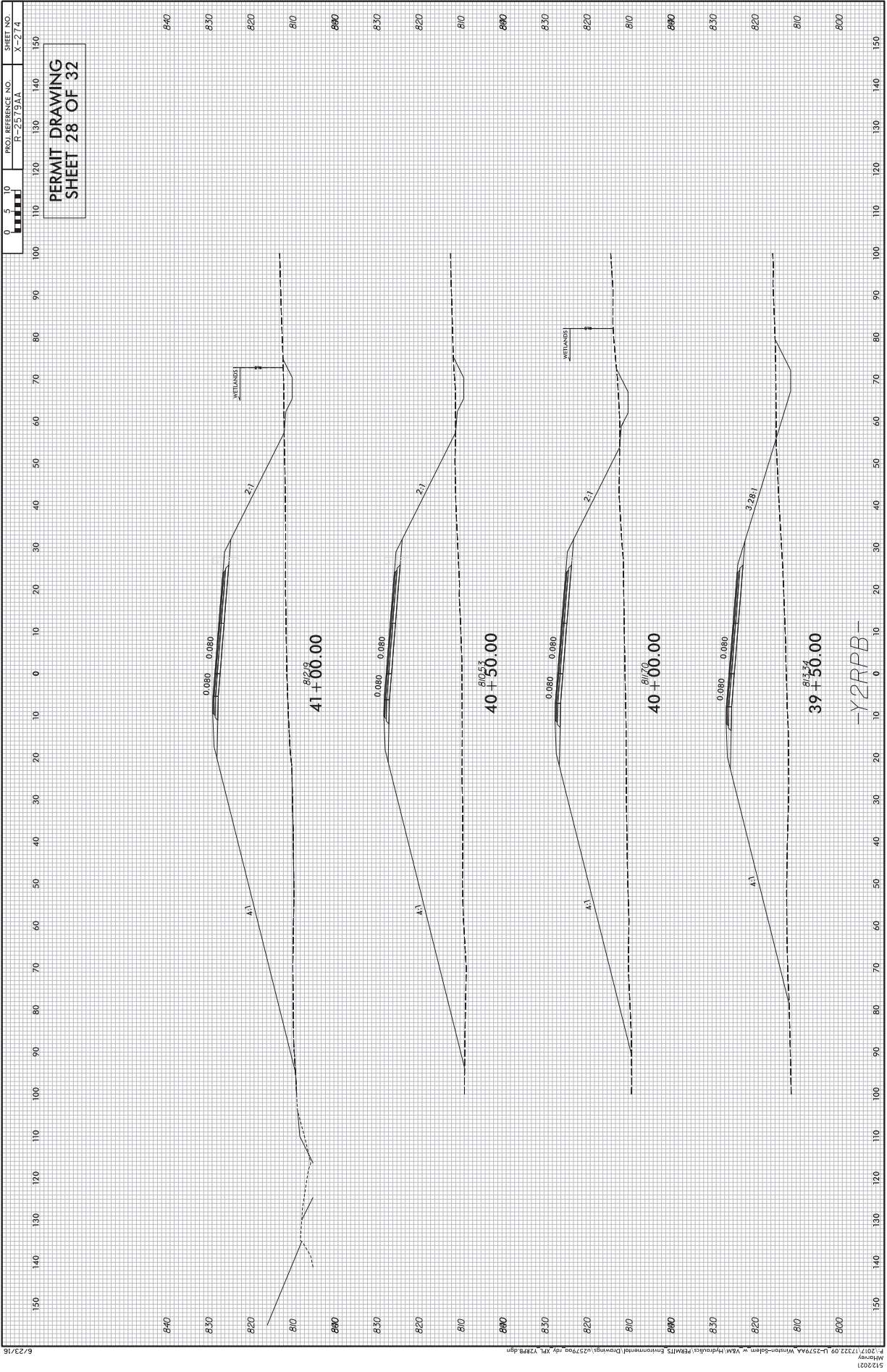


8/17/99 8/17/2021



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PROJ. REFERENCE NO. R-2579AA		
SHEET NO. X-274		

PERMIT DRAWING
SHEET 28 OF 32



6/23/16

5/19/2021
P:\2017\17322 09 U-2579AA Wetland-Solam v Y&M\Hydraulic\FEAKITS Environmental Drawings\2579aa-09_X28_V28PB.dgn
Mikerey

PROJECT REFERENCE NO.	U-2579AA	RW	SHEET NO.	ROADWAY DESIGN CROSS-SECTION	HYDRAULICS CROSS-SECTION
SHEET NO.	16				


Wetherill Engineering

Transmission & Station
Construction Company

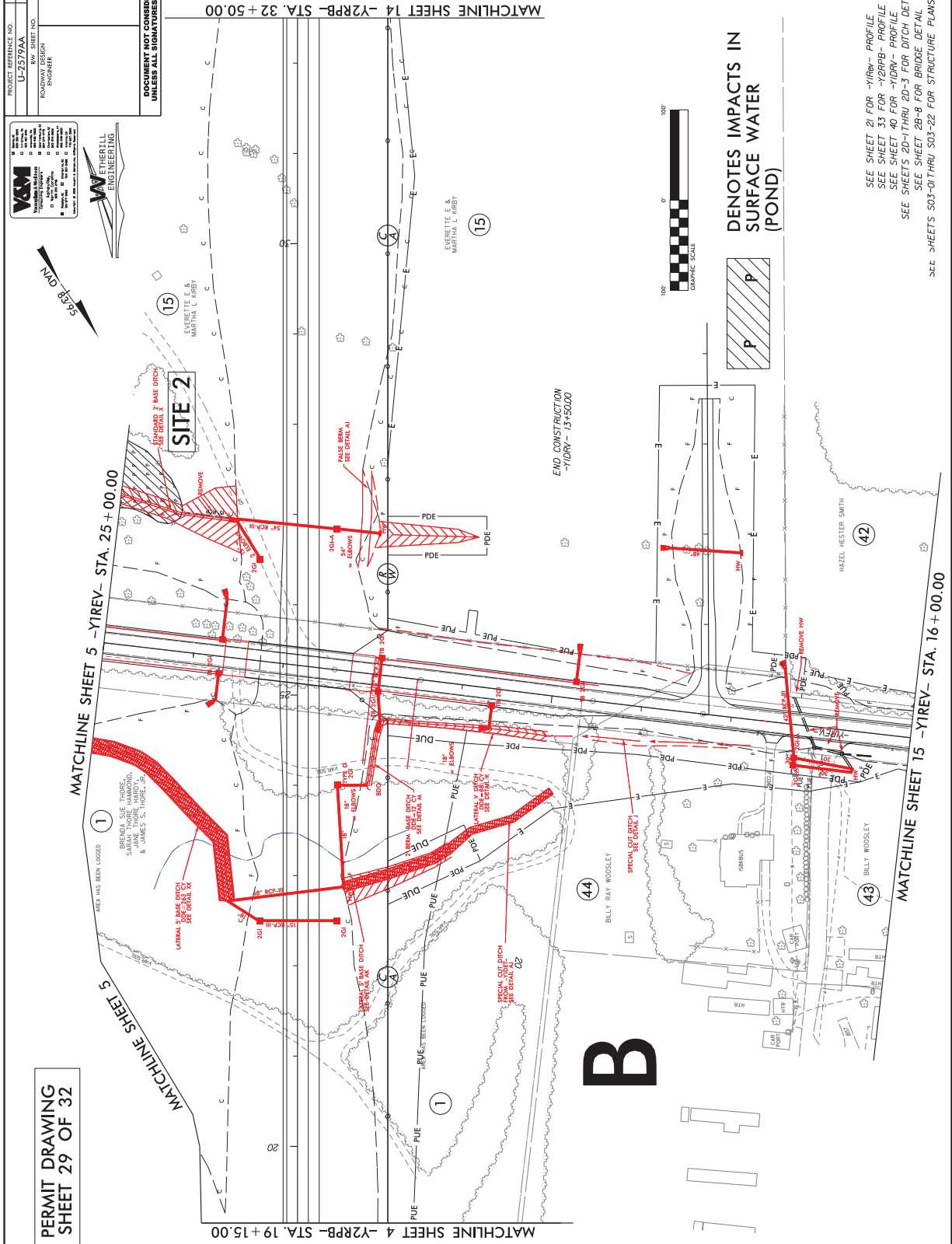
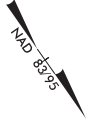
14000 W. 10th Avenue
Denver, CO 80202

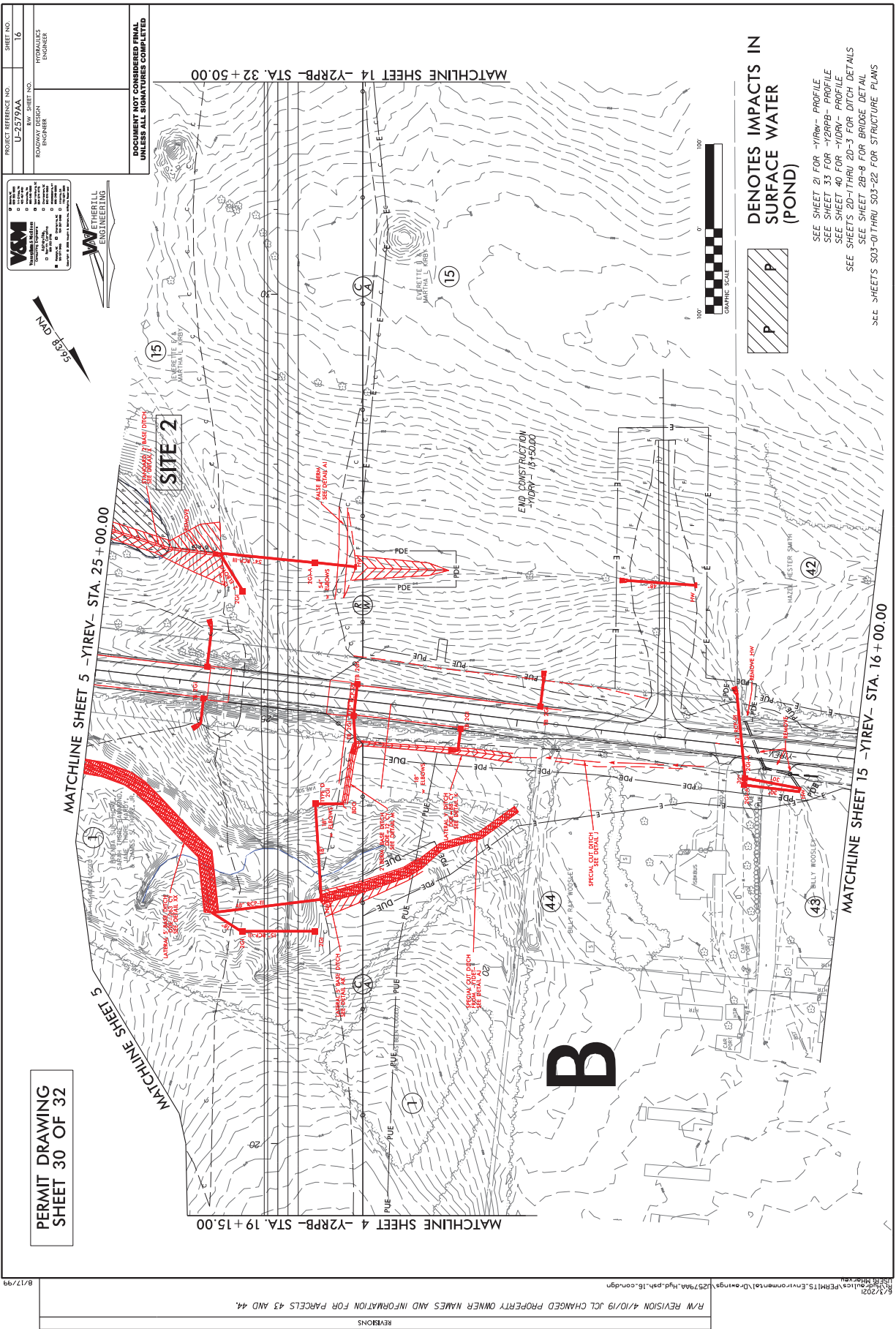
Telephone: (303) 751-2000
Fax: (303) 751-2000

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**WETHERILL
ENGINEERING**

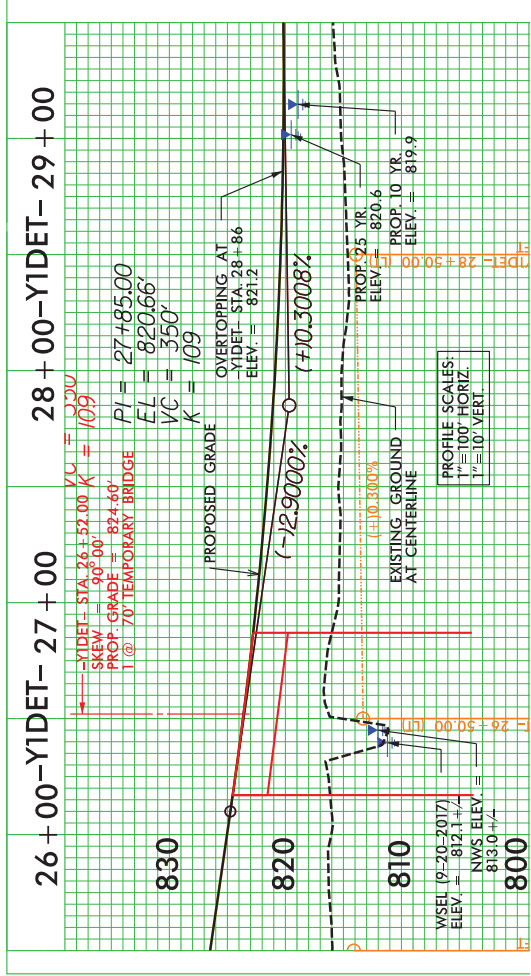




PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	
BY SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR I/P W/ ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PERMIT DRAWING
SHEET 31 OF 32

SEE PERMIT SHEET 10A FOR
PLAN OF -Y1DET- BRIDGE



WETLAND PERMIT IMPACT SUMMARY												
WETLAND IMPACTS					SURFACE WATER IMPACTS							
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW Impacts (ac)	Temp. SW Impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	-L-15+12	42" RCP-V (Not Buried)						0.03	<0.01	392		
1		Channel Armoring							<0.01	14	24	
1		Bank Stabilization							<0.01	15	9	
2A	-Y1REV- 25+60 RT	Drain and Stabilize Pond						0.50				
2B	-Y1REV- 28+00 RT	Drain and Stabilize Pond						0.12				
2C	-Y1REV- 28+60 RT	Drain and Stabilize Pond						2.31				
3	-Y1REV-32+78	Bank Stabilization						<0.01	<0.01	16	20	
3		2 @ 9'x9' RCBC						0.05		240		
3		Channel Change						0.02	<0.01	124		
3A	-Y2FLYCA- 46+56 LT to 46+52	Bank Stabilization						<0.01	<0.01	26	20	
3B	-Y2FLYCA- 46+56 LT to 46+52	Detour Ditch Outlets						<0.01	<0.01	20	40	
4	-L- 36+28	2 @ 10'x9' RCBC						0.01	<0.01	35	18	
4	-L- 34+68 RT	Channel Change						0.10		418		
4	-L- 34+65 LT	Channel Change						0.02		85		
4		Bank Stabilization						0.01		80		
4A	-L- 33+95 to 34+33 RT	Bank Stabilization and Temporary Diversion Channel for Culvert Phasing						0.01	<0.01	67	10	
5	-Y1REV- 41+70 RT	15" Pipe Removal	<0.01			0.02			<0.01	42	40	
5A	-Y1REV- 39+50 RT	60" Pipe Removal/Scour Hole Stabilization						<0.01	<0.01	8	10	
5B	-Y1REV- 44+50 RT	60" Pipe Removal/Scour Hole Stabilization						0.05	<0.01	236	17	
5C	-Y1REV- 44+63 to 47+09 F	Bank Stabilization										
5D	-L- 39+22 to 39+93 RT	Bank Stabilization and Temporary Diversion Channel for Culvert Phasing						0.06		173		
6	-L- 45+60	36" Welded Steel						<0.01	<0.01	57		
6		Bank Stabilization						<0.01	<0.01	68	20	
6A	-Y2 FLYAB- 23+00	Drain and Stabilize Pond						0.11				
7	-L- 54+04	72" Alu/Welded Steel						<0.01	<0.01	26		
7		Bank Stabilization						<0.01	<0.01	23	15	
7A	-L- 54+04	72" Alu/Welded Steel						<0.01	<0.01	11		
7A		Bank Stabilization						<0.01	<0.01	35	10	
8	-Y2- 15+70 to 17+65 RT	4" Base Ditch	0.04		0.04	0.02						
9	-Y2- 15+92 to 17+31 RT	Erosion Control Practices				0.06						
10	-Y2- 18+36	Bank Stabilization							<0.01	60	20	
10A	-Y2- 19+50 LT	Bank Stabilization						<0.01	<0.01	9	22	
10B	-Y2- 22+10 LT	Bank Stabilization						<0.01	<0.01	8	20	
10C	-Y2- 23+50 LT	Bank Stabilization						<0.01	<0.01	8	10	
10D	-Y2- 25+50 LT	Bank Stabilization						<0.01	<0.01	10	10	
11	-Y2- 19+40 to 20+01 RT	Erosion Control Practices			0.03							
12A	-Y2- 52+60	Channel Armoring for Energy Dissipator Basin						<0.01		33		
12B	-Y2- 54+75	Channel Change						<0.01	<0.01	80	10	
13	-Y2- 72+48 RT	60" Alu/Welded Steel						<0.01	<0.01	32		
14		Channel Armoring						<0.01	<0.01	31	25	
14	-Y2- 78+70	3 @ 8'x8' RCBC Extension						0.06		150		
14A	-Y2FLYCA- 14+75 to 15+30	Bank Stabilization						0.03	<0.01	97	20	
14B	-Y2FLYCA- 15+68 to 17+46	3' Base Ditch						<0.01	<0.01	50	10	
15	-Y2RCPB- 41+50	36" RCP-III	0.38		0.05							
15A	-Y2RCPB- 41+50	Bank Stabilization						0.03	<0.01	249		
15A	-Y2RCPB- 39+50 to 42+00	Bank Stabilization	0.64		0.07	0.20		<0.01	<0.01	16	32	
TOTALS**			1.07	0.11	0.38			3.63	0.06	3044	422	0

*Rounded totals are sum of actual impacts

NOTES:
*SA: There will be total take of the remnant, shown in the quantities.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
6/24/2021
Foranthe Co.
U-2579AA

SHEET 32 OF 32

NOTES:
15A - There will be total take of the remnant, shown in the quantities.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
6/24/ 2021
Perryette Co.
U-2579AA

TIP NO.
U-2579AA

SHEET NO.
UC-1

Utility Drawings
Sheet 1 of 4

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

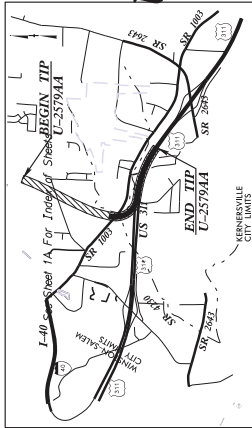
UTILITY CONSTRUCTION PLANS
FORSYTH COUNTY

LOCATION: WINSTON SALEM NORTHERN BELTWAY EASTERN SECTION
(FUTURE I-74) FROM US 311 TO I-40

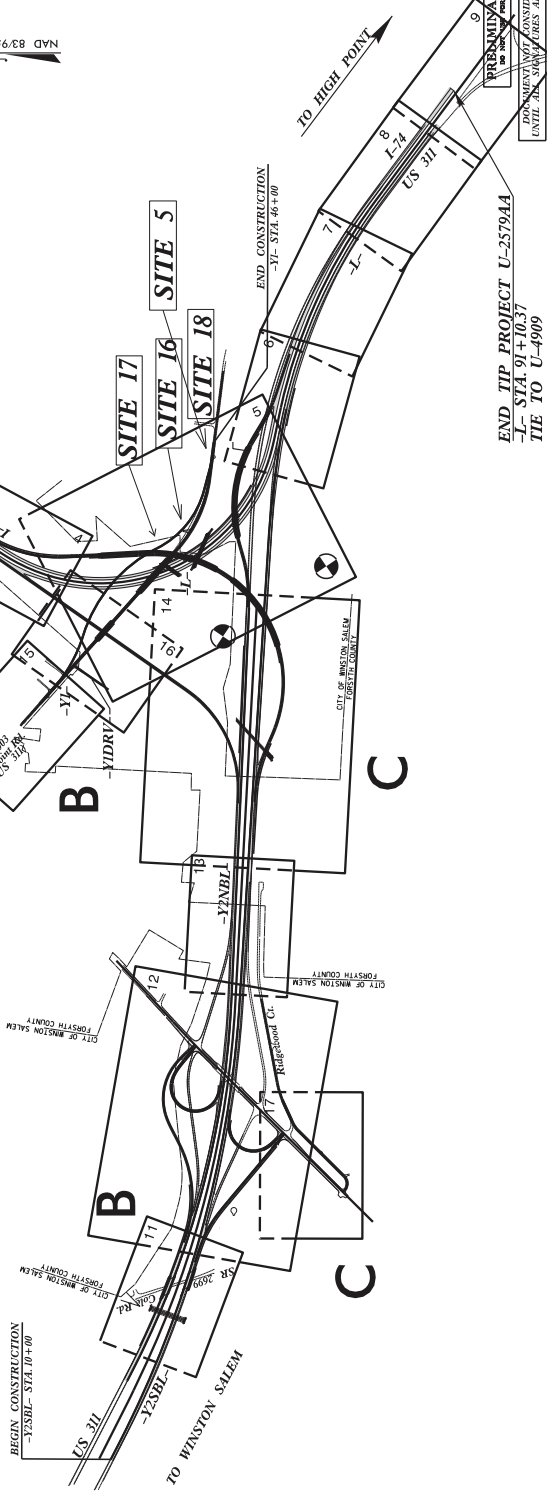
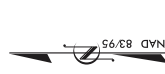
WETLAND AND SURFACE WATER IMPACTS PERMIT

TYPE OF WORK: UTILITY RELOCATION PLAN

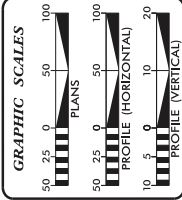
TO I-40 BYPASS
BEGIN TIP PROJECT U-2579AA
-L- POT STA 10+00.00 =
END PROJECT U-2579AB
-L- POT STA 836+32.44



VICINITY MAP

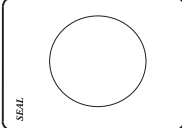


END TIP PROJECT U-2579AA
-L- STA 91+10.37
TIE TO U-4909



WATER AND SEWER
OWNERS ON PROJECT

- (A) WATER XXXXXXXX
- (B) SANITARY SEWER
- (C) XXXXX
- (D) XXXXX
- (E) XXXXX



DIVISION OF HIGHWAYS
UTILITIES UNIT
ESS BARR SERVICES CENTER
1000 WEST 10TH STREET
FARMER, NC 28625
PHONE (703) 707-6600
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TUCKER MARTIN
ALLI KOUCHER
JON LOUGHRY

UTILITIES REGIONAL MANAGER
UTILITIES REGIONAL ENGINEER
UTILITIES ENGINEER

TIP PROJECT: U-2579AA

MATCHLINE SHEET 4
-Y2FLYCA- STA. 52 + 60.00

[illegible]

SITE 3A

BRENDA SUE THORE,
SARAH THORE HAMMOND,
CLARENE THORE HARDY,
CLARENCE S. S. THORE, JR.,
WGEORGE
EST. 65 WOK 96 PG 372
EST. 1265 SY GF.

BEGIN SBR STABIL
-L- +0754
SEE DETAIL T
RIP RAP
EMBANKMENT

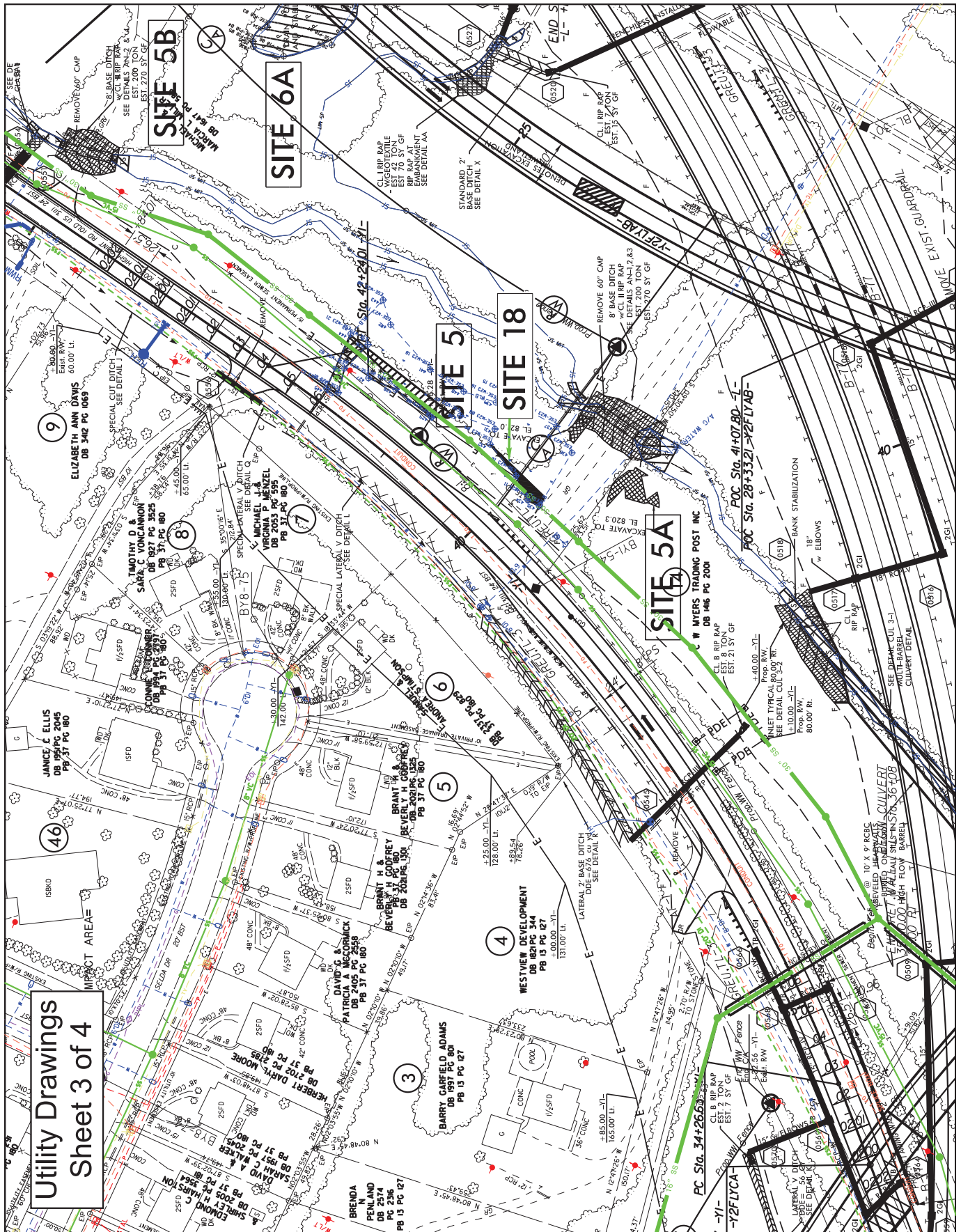
BASE DITCH
139 CY
DETAIL C

LATERAL 6' BAY
DDE = SEE



10





WETLAND AND SURFACE WATER IMPACTS SUMMARY												
			WETLAND IMPACTS				SURFACE WATER IMPACTS					
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
Site-16	Y2FLYCA	Sewer 16" gravity			< 0.01							
Site-17	Y2FLYCA	Sewer 16" gravity			0.03							
Site-18	Y1	Sewer 30" gravity			< 0.01							
Site-5	Y1	Sewer 30" gravity			0.02							
			</									

*Rounded totals are sum of actual impacts
 NOTES:

County: FORSYTH

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	0000700000-N	SP	FIELD OFFICE	Lump Sum	L.S.	
0004	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0005	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	4 ACR		
0006	0015000000-N	205	SEALING ABANDONED WELLS	2 EA		
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	435,000 CY		
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (22+84.09 -Y1-)	Lump Sum	L.S.	
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (28+33.21 -Y2FLYAB-)	Lump Sum	L.S.	
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0012	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (30+02.29 -Y2FLYCA-)	Lump Sum	L.S.	
0013	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (30+69.44 -Y1-)	Lump Sum	L.S.	
0014	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0016	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ***** (30+69.44 -Y1-)	Lump Sum	L.S.	

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0017	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ***** (39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0018	0036000000-E	225	UNDERCUT EXCAVATION	1,750 CY		
0019	0106000000-E	230	BORROW EXCAVATION	640,000 CY		
0020	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	10 EA		
0021	0134000000-E	240	DRAINAGE DITCH EXCAVATION	7,500 CY		
0022	0141000000-E	240	BERM DITCH CONSTRUCTION	1,050 LF		
0023	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	72,600 SY		
0024	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	3,910 SY		
0025	0192000000-N	260	PROOF ROLLING	30 HR		
0026	0195000000-E	265	SELECT GRANULAR MATERIAL	22,450 CY		
0027	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	127,000 SY		
0028	0199000000-E	SP	TEMPORARY SHORING	970 SF		
0029	0223000000-E	275	ROCK PLATING	2,550 SY		
0030	0241000000-E	SP	GENERIC GRADING ITEM GEOTEXTILE FOR EMBANKMENT STABILIZATION, TYPE 5	29,390 SY		
0031	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	3,050 TON		
0032	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	10,438 SY		
0033	0342000000-E	310	*** SIDE DRAIN PIPE (30")	1,380 LF		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0034	0342000000-E	310	*** SIDE DRAIN PIPE (36")	1,036 LF		
0035	0342000000-E	310	*** SIDE DRAIN PIPE (42")	180 LF		
0036	0342000000-E	310	*** SIDE DRAIN PIPE (48")	528 LF		
0037	0342000000-E	310	*** SIDE DRAIN PIPE (54")	48 LF		
0038	0342000000-E	310	*** SIDE DRAIN PIPE (60")	108 LF		
0039	0342000000-E	310	*** SIDE DRAIN PIPE (72")	212 LF		
0040	0343000000-E	310	15" SIDE DRAIN PIPE	5,024 LF		
0041	0344000000-E	310	18" SIDE DRAIN PIPE	2,000 LF		
0042	0345000000-E	310	24" SIDE DRAIN PIPE	932 LF		
0043	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (15")	59 EA		
0044	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (18")	32 EA		
0045	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (24")	14 EA		
0046	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (30")	2 EA		
0047	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (36")	2 EA		
0048	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (48")	2 EA		
0049	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (54")	2 EA		
0050	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	1,344 LF		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0051	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	300 LF		
0052	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	584 LF		
0053	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	608 LF		
0054	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	632 LF		
0055	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	220 LF		
0056	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	132 LF		
0057	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	748 LF		
0058	0448000000-E	310	***** RC PIPE CULVERTS, CLASS IV (48")	236 LF		
0059	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	844 LF		
0060	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	604 LF		
0061	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	136 LF		
0062	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	628 LF		
0063	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	172 LF		
0064	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	248 LF		
0065	0576000000-E	310	*** CS PIPE CULVERTS, ***** THICK (48", 0.109")	88 LF		
0066	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	672 LF		
0067	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	40 LF		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0068	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	144 LF		
0069	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (15", 0.064")	6 EA		
0070	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (24", 0.064")	2 EA		
0071	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (48", 0.109")	2 EA		
0072	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (15", 0.500")	128 LF		
0073	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (18", 0.500")	332 LF		
0074	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (24", 0.500")	602 LF		
0075	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (30", 0.500")	284 LF		
0076	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (36", 0.500")	308 LF		
0077	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (42", 0.625")	112 LF		
0078	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (48", 0.625")	656 LF		
0079	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (60", 0.875)	146 LF		
0080	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (72", 1.000")	190 LF		
0081	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (15", 0.500")	128 LF		
0082	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (18", 0.500")	332 LF		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0083	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (24", 0.500")	602 LF		
0084	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (30", 0.500")	284 LF		
0085	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (36", 0.500")	308 LF		
0086	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (42", 0.625")	112 LF		
0087	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (48", 0.625")	656 LF		
0088	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (60", 0.875)	146 LF		
0089	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (72", 1.000")	190 LF		
0090	0987000000-E	310	GENERIC PIPE ITEM 15" RC PIPE CULVERT, CLASS V	204 LF		
0091	0987000000-E	310	GENERIC PIPE ITEM 18" RC PIPE CULVERT, CLASS V	152 LF		
0092	0987000000-E	310	GENERIC PIPE ITEM 42" RC PIPE CULVERT, CLASS V	328 LF		
0093	0995000000-E	340	PIPE REMOVAL	5,818 LF		
0094	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0095	1099500000-E	505	SHALLOW UNDERCUT	2,500 CY		
0096	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	100,200 TON		
0097	1110000000-E	510	STABILIZER AGGREGATE	500 TON		
0098	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	47,367 SY		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0099	1121000000-E	520	AGGREGATE BASE COURSE	359 TON		
0100	1220000000-E	545	INCIDENTAL STONE BASE	1,000 TON		
0101	1297000000-E	607	MILLING ASPHALT PAVEMENT, **** DEPTH (1-1/2")	15,570 SY		
0102	1308000000-E	607	MILLING ASPHALT PAVEMENT, **** TO ***** (0" TO 1-1/2")	1,730 SY		
0103	1330000000-E	607	INCIDENTAL MILLING	1,750 SY		
0104	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	48,810 TON		
0105	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	53,700 TON		
0106	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	6,650 TON		
0107	1520000000-E	SP	ASPHALT CONC SURFACE COURSE, TYPE S9.5B (LEVELING COURSE)	100 TON		
0108	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	39,100 TON		
0109	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	7,520 TON		
0110	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	520 TON		
0111	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	65,500 LF		
0112	2000000000-N	806	RIGHT-OF-WAY MARKERS	48 EA		
0113	2022000000-E	815	SUBDRAIN EXCAVATION	1,344 CY		
0114	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	4,000 SY		
0115	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	672 CY		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0116	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	4,000 LF		
0117	2070000000-N	815	SUBDRAIN PIPE OUTLET	8 EA		
0118	2077000000-E	815	6" OUTLET PIPE	48 LF		
0119	2099000000-E	816	SHOULDER DRAIN	3,100 LF		
0120	2110000000-E	816	4" SHOULDER DRAIN PIPE	3,100 LF		
0121	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	125 LF		
0122	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	5 EA		
0123	2143000000-E	818	BLOTTING SAND	500 TON		
0124	2209000000-E	838	ENDWALLS	70 CY		
0125	2220000000-E	838	REINFORCED ENDWALLS	34 CY		
0126	2253000000-E	840	PIPE COLLARS	8 CY		
0127	2275000000-E	SP	FLOWABLE FILL	1,260 CY		
0128	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	183 EA		
0129	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	50 CY		
0130	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	176.2 LF		
0131	2354000000-N	840	FRAME WITH GRATE, STD 840.22	5 EA		
0132	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	58 EA		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0133	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	90 EA		
0134	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	9 EA		
0135	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	2 EA		
0136	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	4 EA		
0137	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	7 EA		
0138	2396000000-N	840	FRAME WITH COVER, STD 840.54	24 EA		
0139	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	1 EA		
0140	2440000000-N	852	CONCRETE TRANSITIONAL SECTION FOR CATCH BASIN	13 EA		
0141	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	2,180 LF		
0142	2556000000-E	846	SHOULDER BERM GUTTER	12,000 LF		
0143	2619000000-E	850	4" CONCRETE PAVED DITCH	220 SY		
0144	2647000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	260 SY		
0145	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	900 LF		
0146	3030000000-E	862	STEEL BEAM GUARDRAIL	21,800 LF		
0147	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	50 LF		
0148	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA		
0149	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	19 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0150	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	33 EA		
0151	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	36 EA		
0152	3360000000-E	863	REMOVE EXISTING GUARDRAIL	7,575 LF		
0153	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	1,900 LF		
0154	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ***** (CAT-1)	5 EA		
0155	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	5 EA		
0156	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	10,175 LF		
0157	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	637 EA		
0158	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	165 EA		
0159	3557000000-E	866	ADDITIONAL BARBED WIRE	500 LF		
0160	3628000000-E	876	RIP RAP, CLASS I	8,200 TON		
0161	3635000000-E	876	RIP RAP, CLASS II	720 TON		
0162	3649000000-E	876	RIP RAP, CLASS B	1,100 TON		
0163	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	19,050 SY		
0164	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	24 CY		
0165	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	7 CY		
0166	4057000000-E	SP	OVERHEAD FOOTING	247 CY		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0167	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	19,264 LB		
0168	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	11,317 LB		
0169	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	3,565 LF		
0170	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	142 EA		
0171	4082000000-E	903	SUPPORTS, WOOD	247 LF		
0172	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-118+00.00 -40E-)	Lump Sum	L.S.	
0173	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (128+35.00 -L-)	Lump Sum	L.S.	
0174	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (16+09.00 -L-)	Lump Sum	L.S.	
0175	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (25+15.00 -Y1-)	Lump Sum	L.S.	
0176	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (31+97.00 -Y2SBL-)	Lump Sum	L.S.	
0177	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-351+06.00 -52S-)	Lump Sum	L.S.	
0178	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-40+00.00 -40E-)	Lump Sum	L.S.	
0179	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (43+96.00 -Y2NBL-)	Lump Sum	L.S.	
0180	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (55+69.00 -L-)	Lump Sum	L.S.	
0181	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (58+00.00 -Y2SBL-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0182	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (69+20.00 -Y2SBL-)	Lump Sum	L.S.	
0183	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (70+74.00 -Y2NBL-)	Lump Sum	L.S.	
0184	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (71+22.00 -40E-)	Lump Sum	L.S.	
0185	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (82+00.00 -L-)	Lump Sum	L.S.	
0186	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (82+11.00 -Y2SBL-)	Lump Sum	L.S.	
0187	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (86+60.00 -L-)	Lump Sum	L.S.	
0188	4096000000-N	904	SIGN ERECTION, TYPE D	16 EA		
0189	4102000000-N	904	SIGN ERECTION, TYPE E	63 EA		
0190	4108000000-N	904	SIGN ERECTION, TYPE F	53 EA		
0191	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	71 EA		
0192	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	24 EA		
0193	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	58 EA		
0194	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	26 EA		
0195	4114000000-N	904	SIGN ERECTION, MILEMARKERS	140 EA		
0196	4115000000-N	904	SIGN ERECTION, OVERLAY (OVERHEAD)	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0197	4116000000-N	904	SIGN ERECTION, OVERLAY (GROUND MOUNTED)	43 EA		
0198	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	3 EA		
0199	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	31 EA		
0200	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	153 EA		
0201	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	41 EA		
0202	4236000000-N	907	DISPOSAL OF SIGN, A & B (GROUND MOUNTED)	21 EA		
0203	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	690 SF		
0204	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	1,834 SF		
0205	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	128 SF		
0206	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	509 SF		
0207	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	208 SF		
0208	4415000000-N	1115	FLASHING ARROW BOARD	8 EA		
0209	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	6 EA		
0210	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	48 DAY		
0211	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	8 EA		
0212	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	18 EA		
0213	4432000000-N	SP	HIGH VISIBILITY DRUMS	323 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0214	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	24 EA		
0215	4435000000-N	1135	CONES	34 EA		
0216	4445000000-E	1145	BARRICADES (TYPE III)	388 LF		
0217	4455000000-N	1150	FLAGGER	16 DAY		
0218	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	14 EA		
0219	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	9 EA		
0220	4480000000-N	1165	TMA	4 EA		
0221	4485000000-E	1170	PORTABLE CONCRETE BARRIER	25,200 LF		
0222	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	487 LF		
0223	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	16,627 LF		
0224	4510000000-N	1190	LAW ENFORCEMENT	208 HR		
0225	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	2,965 EA		
0226	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	21,563 LF		
0227	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	108,682 LF		
0228	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	18,262 LF		
0229	4709000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	55 LF		
0230	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	44 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0231	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	51 EA		
0232	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (II)	5,619 LF		
0233	4775000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (II)	8,157 LF		
0234	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (II)	62 LF		
0235	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	53,663 LF		
0236	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	1,862 LF		
0237	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	206 LF		
0238	4840000000-N	1205	PAINT PAVEMENT MARKING CHARACTER	88 EA		
0239	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	112 EA		
0240	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	236,251 LF		
0241	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	13,248 LF		
0242	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	8,247 LF		
0243	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	151,529 LF		
0244	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	600 LF		
0245	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	7,447 LF		
0246	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	44 LF		
0247	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	33 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0248	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	58 EA		
0249	4905100000-N	SP	NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	1,670 EA		
0250	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0251	5325600000-E	1510	6" WATER LINE	32 LF		
0252	5325800000-E	1510	8" WATER LINE	165 LF		
0253	5327400000-E	1510	24" WATER LINE	74 LF		
0254	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	6,175 LB		
0255	5540000000-E	1515	6" VALVE	4 EA		
0256	5648000000-N	1515	RELOCATE WATER METER	3 EA		
0257	5666000000-N	1515	FIRE HYDRANT	3 EA		
0258	5673000000-E	1515	FIRE HYDRANT LEG	83 LF		
0259	5686500000-E	1515	WATER SERVICE LINE	39 LF		
0260	5691300000-E	1520	8" SANITARY GRAVITY SEWER	1,461 LF		
0261	5691600000-E	1520	16" SANITARY GRAVITY SEWER	1,080 LF		
0262	5691800000-E	1520	20" SANITARY GRAVITY SEWER	39 LF		
0263	5692000000-E	1520	30" SANITARY GRAVITY SEWER	2,062 LF		
0264	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	4 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0265	5768500000-E	1520	SEWER SERVICE LINE	400 LF		
0266	5775000000-E	1525	4' DIA UTILITY MANHOLE	10 EA		
0267	5776000000-E	1525	5' DIA UTILITY MANHOLE	19 EA		
0268	5777000000-E	1525	6' DIA UTILITY MANHOLE	3 EA		
0269	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	54 LF		
0270	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	144 LF		
0271	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	18 LF		
0272	5798000000-E	1530	ABANDON *** UTILITY PIPE (15")	1,704 LF		
0273	5804000000-E	1530	ABANDON 12" UTILITY PIPE	465 LF		
0274	5810000000-E	1530	ABANDON 16" UTILITY PIPE	38 LF		
0275	5812000000-E	1530	ABANDON 20" UTILITY PIPE	1,455 LF		
0276	5813000000-E	1530	ABANDON 24" UTILITY PIPE	63 LF		
0277	5814000000-E	1530	ABANDON 30" UTILITY PIPE	659 LF		
0278	5815000000-N	1530	REMOVE WATER METER	2 EA		
0279	5815500000-N	1530	REMOVE FIRE HYDRANT	4 EA		
0280	5816000000-N	1530	ABANDON UTILITY MANHOLE	15 EA		
0281	5828000000-N	1530	REMOVE UTILITY MANHOLE	2 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0282	5835000000-E	1540	*** ENCASEMENT PIPE (54")	260 LF		
0283	5835700000-E	1540	16" ENCASEMENT PIPE	100 LF		
0284	6000000000-E	1605	TEMPORARY SILT FENCE	62,925 LF		
0285	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	3,640 TON		
0286	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	13,760 TON		
0287	6012000000-E	1610	SEDIMENT CONTROL STONE	9,110 TON		
0288	6015000000-E	1615	TEMPORARY MULCHING	415.5 ACR		
0289	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	22,600 LB		
0290	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	114.5 TON		
0291	6024000000-E	1622	TEMPORARY SLOPE DRAINS	9,585 LF		
0292	6029000000-E	SP	SAFETY FENCE	800 LF		
0293	6030000000-E	1630	SILT EXCAVATION	23,690 CY		
0294	6036000000-E	1631	MATting FOR EROSION CONTROL	59,405 SY		
0295	6037000000-E	SP	COIR FIBER MAT	180 SY		
0296	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	5,000 SY		
0297	6042000000-E	1632	1/4" HARDWARE CLOTH	9,410 LF		
0298	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	50 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0299	6069000000-E	1638	STILLING BASINS	2,309 CY		
0300	6070000000-N	1639	SPECIAL STILLING BASINS	10 EA		
0301	6071012000-E	SP	COIR FIBER WATTLE	3,480 LF		
0302	6071014000-E	SP	COIR FIBER WATTLE BARRIER	490 LF		
0303	6071020000-E	SP	POLYACRYLAMIDE (PAM)	3,405 LB		
0304	6071030000-E	1640	COIR FIBER BAFFLE	2,275 LF		
0305	6071050000-E	SP	*** SKIMMER (1-1/2")	12 EA		
0306	6071050000-E	SP	*** SKIMMER (2")	2 EA		
0307	6071050000-E	SP	*** SKIMMER (2-1/2")	3 EA		
0308	6084000000-E	1660	SEEDING & MULCHING	333 ACR		
0309	6087000000-E	1660	MOWING	270 ACR		
0310	6090000000-E	1661	SEED FOR REPAIR SEEDING	4,200 LB		
0311	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	11.5 TON		
0312	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	8,200 LB		
0313	6108000000-E	1665	FERTILIZER TOPDRESSING	246 TON		
0314	6111000000-E	SP	IMPERVIOUS DIKE	710 LF		
0315	6114500000-N	1667	SPECIALIZED HAND MOWING	10 MHR		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0316	6114800000-N	SP	MANUAL LITTER REMOVAL	1 MHR		
0317	6114900000-E	SP	LITTER DISPOSAL	2 TON		
0318	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	75 EA		
0319	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	10 EA		
0320	6120000000-E	SP	CULVERT DIVERSION CHANNEL	1,400 CY		
0321	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	88 EA		
0322	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	88 EA		
0323	7279000000-E	1715	TRACER WIRE	20,451 LF		
0324	7300000000-E	1715	UNPAVED TRENCHING (***** (1, 2"))	1,447 LF		
0325	7300000000-E	1715	UNPAVED TRENCHING (***** (2, 2"))	13,448 LF		
0326	7300000000-E	1715	UNPAVED TRENCHING (***** (3, 2"))	1,488 LF		
0327	7301000000-E	1715	DIRECTIONAL DRILL (***** (2, 2"))	5,515 LF		
0328	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	29 EA		
0329	7360000000-N	1720	WOOD POLE	7 EA		
0330	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (144)	14,730 LF		
0331	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (72)	6,074 LF		
0332	7528000000-E	1730	DROP CABLE	1,689 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0333	7540000000-N	1731	SPLICE ENCLOSURE	8 EA		
0334	7552000000-N	1731	INTERCONNECT CENTER	11 EA		
0335	7566000000-N	1733	DELINEATOR MARKER	37 EA		
0336	7980000000-N	SP	GENERIC SIGNAL ITEM 10KVA SINGLE PHASE TRANSFORMER	1 EA		
0337	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	43 EA		
0338	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV EXTENSION POLE	1 EA		
0339	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE (50')	5 EA		
0340	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	6 EA		
0341	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	3 EA		
0342	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	3 EA		
0343	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)	3 EA		
0344	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	10 EA		
0345	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	8 EA		
0346	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	5 EA		
0347	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET	1 EA		
0348	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER	1 EA		
0349	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0350	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVERSIZED)	8 EA		
0351	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (STANDARD SIZE)	26 EA		
0352	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINATION PANEL	7 EA		
0353	7980000000-N	SP	GENERIC SIGNAL ITEM SOIL TEST	5 EA		
0354	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	1 EA		
0355	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR	430 LF		
0356	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS	2,239 LF		
0357	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS	1,897 LF		
0358	7992000000-E	SP	GENERIC SIGNAL ITEM DRILLED PIER FOUNDATION	40 CY		
0359	7992000000-E	SP	GENERIC SIGNAL ITEM OVERHEAD FOOTINGS	24 CY		
CULVERT ITEMS						
0360	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (32+77.50 -L-)	Lump Sum	L.S.	
0361	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0362	8126000000-N	414	CULVERT EXCAVATION, STA ***** (32+77.50 -L-)	Lump Sum	L.S.	
0363	8126000000-N	414	CULVERT EXCAVATION, STA ***** (36+27.30 -L-)	Lump Sum	L.S.	
0364	8126000000-N	414	CULVERT EXCAVATION, STA ***** (78+68.93 -Y2-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0365	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	1,293 TON		
0366	8196000000-E	420	CLASS A CONCRETE (CULVERT)	2,144 CY		
0367	8245000000-E	425	REINFORCING STEEL (CULVERT)	262,053 LB		
0368	8590000000-E	876	RIP RAP, CLASS ** (I)	722 TON		
0369	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	1,195 SY		
WALL ITEMS						
0370	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	1,875 SF		
0371	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	4,205 SF		
0372	8801000000-E	SP	MSE RETAINING WALL NO **** (3)	9,155 SF		
0373	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	2,625 SF		
0374	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	275 SF		
0375	8802010000-E	SP	SOIL NAIL RETAINING WALLS	2,560 SF		
0376	8802015100-N	SP	SOIL NAIL VERIFICATION TESTS	2 EA		
0377	8802015110-N	SP	SOIL NAIL PROOF TESTS	8 EA		
0378	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT (SOUND BARRIER WALL)	57,008 SF		
0379	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL -NW7-	29,793 SF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
STRUCTURE ITEMS						
0380	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0381	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0382	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0383	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (1, 20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0384	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (1, 29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0385	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (2, 20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0386	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (2, 29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0387	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0388	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 28+33.21 -Y2FLYAB-)	Lump Sum	L.S.	
0389	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0390	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,30+02.29 -Y2FLYCA-)	Lump Sum	L.S.	
0391	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,30+69.44 -Y1-)	Lump Sum	L.S.	
0392	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0393	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2, 28+33.21 -Y2FLYAB-)	Lump Sum	L.S.	

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0394	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0395	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0396	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,30+02.29 -Y2FLYCA-)	Lump Sum	L.S.	
0397	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0398	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (3, 28+33.21 -Y2FLYAB-)	Lump Sum	L.S.	
0399	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (3,39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0400	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (4,39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0401	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (5,39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0402	8096000000-E	450	PILE EXCAVATION IN SOIL	50 LF		
0403	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	39 LF		
0404	8105500000-E	411	***-*** DIA DRILLED PIERS IN SOIL (5'-0")	293.42 LF		
0405	8105600000-E	411	***-*** DIA DRILLED PIERS NOT IN SOIL (5'-0")	135 LF		
0406	8111000000-E	411	PERMANENT STEEL CASING FOR ***- *** DIA DRILLED PIER (5'-0")	156.4 LF		
0407	8112730000-N	450	PDA TESTING	3 EA		
0408	8113000000-N	411	SID INSPECTIONS	1 EA		

County: FORSYTH

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0409	8115000000-N	411	CSL TESTING	2 EA		
0410	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	140,631 SF		
0411	8161000000-E	420	GROOVING BRIDGE FLOORS	167,767.5 SF		
0412	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	4,235 CY		
0413	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (20+68.01 -Y2NBL-)	Lump Sum	L.S.	
0414	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (22+84.09 -Y1-)	Lump Sum	L.S.	
0415	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (28+33.21 -Y2FLAYAB-)	Lump Sum	L.S.	
0416	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (29+89.90 -Y2SBL-)	Lump Sum	L.S.	
0417	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (30+02.29 -Y2FLYCA-)	Lump Sum	L.S.	
0418	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (30+69.44 -Y1-)	Lump Sum	L.S.	
0419	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (39+65.10 -Y2FLYCA-)	Lump Sum	L.S.	
0420	8217000000-E	425	REINFORCING STEEL (BRIDGE)	912,235 LB		
0421	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	28,249 LB		
0422	8274000000-E	430	MODIFIED 63" PRESTRESSED CONC GIRDERS	571.56 LF		
0423	8280000000-E	440	APPROX LBS STRUCTURAL STEEL	7,832,823 LS		
0424	8296000000-N	442	POLLUTION CONTROL	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0426	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	72 EA		
0427	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)	276 EA		
0428	8364000000-E	450	HP 12 X 53 STEEL PILES	3,627 LF		
0429	8384000000-E	450	HP 14 X 73 STEEL PILES	13,618.75 LF		
0430	8391000000-N	450	STEEL PILE POINTS	8 EA		
0431	8392500000-E	450	PREDRILLING FOR PILES	200 LF		
0432	8503000000-E	460	CONCRETE BARRIER RAIL	6,757.03 LF		
0433	8531000000-E	462	4" SLOPE PROTECTION	2,425.7 SY		
0434	8559000000-E	SP	CLASS II, SURFACE PREPARATION	43.1 SY		
0435	8654000000-N	SP	DISC BEARINGS	Lump Sum	L.S.	
0436	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0437	8664000000-E	SP	SHOTCRETE REPAIRS	111.7 CF		
0438	8678000000-E	SP	EPOXY RESIN INJECTION	100.8 LF		
0439	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum	L.S.	
0440	8713000000-N	SP	MODULAR EXPANSION JOINT SEALS	Lump Sum	L.S.	
0441	8860000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE #330394	Lump Sum	L.S.	
0442	8860000000-N	SP	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE #330394	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0443	8860000000-N	SP	GENERIC STRUCTURE ITEM POST-TENSIONING ENCASEMENT	Lump Sum	L.S.	
0444	8860000000-N	SP	GENERIC STRUCTURE ITEM POST-TENSIONING TENDONS	Lump Sum	L.S.	
0445	8860000000-N	SP	GENERIC STRUCTURE ITEM STRIP SEAL EXPANSION JOINT	Lump Sum	L.S.	
0446	8867000000-E	SP	GENERIC STRUCTURE ITEM FOAM JOINT SEALS FOR PRESERVATION	522.11 LF		
0447	8867000000-E	SP	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT	445.08 LF		
0448	8881000000-E	SP	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE	75.2 CY		
0449	8889000000-E	SP	GENERIC STRUCTURE ITEM BEAM REPAIR PLATING	11.8 LB		
0450	8892000000-E	SP	GENERIC STRUCTURE ITEM BRIDGE JOINT DEMOLITION	219 SF		
0451	8892000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE MEDIAN REPLACEMENT	955.5 SF		
0452	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATING	1,542.1 SF		
0453	8893000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE DECK REPAIR FOR POLYMER CONCRETE OVERLAY	43.1 SY		
0454	8893000000-E	SP	GENERIC STRUCTURE ITEM PLACING AND FINISHING POLYMER CONCRETE OVERLAY	5,331.5 SY		
0455	8893000000-E	SP	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK	4,625.5 SY		
0456	8893000000-E	SP	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK	4,625.5 SY		
0457	8897000000-N	SP	GENERIC STRUCTURE ITEM 11-3/4" DIA MICROPILES	82 EA		
0458	8897000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING BEARINGS WITH HIGH RATIO CALCIUM SULFONATE	32 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0459	8897000000-N	SP	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES	1 EA		
0460	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS	8 EA		
0461	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS	1 EA		
0462	8897000000-N	SP	GENERIC STRUCTURE ITEM STEEL BEARING KEEPER ANGLE ASSEMBLY	1 EA		
0463	8897000000-N	SP	GENERIC STRUCTURE ITEM STEEL BEARING RETAINER ANGLE ASSEMBLY	1 EA		
***** BEGIN SCHEDULE AA ***** ***** (2 ALTERNATES) *****						
0464 AA1	8881000000-E	SP	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS	121.1 CY		
*** OR ***						
0465 AA2	8881000000-E	SP	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIALS	121.1 CY		
***** END SCHEDULE AA *****						

1134/Oct12/Q12454797.25/D2186166246210/E463

Total Amount Of Bid For Entire Project :

Vendor 1 of 7: FLATIRON CONSTRUCTORS INC (3076)
Call Order 001 (Proposal: C204746)

Bid Information

Proposal County: FORSYTH

Vendor Address: 860 AVIATION PARKWAY
MORRISVILLE , NC , 27560

Signature Check: James Alan Schneiderman

Time Bid Received: October 18, 2022 01:57 PM

Amendment Count: 3

Bid Checksum: 4DC2623C26

Bid Total: \$126,045,009.70

Items Total: \$126,045,009.70

Time Total: \$0.00

Bidding Errors:

None.

DBE Goal: 3.00% (\$3,781,350.29)
Participation Submitted 6.05% (\$4,234,715.10)

Vendor 1 of 7: FLATIRON CONSTRUCTORS INC (3076)
Call Order 001 (Proposal: C204746)

Bid Bond Information

Projects:	Bond Maximum:
Counties:	State of Incorporation:
Bond ID: SNC09306885	Agency Execution Date: 09/30/2022 01
Paid by Check: No	Surety Name: Surety2000
Bond Percent: 5%	Bond Agency Name: Liberty Mutual Insurance Company

DBE Load Information

Letting ID: L221018
Letting Date: 10/18/2022
Call Order: 001
Contract ID: C204746
Project: 0074226007422600742260074226
Bid Total: \$126,045,009.70
DBE Goal: 3.00% (\$3,781,350.29)

Vendor ID: 3076
Vendor Name: Flatiron Constructors Inc
DBE Entered: 3.36% (\$4,234,715.10)

Vendor ID	DBE Name	Is Supplier?	City/State	Goods/Service	Amount
12802	NICKELSTON INDUSTRIES INC	False	POST OFFICE BOX 133 LAWSONVILLE, NC 27022	SubContractor	810,600.50
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	POST OFFICE BOX 24511 WINSTON-SALEM, NC 27114	SubContractor	2,791,985.00
11572	CRUZ BROTHERS CONCRETE, INC.	False	1572 PAYNE ROAD/LOT 75 LOT 75 , GRAHAM, NC 27253	SubContractor	632,129.60

Letting: L221018
10/18/2022 02:00:00 PM

North Carolina Department of Transportation
3076 - Flatiron Constructors Inc

Contract ID: C204746
Call: 001

BondID: SNC09306885

Surety Registry Agency: Surety2000

Verified?: 1

Surety Agency: Liberty Mutual Insurance Company

Bond Execution Date: 09/30/2022 01:47:45 PM

Line Number	Item Number	Quantity	Unit	Unit Price	Extension Price
Section 0001					
ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	\$6,302,000.0000	\$6,302,000.00
0002	0000400000-N CONSTRUCTION SURVEYING	1.000	LS	\$1,500,000.0000	\$1,500,000.00
0003	0000700000-N FIELD OFFICE	1.000	LS	\$300,000.0000	\$300,000.00
0004	0001000000-E CLEARING & GRUBBING .. ACRE(S)	1.000	LS	\$9,778,000.0000	\$9,778,000.00
0005	0008000000-E SUPPLEMENTARY CLEARING & GRUBBING	4.000	ACR	\$13,500.0000	\$54,000.00
0006	0015000000-N SEALING ABANDONED WELLS	2.000	EA	\$2,567.0700	\$5,134.14
0007	0022000000-E UNCLASSIFIED EXCAVATION	435000.000	CY	\$5.5000	\$2,392,500.00
0008	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (20+68.01 -Y2NBL-)	1.000	LS	\$20,000.0000	\$20,000.00
0009	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (22+84.09 -Y1-)	1.000	LS	\$35,000.0000	\$35,000.00
0010	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (28+33.21 -Y2FLYAB-)	1.000	LS	\$90,000.0000	\$90,000.00
0011	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (29+89.90 -Y2SBL-)	1.000	LS	\$22,500.0000	\$22,500.00
0012	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (30+02.29 -Y2FLYCA-)	1.000	LS	\$50,000.0000	\$50,000.00
0013	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (30+69.44 -Y1-)	1.000	LS	\$48,000.0000	\$48,000.00
0014	0028000000-N TYPE I STANDARD APPROACH FILL STATION ***** (39+65.10 -Y2FLYCA-)	1.000	LS	\$47,000.0000	\$47,000.00
0016	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ***** (30+69.44 -Y1-)	1.000	LS	\$55,000.0000	\$55,000.00
0017	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ***** (39+65.10 -Y2FLYCA-)	1.000	LS	\$53,000.0000	\$53,000.00
0018	0036000000-E UNDERCUT EXCAVATION	1750.000	CY	\$14.0000	\$24,500.00
0019	0106000000-E BORROW EXCAVATION	640000.000	CY	\$0.0100	\$6,400.00
0020	0127000000-N EMBANKMENT SETTLEMENT GAUGES	10.000	EA	\$400.0000	\$4,000.00
0021	0134000000-E DRAINAGE DITCH EXCAVATION	7500.000	CY	\$7.5000	\$56,250.00
0022	0141000000-E BERM DITCH CONSTRUCTION	1050.000	LF	\$8.0000	\$8,400.00
0023	0156000000-E REMOVAL OF EXISTING ASPHALT PAVEMENT	72600.000	SY	\$5.6000	\$406,560.00
0024	0177000000-E BREAKING OF EXISTING ASPHALT PAVEMENT	3910.000	SY	\$4.2500	\$16,617.50

0025	0192000000-N	30.000	HR	\$150.0000	\$4,500.00
	PROOF ROLLING				
0026	0195000000-E	22450.000	CY	\$0.0100	\$224.50
	SELECT GRANULAR MATERIAL				
0027	0196000000-E	127000.000	SY	\$2.0000	\$254,000.00
	GEOTEXTILE FOR SOIL STABILIZATION				
0028	0199000000-E	970.000	SF	\$148.0000	\$143,560.00
	TEMPORARY SHORING				
0029	0223000000-E	2550.000	SY	\$70.0000	\$178,500.00
	ROCK PLATING				
0030	0241000000-E	29390.000	SY	\$4.5000	\$132,255.00
	GENERIC GRADING ITEM GEOTEXTILE FOR EMBANKMENT STABILIZATION, TYPE 5				
0031	0318000000-E	3050.000	TON	\$45.0000	\$137,250.00
	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES				
0032	0320000000-E	10438.000	SY	\$3.5000	\$36,533.00
	FOUNDATION CONDITIONING GEOTEXTILE				
0033	0342000000-E	1380.000	LF	\$145.0000	\$200,100.00
	*** SIDE DRAIN PIPE (30")				
0034	0342000000-E	1036.000	LF	\$160.0000	\$165,760.00
	*** SIDE DRAIN PIPE (36")				
0035	0342000000-E	180.000	LF	\$300.0000	\$54,000.00
	*** SIDE DRAIN PIPE (42")				
0036	0342000000-E	528.000	LF	\$325.0000	\$171,600.00
	*** SIDE DRAIN PIPE (48")				
0037	0342000000-E	48.000	LF	\$425.0000	\$20,400.00
	*** SIDE DRAIN PIPE (54")				
0038	0342000000-E	108.000	LF	\$575.0000	\$62,100.00
	*** SIDE DRAIN PIPE (60")				
0039	0342000000-E	212.000	LF	\$800.0000	\$169,600.00
	*** SIDE DRAIN PIPE (72")				
0040	0343000000-E	5024.000	LF	\$90.0000	\$452,160.00
	15" SIDE DRAIN PIPE				
0041	0344000000-E	2000.000	LF	\$100.0000	\$200,000.00
	18" SIDE DRAIN PIPE				
0042	0345000000-E	932.000	LF	\$125.0000	\$116,500.00
	24" SIDE DRAIN PIPE				
0043	0348000000-E	59.000	EA	\$560.0000	\$33,040.00
	*** SIDE DRAIN PIPE ELBOWS (15")				
0044	0348000000-E	32.000	EA	\$625.0000	\$20,000.00
	*** SIDE DRAIN PIPE ELBOWS (18")				
0045	0348000000-E	14.000	EA	\$750.0000	\$10,500.00
	*** SIDE DRAIN PIPE ELBOWS (24")				
0046	0348000000-E	2.000	EA	\$1,250.0000	\$2,500.00
	*** SIDE DRAIN PIPE ELBOWS (30")				
0047	0348000000-E	2.000	EA	\$1,500.0000	\$3,000.00
	*** SIDE DRAIN PIPE ELBOWS (36")				
0048	0348000000-E	2.000	EA	\$2,800.0000	\$5,600.00
	*** SIDE DRAIN PIPE ELBOWS (48")				
0049	0348000000-E	2.000	EA	\$3,200.0000	\$6,400.00

*** SIDE DRAIN PIPE ELBOWS (54")				
0050	0366000000-E	1344.000 LF	\$92.0000	\$123,648.00
	15" RC PIPE CULVERTS, CLASS III			
0051	0372000000-E	300.000 LF	\$125.0000	\$37,500.00
	18" RC PIPE CULVERTS, CLASS III			
0052	0378000000-E	584.000 LF	\$145.0000	\$84,680.00
	24" RC PIPE CULVERTS, CLASS III			
0053	0384000000-E	608.000 LF	\$155.0000	\$94,240.00
	30" RC PIPE CULVERTS, CLASS III			
0054	0390000000-E	632.000 LF	\$190.0000	\$120,080.00
	36" RC PIPE CULVERTS, CLASS III			
0055	0396000000-E	220.000 LF	\$290.0000	\$63,800.00
	42" RC PIPE CULVERTS, CLASS III			
0056	0402000000-E	132.000 LF	\$350.0000	\$46,200.00
	48" RC PIPE CULVERTS, CLASS III			
0057	0408000000-E	748.000 LF	\$450.0000	\$336,600.00
	54" RC PIPE CULVERTS, CLASS III			
0058	0448000000-E	236.000 LF	\$380.0000	\$89,680.00
	***** RC PIPE CULVERTS, CLASS IV (48")			
0059	0448200000-E	844.000 LF	\$110.0000	\$92,840.00
	15" RC PIPE CULVERTS, CLASS IV			
0060	0448300000-E	604.000 LF	\$115.0000	\$69,460.00
	18" RC PIPE CULVERTS, CLASS IV			
0061	0448400000-E	136.000 LF	\$145.0000	\$19,720.00
	24" RC PIPE CULVERTS, CLASS IV			
0062	0448500000-E	628.000 LF	\$225.0000	\$141,300.00
	30" RC PIPE CULVERTS, CLASS IV			
0063	0448600000-E	172.000 LF	\$240.0000	\$41,280.00
	36" RC PIPE CULVERTS, CLASS IV			
0064	0448700000-E	248.000 LF	\$325.0000	\$80,600.00
	42" RC PIPE CULVERTS, CLASS IV			
0065	0576000000-E	88.000 LF	\$300.0000	\$26,400.00
	*** CS PIPE CULVERTS, ***** THICK (48", 0.109")			
0066	0582000000-E	672.000 LF	\$105.0000	\$70,560.00
	15" CS PIPE CULVERTS, 0.064" THICK			
0067	0588000000-E	40.000 LF	\$125.0000	\$5,000.00
	18" CS PIPE CULVERTS, 0.064" THICK			
0068	0594000000-E	144.000 LF	\$140.0000	\$20,160.00
	24" CS PIPE CULVERTS, 0.064" THICK			
0069	0636000000-E	6.000 EA	\$825.0000	\$4,950.00
	*** CS PIPE ELBOWS, ***** THICK (15", 0.064")			
0070	0636000000-E	2.000 EA	\$1,000.0000	\$2,000.00
	*** CS PIPE ELBOWS, ***** THICK (24", 0.064")			
0071	0636000000-E	2.000 EA	\$1,800.0000	\$3,600.00
	*** CS PIPE ELBOWS, ***** THICK (48", 0.109")			
0072	0973100000-E	128.000 LF	\$785.0000	\$100,480.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (15", 0.500")			
0073	0973100000-E	332.000 LF	\$815.0000	\$270,580.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (18", 0.500")			

0074	0973100000-E	602.000	LF	\$950.0000	\$571,900.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (24", 0.500")				
0075	0973100000-E	284.000	LF	\$1,150.0000	\$326,600.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (30", 0.500")				
0076	0973100000-E	308.000	LF	\$875.0000	\$269,500.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (36", 0.500")				
0077	0973100000-E	112.000	LF	\$1,675.0000	\$187,600.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (42", 0.625")				
0078	0973100000-E	656.000	LF	\$1,290.0000	\$846,240.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (48", 0.625")				
0079	0973100000-E	146.000	LF	\$2,700.0000	\$394,200.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (60", 0.875)				
0080	0973100000-E	190.000	LF	\$3,100.0000	\$589,000.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (72", 1.000")				
0081	0973300000-E	128.000	LF	\$0.0100	\$1.28
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (15", 0.500")				
0082	0973300000-E	332.000	LF	\$0.0100	\$3.32
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (18", 0.500")				
0083	0973300000-E	602.000	LF	\$0.0100	\$6.02
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (24", 0.500")				
0084	0973300000-E	284.000	LF	\$0.0100	\$2.84
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (30", 0.500")				
0085	0973300000-E	308.000	LF	\$1,808.0000	\$556,864.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (36", 0.500")				
0086	0973300000-E	112.000	LF	\$0.0100	\$1.12
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (42", 0.625")				
0087	0973300000-E	656.000	LF	\$2,040.0000	\$1,338,240.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (48", 0.625")				
0088	0973300000-E	146.000	LF	\$0.0100	\$1.46
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (60", 0.875)				
0089	0973300000-E	190.000	LF	\$4,060.0000	\$771,400.00
	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (72", 1.000")				
0090	0987000000-E	204.000	LF	\$140.0000	\$28,560.00
	GENERIC PIPE ITEM 15" RC PIPE CULVERT, CLASS V				
0091	0987000000-E	152.000	LF	\$140.0000	\$21,280.00
	GENERIC PIPE ITEM 18" RC PIPE CULVERT, CLASS V				
0092	0987000000-E	328.000	LF	\$350.0000	\$114,800.00
	GENERIC PIPE ITEM 42" RC PIPE CULVERT, CLASS V				
0093	0995000000-E	5818.000	LF	\$24.0000	\$139,632.00
	PIPE REMOVAL				
0094	1011000000-N	1.000	LS	\$1,500,000.0000	\$1,500,000.00
	FINE GRADING				
0095	1099500000-E	2500.000	CY	\$15.0000	\$37,500.00
	SHALLOW UNDERCUT				
0096	1099700000-E	100200.000	TON	\$38.0000	\$3,807,600.00
	CLASS IV SUBGRADE STABILIZATION				
0097	1110000000-E	500.000	TON	\$45.0000	\$22,500.00
	STABILIZER AGGREGATE				
0098	1115000000-E	47367.000	SY	\$4.0000	\$189,468.00

GEOTEXTILE FOR PAVEMENT STABILIZATION				
0099	1121000000-E	359.000 TON	\$70.0000	\$25,130.00
	AGGREGATE BASE COURSE			
0100	1220000000-E	1000.000 TON	\$65.0000	\$65,000.00
	INCIDENTAL STONE BASE			
0101	1297000000-E	15570.000 SY	\$1.9500	\$30,361.50
	MILLING ASPHALT PAVEMENT, ***" DEPTH (1-1/2")			
0102	1308000000-E	1730.000 SY	\$7.3000	\$12,629.00
	MILLING ASPHALT PAVEMENT, ****" TO *****" (0" TO 1-1/2")			
0103	1330000000-E	1750.000 SY	\$10.0000	\$17,500.00
	INCIDENTAL MILLING			
0104	1491000000-E	48810.000 TON	\$46.0000	\$2,245,260.00
	ASPHALT CONC BASE COURSE, TYPE B25.0C			
0105	1503000000-E	53700.000 TON	\$44.0000	\$2,362,800.00
	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C			
0106	1519000000-E	6650.000 TON	\$57.0000	\$379,050.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5B			
0107	1520000000-E	100.000 TON	\$93.0000	\$9,300.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5B (LEVELING COURSE)			
0108	1523000000-E	39100.000 TON	\$44.0000	\$1,720,400.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5C			
0109	1575000000-E	7520.000 TON	\$915.0000	\$6,880,800.00
	ASPHALT BINDER FOR PLANT MIX			
0110	1693000000-E	520.000 TON	\$200.0000	\$104,000.00
	ASPHALT PLANT MIX, PAVEMENT REPAIR			
0111	1840000000-E	65500.000 LF	\$0.3100	\$20,305.00
	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)			
0112	2000000000-N	48.000 EA	\$550.0000	\$26,400.00
	RIGHT-OF-WAY MARKERS			
0113	2022000000-E	1344.000 CY	\$36.0000	\$48,384.00
	SUBDRAIN EXCAVATION			
0114	2026000000-E	4000.000 SY	\$14.5000	\$58,000.00
	GEOTEXTILE FOR SUBSURFACE DRAINS			
0115	2036000000-E	672.000 CY	\$77.0000	\$51,744.00
	SUBDRAIN COARSE AGGREGATE			
0116	2044000000-E	4000.000 LF	\$18.5000	\$74,000.00
	6" PERFORATED SUBDRAIN PIPE			
0117	2070000000-N	8.000 EA	\$407.0000	\$3,256.00
	SUBDRAIN PIPE OUTLET			
0118	2077000000-E	48.000 LF	\$46.0000	\$2,208.00
	6" OUTLET PIPE			
0119	2099000000-E	3100.000 LF	\$17.0000	\$52,700.00
	SHOULDER DRAIN			
0120	2110000000-E	3100.000 LF	\$2.2000	\$6,820.00
	4" SHOULDER DRAIN PIPE			
0121	2121000000-E	125.000 LF	\$24.0000	\$3,000.00
	4" OUTLET PIPE FOR SHOULDER DRAINS			
0122	2132000000-N	5.000 EA	\$492.0000	\$2,460.00
	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET			

0123	2143000000-E BLOTTING SAND	500.000 TON	\$70.0000	\$35,000.00
0124	2209000000-E ENDWALLS	70.000 CY	\$1,400.0000	\$98,000.00
0125	2220000000-E REINFORCED ENDWALLS	34.000 CY	\$2,400.0000	\$81,600.00
0126	2253000000-E PIPE COLLARS	8.000 CY	\$1,350.0000	\$10,800.00
0127	2275000000-E FLOWABLE FILL	1260.000 CY	\$250.0000	\$315,000.00
0128	2286000000-N MASONRY DRAINAGE STRUCTURES	183.000 EA	\$4,200.0000	\$768,600.00
0129	2297000000-E MASONRY DRAINAGE STRUCTURES	50.000 CY	\$3,000.0000	\$150,000.00
0130	2308000000-E MASONRY DRAINAGE STRUCTURES	176.200 LF	\$900.0000	\$158,580.00
0131	2354000000-N FRAME WITH GRATE, STD 840.22	5.000 EA	\$1,150.0000	\$5,750.00
0132	2364200000-N FRAME WITH TWO GRATES, STD 840.20	58.000 EA	\$1,400.0000	\$81,200.00
0133	2365000000-N FRAME WITH TWO GRATES, STD 840.22	90.000 EA	\$1,400.0000	\$126,000.00
0134	2367000000-N FRAME WITH TWO GRATES, STD 840.29	9.000 EA	\$1,400.0000	\$12,600.00
0135	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	2.000 EA	\$1,400.0000	\$2,800.00
0136	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	4.000 EA	\$1,410.0000	\$5,640.00
0137	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	7.000 EA	\$1,410.0000	\$9,870.00
0138	2396000000-N FRAME WITH COVER, STD 840.54	24.000 EA	\$1,150.0000	\$27,600.00
0139	2407000000-N STEEL FRAME WITH TWO GRATES, STD 840.37	1.000 EA	\$4,000.0000	\$4,000.00
0140	2440000000-N CONCRETE TRANSITIONAL SECTION FOR CATCH BASIN	13.000 EA	\$969.3900	\$12,602.07
0141	2549000000-E 2'-6" CONCRETE CURB & GUTTER	2180.000 LF	\$38.0000	\$82,840.00
0142	2556000000-E SHOULDER BERM GUTTER	12000.000 LF	\$45.5000	\$546,000.00
0143	2619000000-E 4" CONCRETE PAVED DITCH	220.000 SY	\$133.0000	\$29,260.00
0144	2647000000-E 5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	260.000 SY	\$91.0000	\$23,660.00
0145	2724000000-E PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	900.000 LF	\$110.0000	\$99,000.00
0146	3030000000-E STEEL BEAM GUARDRAIL	21800.000 LF	\$25.5000	\$555,900.00
0147	3045000000-E	50.000 LF	\$27.5000	\$1,375.00

STEEL BEAM GUARDRAIL, SHOP CURVED					
0148	3150000000-N	10.000 EA	\$58.0000	\$580.00	
	ADDITIONAL GUARDRAIL POSTS				
0149	3210000000-N	19.000 EA	\$914.0000	\$17,366.00	
	GUARDRAIL END UNITS, TYPE CAT-1				
0150	3287000000-N	33.000 EA	\$3,150.0000	\$103,950.00	
	GUARDRAIL END UNITS, TYPE TL-3				
0151	3317000000-N	36.000 EA	\$2,843.0000	\$102,348.00	
	GUARDRAIL ANCHOR UNITS, TYPE B-77				
0152	3360000000-E	7575.000 LF	\$1.1000	\$8,332.50	
	REMOVE EXISTING GUARDRAIL				
0153	3380000000-E	1900.000 LF	\$8.1500	\$15,485.00	
	TEMPORARY STEEL BEAM GUARDRAIL				
0154	3387000000-N	5.000 EA	\$508.0000	\$2,540.00	
	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ***** (CAT-1)				
0155	3389150000-N	5.000 EA	\$1,016.0000	\$5,080.00	
	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)				
0156	3503000000-E	10175.000 LF	\$4.4000	\$44,770.00	
	WOVEN WIRE FENCE, 47" FABRIC				
0157	3509000000-E	637.000 EA	\$32.5000	\$20,702.50	
	4" TIMBER FENCE POSTS, 7'-6" LONG				
0158	3515000000-E	165.000 EA	\$38.6000	\$6,369.00	
	5" TIMBER FENCE POSTS, 8'-0" LONG				
0159	3557000000-E	500.000 LF	\$1.0200	\$510.00	
	ADDITIONAL BARBED WIRE				
0160	3628000000-E	8200.000 TON	\$50.5000	\$414,100.00	
	RIP RAP, CLASS I				
0161	3635000000-E	720.000 TON	\$75.0000	\$54,000.00	
	RIP RAP, CLASS II				
0162	3649000000-E	1100.000 TON	\$170.0000	\$187,000.00	
	RIP RAP, CLASS B				
0163	3656000000-E	19050.000 SY	\$3.7500	\$71,437.50	
	GEOTEXTILE FOR DRAINAGE				
0164	4048000000-E	24.000 CY	\$1,010.1000	\$24,242.40	
	REINFORCED CONCRETE SIGN FOUNDATIONS				
0165	4054000000-E	7.000 CY	\$506.0000	\$3,542.00	
	PLAIN CONCRETE SIGN FOUNDATIONS				
0166	4057000000-E	247.000 CY	\$2,021.0000	\$499,187.00	
	OVERHEAD FOOTING				
0167	4060000000-E	19264.000 LB	\$8.1000	\$156,038.40	
	SUPPORTS, BREAKAWAY STEEL BEAM				
0168	4066000000-E	11317.000 LB	\$8.1000	\$91,667.70	
	SUPPORTS, SIMPLE STEEL BEAM				
0169	4072000000-E	3565.000 LF	\$12.1500	\$43,314.75	
	SUPPORTS, 3-LB STEEL U-CHANNEL				
0170	4078000000-E	142.000 EA	\$76.0000	\$10,792.00	
	SUPPORTS, 2-LB STEEL U-CHANNEL				
0171	4082000000-E	247.000 LF	\$15.2000	\$3,754.40	
	SUPPORTS, WOOD				

0172	4082100000-N	1.000 LS	\$71,718.0000	\$71,718.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(-118+00.00 -40E-)	
0173	4082100000-N	1.000 LS	\$121,213.0000	\$121,213.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(128+35.00 -L-)	
0174	4082100000-N	1.000 LS	\$121,213.0000	\$121,213.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(16+09.00 -L-)	
0175	4082100000-N	1.000 LS	\$151,516.0000	\$151,516.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(25+15.00 -Y1-)	
0176	4082100000-N	1.000 LS	\$146,465.0000	\$146,465.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(31+97.00 -Y2SBL-)	
0177	4082100000-N	1.000 LS	\$60,607.0000	\$60,607.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(-351+06.00 -52S-)	
0178	4082100000-N	1.000 LS	\$72,728.0000	\$72,728.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(-40+00.00 -40E-)	
0179	4082100000-N	1.000 LS	\$95,960.0000	\$95,960.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(43+96.00 -Y2NBL-)	
0180	4082100000-N	1.000 LS	\$111,112.0000	\$111,112.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(55+69.00 -L-)	
0181	4082100000-N	1.000 LS	\$68,687.0000	\$68,687.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(58+00.00 -Y2SBL-)	
0182	4082100000-N	1.000 LS	\$70,708.0000	\$70,708.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(69+20.00 -Y2SBL-)	
0183	4082100000-N	1.000 LS	\$71,718.0000	\$71,718.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(70+74.00 -Y2NBL-)	
0184	4082100000-N	1.000 LS	\$75,758.0000	\$75,758.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(71+22.00 -40E-)	
0185	4082100000-N	1.000 LS	\$75,758.0000	\$75,758.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(82+00.00 -L-)	
0186	4082100000-N	1.000 LS	\$14,142.0000	\$14,142.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(82+11.00 -Y2SBL-)	
0187	4082100000-N	1.000 LS	\$106,061.0000	\$106,061.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****		(86+60.00 -L-)	
0188	4096000000-N	16.000 EA	\$152.0000	\$2,432.00
	SIGN ERECTION, TYPE D			
0189	4102000000-N	63.000 EA	\$66.0000	\$4,158.00
	SIGN ERECTION, TYPE E			
0190	4108000000-N	53.000 EA	\$203.0000	\$10,759.00
	SIGN ERECTION, TYPE F			
0191	4109000000-N	71.000 EA	\$11.0000	\$781.00
	SIGN ERECTION, TYPE *** (OVERHEAD) (A)			
0192	4109000000-N	24.000 EA	\$11.0000	\$264.00
	SIGN ERECTION, TYPE *** (OVERHEAD) (B)			
0193	4110000000-N	58.000 EA	\$809.0000	\$46,922.00
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)			
0194	4110000000-N	26.000 EA	\$405.0000	\$10,530.00
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)			
0195	4114000000-N	140.000 EA	\$51.0000	\$7,140.00
	SIGN ERECTION, MILEMARKERS			
0196	4115000000-N	8.000 EA	\$809.0000	\$6,472.00

SIGN ERECTION, OVERLAY (OVERHEAD)				
0197	4116000000-N	43.000 EA	\$809.0000	\$34,787.00
SIGN ERECTION, OVERLAY (GROUND MOUNTED)				
0198	4149000000-N	3.000 EA	\$17,677.0000	\$53,031.00
DISPOSAL OF SIGN SYSTEM, OVERHEAD				
0199	4152000000-N	31.000 EA	\$506.0000	\$15,686.00
DISPOSAL OF SIGN SYSTEM, STEEL BEAM				
0200	4155000000-N	153.000 EA	\$1.0000	\$153.00
DISPOSAL OF SIGN SYSTEM, U-CHANNEL				
0201	4234000000-N	41.000 EA	\$51.0000	\$2,091.00
DISPOSAL OF SIGN, A OR B (OVERHEAD)				
0202	4236000000-N	21.000 EA	\$51.0000	\$1,071.00
DISPOSAL OF SIGN, A & B (GROUND MOUNTED)				
0203	4400000000-E	690.000 SF	\$6.6000	\$4,554.00
WORK ZONE SIGNS (STATIONARY)				
0204	4402000000-E	1834.000 SF	\$9.0000	\$16,506.00
HIGH VISIBILITY STATIONARY SIGNS				
0205	4405000000-E	128.000 SF	\$8.5000	\$1,088.00
WORK ZONE SIGNS (PORTABLE)				
0206	4407000000-E	509.000 SF	\$9.6000	\$4,886.40
HIGH VISIBILITY PORTABLE SIGNS				
0207	4410000000-E	208.000 SF	\$7.0000	\$1,456.00
WORK ZONE SIGNS (BARRICADE MOUNTED)				
0208	4415000000-N	8.000 EA	\$2,630.0000	\$21,040.00
FLASHING ARROW BOARD				
0209	4420000000-N	6.000 EA	\$10,405.0000	\$62,430.00
PORTABLE CHANGEABLE MESSAGE SIGN				
0210	4422000000-N	48.000 DAY	\$69.0000	\$3,312.00
PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)				
0211	4423000000-N	8.000 EA	\$4,550.0000	\$36,400.00
WORK ZONE DIGITAL SPEED LIMIT SIGNS				
0212	4424000000-N	18.000 EA	\$2,830.0000	\$50,940.00
WORK ZONE PRESENCE LIGHTING				
0213	4432000000-N	323.000 EA	\$60.0000	\$19,380.00
HIGH VISIBILITY DRUMS				
0214	4434000000-N	24.000 EA	\$127.0000	\$3,048.00
SEQUENTIAL FLASHING WARNING LIGHTS				
0215	4435000000-N	34.000 EA	\$24.0000	\$816.00
CONES				
0216	4445000000-E	388.000 LF	\$26.0000	\$10,088.00
BARRICADES (TYPE III)				
0217	4455000000-N	16.000 DAY	\$375.0000	\$6,000.00
FLAGGER				
0218	4465000000-N	14.000 EA	\$7,750.0000	\$108,500.00
TEMPORARY CRASH CUSHIONS				
0219	4470000000-N	9.000 EA	\$2,990.0000	\$26,910.00
REMOVE & RESET TEMPORARY CRASH CUSHION				
0220	4480000000-N	4.000 EA	\$81,500.0000	\$326,000.00
TMA				

0221	4485000000-E	25200.000 LF	\$39.9000	\$1,005,480.00
	PORTABLE CONCRETE BARRIER			
0222	4490000000-E	487.000 LF	\$64.0000	\$31,168.00
	PORTABLE CONCRETE BARRIER (ANCHORED)			
0223	4500000000-E	16627.000 LF	\$4.9000	\$81,472.30
	REMOVE AND RESET PORTABLE CONCRETE BARRIER			
0224	4510000000-N	208.000 HR	\$80.0000	\$16,640.00
	LAW ENFORCEMENT			
0225	4650000000-N	2965.000 EA	\$5.0500	\$14,973.25
	TEMPORARY RAISED PAVEMENT MARKERS			
0226	4685000000-E	21563.000 LF	\$1.0000	\$21,563.00
	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)			
0227	4688000000-E	108682.000 LF	\$1.1000	\$119,550.20
	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)			
0228	4700000000-E	18262.000 LF	\$2.0500	\$37,437.10
	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)			
0229	4709000000-E	55.000 LF	\$15.1500	\$833.25
	THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)			
0230	4720000000-E	44.000 EA	\$101.0000	\$4,444.00
	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)			
0231	4725000000-E	51.000 EA	\$137.0000	\$6,987.00
	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)			
0232	4770000000-E	5619.000 LF	\$3.0500	\$17,137.95
	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (II)			
0233	4775000000-E	8157.000 LF	\$4.0500	\$33,035.85
	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (II)			
0234	4785000000-E	62.000 LF	\$7.1000	\$440.20
	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (II)			
0235	4810000000-E	53663.000 LF	\$0.3000	\$16,098.90
	PAINT PAVEMENT MARKING LINES (4")			
0236	4825000000-E	1862.000 LF	\$0.7600	\$1,415.12
	PAINT PAVEMENT MARKING LINES (12")			
0237	4835000000-E	206.000 LF	\$3.0500	\$628.30
	PAINT PAVEMENT MARKING LINES (24")			
0238	4840000000-N	88.000 EA	\$36.0000	\$3,168.00
	PAINT PAVEMENT MARKING CHARACTER			
0239	4845000000-N	112.000 EA	\$36.0000	\$4,032.00
	PAINT PAVEMENT MARKING SYMBOL			
0240	4847500000-E	236251.000 LF	\$0.6000	\$141,750.60
	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"			
0241	4847600000-E	13248.000 LF	\$1.1100	\$14,705.28
	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"			
0242	4850000000-E	8247.000 LF	\$0.4500	\$3,711.15
	REMOVAL OF PAVEMENT MARKING LINES (4")			
0243	4855000000-E	151529.000 LF	\$0.4500	\$68,188.05
	REMOVAL OF PAVEMENT MARKING LINES (6")			
0244	4860000000-E	600.000 LF	\$1.0100	\$606.00
	REMOVAL OF PAVEMENT MARKING LINES (8")			
0245	4865000000-E	7447.000 LF	\$1.0100	\$7,521.47

REMOVAL OF PAVEMENT MARKING LINES (12")				
0246	4870000000-E	44.000 LF	\$5.0500	\$222.20
REMOVAL OF PAVEMENT MARKING LINES (24")				
0247	4875000000-N	33.000 EA	\$66.0000	\$2,178.00
REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS				
0248	4900000000-N	58.000 EA	\$10.1000	\$585.80
PERMANENT RAISED PAVEMENT MARKERS				
0249	4905100000-N	1670.000 EA	\$47.0000	\$78,490.00
NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER				
0250	5255000000-N	1.000 LS	\$75,000.0000	\$75,000.00
PORTABLE LIGHTING				
0251	5325600000-E	32.000 LF	\$540.0000	\$17,280.00
6" WATER LINE				
0252	5325800000-E	165.000 LF	\$300.0000	\$49,500.00
8" WATER LINE				
0253	5327400000-E	74.000 LF	\$1,475.0000	\$109,150.00
24" WATER LINE				
0254	5329000000-E	6175.000 LB	\$15.0000	\$92,625.00
DUCTILE IRON WATER PIPE FITTINGS				
0255	5540000000-E	4.000 EA	\$3,025.0000	\$12,100.00
6" VALVE				
0256	5648000000-N	3.000 EA	\$1,725.0000	\$5,175.00
RELOCATE WATER METER				
0257	5666000000-N	3.000 EA	\$9,000.0000	\$27,000.00
FIRE HYDRANT				
0258	5673000000-E	83.000 LF	\$103.0000	\$8,549.00
FIRE HYDRANT LEG				
0259	5686500000-E	39.000 LF	\$39.0000	\$1,521.00
WATER SERVICE LINE				
0260	5691300000-E	1461.000 LF	\$218.0000	\$318,498.00
8" SANITARY GRAVITY SEWER				
0261	5691600000-E	1080.000 LF	\$433.0000	\$467,640.00
16" SANITARY GRAVITY SEWER				
0262	5691800000-E	39.000 LF	\$588.0000	\$22,932.00
20" SANITARY GRAVITY SEWER				
0263	5692000000-E	2062.000 LF	\$990.0000	\$2,041,380.00
30" SANITARY GRAVITY SEWER				
0264	5768000000-N	4.000 EA	\$1,415.0000	\$5,660.00
SANITARY SEWER CLEAN-OUT				
0265	5768500000-E	400.000 LF	\$79.0000	\$31,600.00
SEWER SERVICE LINE				
0266	5775000000-E	10.000 EA	\$8,140.0000	\$81,400.00
4' DIA UTILITY MANHOLE				
0267	5776000000-E	19.000 EA	\$16,500.0000	\$313,500.00
5' DIA UTILITY MANHOLE				
0268	5777000000-E	3.000 EA	\$22,500.0000	\$67,500.00
6' DIA UTILITY MANHOLE				
0269	5781000000-E	54.000 LF	\$432.0000	\$23,328.00
UTILITY MANHOLE WALL 4' DIA				

0270	5782000000-E	144.000	LF	\$528.0000	\$76,032.00
	UTILITY MANHOLE WALL 5' DIA				
0271	5783000000-E	18.000	LF	\$720.0000	\$12,960.00
	UTILITY MANHOLE WALL 6' DIA				
0272	5798000000-E	1704.000	LF	\$29.0000	\$49,416.00
	ABANDON *** UTILITY PIPE (15")				
0273	5804000000-E	465.000	LF	\$24.0000	\$11,160.00
	ABANDON 12" UTILITY PIPE				
0274	5810000000-E	38.000	LF	\$134.0000	\$5,092.00
	ABANDON 16" UTILITY PIPE				
0275	5812000000-E	1455.000	LF	\$34.0000	\$49,470.00
	ABANDON 20" UTILITY PIPE				
0276	5813000000-E	63.000	LF	\$107.0000	\$6,741.00
	ABANDON 24" UTILITY PIPE				
0277	5814000000-E	659.000	LF	\$68.0000	\$44,812.00
	ABANDON 30" UTILITY PIPE				
0278	5815000000-N	2.000	EA	\$972.0000	\$1,944.00
	REMOVE WATER METER				
0279	5815500000-N	4.000	EA	\$778.0000	\$3,112.00
	REMOVE FIRE HYDRANT				
0280	5816000000-N	15.000	EA	\$820.0000	\$12,300.00
	ABANDON UTILITY MANHOLE				
0281	5828000000-N	2.000	EA	\$1,035.0000	\$2,070.00
	REMOVE UTILITY MANHOLE				
0282	5835000000-E	260.000	LF	\$940.0000	\$244,400.00
	*** ENCASEMENT PIPE (54")				
0283	5835700000-E	100.000	LF	\$280.0000	\$28,000.00
	16" ENCASEMENT PIPE				
0284	6000000000-E	62925.000	LF	\$3.1500	\$198,213.75
	TEMPORARY SILT FENCE				
0285	6006000000-E	3640.000	TON	\$73.0000	\$265,720.00
	STONE FOR EROSION CONTROL, CLASS A				
0286	6009000000-E	13760.000	TON	\$70.0000	\$963,200.00
	STONE FOR EROSION CONTROL, CLASS B				
0287	6012000000-E	9110.000	TON	\$60.0000	\$546,600.00
	SEDIMENT CONTROL STONE				
0288	6015000000-E	415.500	ACR	\$940.0000	\$390,570.00
	TEMPORARY MULCHING				
0289	6018000000-E	22600.000	LB	\$3.6000	\$81,360.00
	SEED FOR TEMPORARY SEEDING				
0290	6021000000-E	114.500	TON	\$1,220.0000	\$139,690.00
	FERTILIZER FOR TEMPORARY SEEDING				
0291	6024000000-E	9585.000	LF	\$23.0000	\$220,455.00
	TEMPORARY SLOPE DRAINS				
0292	6029000000-E	800.000	LF	\$3.5500	\$2,840.00
	SAFETY FENCE				
0293	6030000000-E	23690.000	CY	\$7.0000	\$165,830.00
	SILT EXCAVATION				
0294	6036000000-E	59405.000	SY	\$1.8000	\$106,929.00

MATTING FOR EROSION CONTROL					
0295	6037000000-E	180.000	SY	\$9.1500	\$1,647.00
	COIR FIBER MAT				
0296	6038000000-E	5000.000	SY	\$5.1000	\$25,500.00
	PERMANENT SOIL REINFORCEMENT MAT				
0297	6042000000-E	9410.000	LF	\$6.3500	\$59,753.50
	1/4" HARDWARE CLOTH				
0298	6046000000-E	50.000	LF	\$175.0000	\$8,750.00
	TEMPORARY PIPE FOR STREAM CROSSING				
0299	6069000000-E	2309.000	CY	\$7.0000	\$16,163.00
	STILLING BASINS				
0300	6070000000-N	10.000	EA	\$900.0000	\$9,000.00
	SPECIAL STILLING BASINS				
0301	6071012000-E	3480.000	LF	\$11.0000	\$38,280.00
	COIR FIBER WATTLE				
0302	6071014000-E	490.000	LF	\$33.0000	\$16,170.00
	COIR FIBER WATTLE BARRIER				
0303	6071020000-E	3405.000	LB	\$5.1000	\$17,365.50
	POLYACRYLAMIDE (PAM)				
0304	6071030000-E	2275.000	LF	\$12.2000	\$27,755.00
	COIR FIBER BAFFLE				
0305	6071050000-E	12.000	EA	\$1,000.0000	\$12,000.00
	*** SKIMMER (1-1/2")				
0306	6071050000-E	2.000	EA	\$1,200.0000	\$2,400.00
	*** SKIMMER (2")				
0307	6071050000-E	3.000	EA	\$1,400.0000	\$4,200.00
	*** SKIMMER (2-1/2")				
0308	6084000000-E	333.000	ACR	\$2,362.0000	\$786,546.00
	SEEDING & MULCHING				
0309	6087000000-E	270.000	ACR	\$184.0000	\$49,680.00
	MOWING				
0310	6090000000-E	4200.000	LB	\$3.6000	\$15,120.00
	SEED FOR REPAIR SEEDING				
0311	6093000000-E	11.500	TON	\$1,220.0000	\$14,030.00
	FERTILIZER FOR REPAIR SEEDING				
0312	6096000000-E	8200.000	LB	\$3.6000	\$29,520.00
	SEED FOR SUPPLEMENTAL SEEDING				
0313	6108000000-E	246.000	TON	\$1,117.0000	\$274,782.00
	FERTILIZER TOPDRESSING				
0314	6111000000-E	710.000	LF	\$120.0000	\$85,200.00
	IMPERVIOUS DIKE				
0315	6114500000-N	10.000	MHR	\$138.0000	\$1,380.00
	SPECIALIZED HAND MOWING				
0316	6114800000-N	1.000	MHR	\$50.0000	\$50.00
	MANUAL LITTER REMOVAL				
0317	6114900000-E	2.000	TON	\$425.0000	\$850.00
	LITTER DISPOSAL				
0318	6117000000-N	75.000	EA	\$80.0000	\$6,000.00
	RESPONSE FOR EROSION CONTROL				

0319	6117500000-N	10.000	EA	\$2,000.0000	\$20,000.00
	CONCRETE WASHOUT STRUCTURE				
0320	6120000000-E	1400.000	CY	\$14.0000	\$19,600.00
	CULVERT DIVERSION CHANNEL				
0321	6132000000-N	88.000	EA	\$101.0000	\$8,888.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE				
0322	6132000000-N	88.000	EA	\$100.0000	\$8,800.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT				
0323	7279000000-E	20451.000	LF	\$1.0000	\$20,451.00
	TRACER WIRE				
0324	7300000000-E	1447.000	LF	\$10.1000	\$14,614.70
	UNPAVED TRENCHING (***** (1, 2"))				
0325	7300000000-E	13448.000	LF	\$11.0000	\$147,928.00
	UNPAVED TRENCHING (***** (2, 2"))				
0326	7300000000-E	1488.000	LF	\$14.2000	\$21,129.60
	UNPAVED TRENCHING (***** (3, 2"))				
0327	7301000000-E	5515.000	LF	\$25.0000	\$137,875.00
	DIRECTIONAL DRILL (***** (2, 2"))				
0328	7348000000-N	29.000	EA	\$1,215.0000	\$35,235.00
	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)				
0329	7360000000-N	7.000	EA	\$1,516.0000	\$10,612.00
	WOOD POLE				
0330	7516000000-E	14730.000	LF	\$4.0500	\$59,656.50
	COMMUNICATIONS CABLE (** FIBER) (144)				
0331	7516000000-E	6074.000	LF	\$3.3500	\$20,347.90
	COMMUNICATIONS CABLE (** FIBER) (72)				
0332	7528000000-E	1689.000	LF	\$3.0500	\$5,151.45
	DROP CABLE				
0333	7540000000-N	8.000	EA	\$3,030.0000	\$24,240.00
	SPLICE ENCLOSURE				
0334	7552000000-N	11.000	EA	\$5,455.0000	\$60,005.00
	INTERCONNECT CENTER				
0335	7566000000-N	37.000	EA	\$93.0000	\$3,441.00
	DELINEATOR MARKER				
0336	7980000000-N	1.000	EA	\$3,536.0000	\$3,536.00
	GENERIC SIGNAL ITEM 10KVA SINGLE PHASE TRANSFORMER				
0337	7980000000-N	43.000	EA	\$248.0000	\$10,664.00
	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE				
0338	7980000000-N	1.000	EA	\$7,455.0000	\$7,455.00
	GENERIC SIGNAL ITEM CCTV EXTENSION POLE				
0339	7980000000-N	5.000	EA	\$14,647.0000	\$73,235.00
	GENERIC SIGNAL ITEM CCTV METAL POLE (50')				
0340	7980000000-N	6.000	EA	\$4,445.0000	\$26,670.00
	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY				
0341	7980000000-N	3.000	EA	\$12,590.0000	\$37,770.00
	GENERIC SIGNAL ITEM DMS ACCESS LADDER				
0342	7980000000-N	3.000	EA	\$80,420.0000	\$241,260.00
	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE				
0343	7980000000-N	3.000	EA	\$116,162.0000	\$348,486.00

GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)				
0344	7980000000-N	10.000 EA	\$1,820.0000	\$18,200.00
	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT			
0345	7980000000-N	8.000 EA	\$1,520.0000	\$12,160.00
	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH			
0346	7980000000-N	5.000 EA	\$5,556.0000	\$27,780.00
	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET			
0347	7980000000-N	1.000 EA	\$32,324.0000	\$32,324.00
	GENERIC SIGNAL ITEM HUB CABINET			
0348	7980000000-N	1.000 EA	\$925.0000	\$925.00
	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER			
0349	7980000000-N	1.000 EA	\$2,829.0000	\$2,829.00
	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION			
0350	7980000000-N	8.000 EA	\$2,021.0000	\$16,168.00
	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVERSIZED)			
0351	7980000000-N	26.000 EA	\$607.0000	\$15,782.00
	GENERIC SIGNAL ITEM JUNCTION BOX (STANDARD SIZE)			
0352	7980000000-N	7.000 EA	\$4,041.0000	\$28,287.00
	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINATION PANEL			
0353	7980000000-N	5.000 EA	\$1,213.0000	\$6,065.00
	GENERIC SIGNAL ITEM SOIL TEST			
0354	7980000000-N	1.000 EA	\$800.0000	\$800.00
	GENERIC SIGNAL ITEM WOOD PEDESTAL			
0355	7990000000-E	430.000 LF	\$12.0000	\$5,160.00
	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR			
0356	7990000000-E	2239.000 LF	\$8.1000	\$18,135.90
	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS			
0357	7990000000-E	1897.000 LF	\$9.1000	\$17,262.70
	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS			
0358	7992000000-E	40.000 CY	\$1,617.0000	\$64,680.00
	GENERIC SIGNAL ITEM DRILLED PIER FOUNDATION			
0359	7992000000-E	24.000 CY	\$1,617.0000	\$38,808.00
	GENERIC SIGNAL ITEM OVERHEAD FOOTINGS			
Section 0001 Total				\$71,489,768.77

Section 0002
CULVERT ITEMS

0360	8056000000-N	1.000 LS	\$35,000.0000	\$35,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (32+77.50 -L-)			
0361	8065000000-N	1.000 LS	\$3,000.0000	\$3,000.00
	ASBESTOS ASSESSMENT			
0362	8126000000-N	1.000 LS	\$150,000.0000	\$150,000.00
	CULVERT EXCAVATION, STA ***** (32+77.50 -L-)			
0363	8126000000-N	1.000 LS	\$140,000.0000	\$140,000.00
	CULVERT EXCAVATION, STA ***** (36+27.30 -L-)			
0364	8126000000-N	1.000 LS	\$75,000.0000	\$75,000.00
	CULVERT EXCAVATION, STA ***** (78+68.93 -Y2-)			

0365	8133000000-E	1293.000 TON	\$85.0000	\$109,905.00
	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT			
0366	8196000000-E	2144.000 CY	\$900.0000	\$1,929,600.00
	CLASS A CONCRETE (CULVERT)			
0367	8245000000-E	262053.000 LB	\$1.7500	\$458,592.75
	REINFORCING STEEL (CULVERT)			
0368	8590000000-E	722.000 TON	\$59.5000	\$42,959.00
	RIP RAP, CLASS ** (I)			
0369	8622000000-E	1195.000 SY	\$5.5000	\$6,572.50
	GEOTEXTILE FOR DRAINAGE			
Section 0002 Total				\$2,950,629.25

Section 0003
WALL ITEMS

0370	8801000000-E	1875.000 SF	\$150.0000	\$281,250.00
	MSE RETAINING WALL NO **** (1)			
0371	8801000000-E	4205.000 SF	\$177.0000	\$744,285.00
	MSE RETAINING WALL NO **** (2)			
0372	8801000000-E	9155.000 SF	\$214.0000	\$1,959,170.00
	MSE RETAINING WALL NO **** (3)			
0373	8801000000-E	2625.000 SF	\$164.0000	\$430,500.00
	MSE RETAINING WALL NO **** (4)			
0374	8801000000-E	275.000 SF	\$200.0000	\$55,000.00
	MSE RETAINING WALL NO **** (5)			
0375	8802010000-E	2560.000 SF	\$97.0000	\$248,320.00
	SOIL NAIL RETAINING WALLS			
0376	8802015100-N	2.000 EA	\$775.0000	\$1,550.00
	SOIL NAIL VERIFICATION TESTS			
0377	8802015110-N	8.000 EA	\$276.0000	\$2,208.00
	SOIL NAIL PROOF TESTS			
0378	8847000000-E	57008.000 SF	\$1.1800	\$67,269.44
	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT (SOUND BARRIER WALL)			
0379	8847000000-E	29793.000 SF	\$50.0000	\$1,489,650.00
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL -NW7-			
Section 0003 Total				\$5,279,202.44

Section 0004
STRUCTURE ITEMS

0380	8035000000-N	1.000 LS	\$60,000.0000	\$60,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (20+68.01 -Y2NBL-)			
0381	8035000000-N	1.000 LS	\$45,000.0000	\$45,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (29+89.90 -Y2SBL-)			
0382	8065000000-N	1.000 LS	\$3,200.0000	\$3,200.00
	ASBESTOS ASSESSMENT			
0383	8084000000-N	1.000 LS	\$4,000.0000	\$4,000.00
	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (1, 20+68.01 -			

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0403	8097000000-E	39.000 LF	\$390.0000	\$15,210.00
	PILE EXCAVATION NOT IN SOIL			
0404	8105500000-E	293.420 LF	\$1,435.0000	\$421,057.70
	-" DIA DRILLED PIERS IN SOIL (5'-0")			
0405	8105600000-E	135.000 LF	\$1,850.0000	\$249,750.00
	-" DIA DRILLED PIERS NOT IN SOIL (5'-0")			
0406	8111000000-E	156.400 LF	\$525.0000	\$82,110.00
	PERMANENT STEEL CASING FOR ***-***" DIA DRILLED PIER (5'-0")			
0407	8112730000-N	3.000 EA	\$5,000.0000	\$15,000.00
	PDA TESTING			
0408	8113000000-N	1.000 EA	\$1,100.0000	\$1,100.00
	SID INSPECTIONS			
0409	8115000000-N	2.000 EA	\$15,000.0000	\$30,000.00
	CSL TESTING			
0410	8147000000-E	140631.000 SF	\$43.0000	\$6,047,133.00
	REINFORCED CONCRETE DECK SLAB			
0411	8161000000-E	167767.500 SF	\$1.2000	\$201,321.00
	GROOVING BRIDGE FLOORS			
0412	8182000000-E	4235.000 CY	\$950.0000	\$4,023,250.00
	CLASS A CONCRETE (BRIDGE)			
0413	8210000000-N	1.000 LS	\$28,000.0000	\$28,000.00
	BRIDGE APPROACH SLABS, STATION ***** (20+68.01 -Y2NBL-)			
0414	8210000000-N	1.000 LS	\$55,000.0000	\$55,000.00
	BRIDGE APPROACH SLABS, STATION ***** (22+84.09 -Y1-)			
0415	8210000000-N	1.000 LS	\$91,000.0000	\$91,000.00
	BRIDGE APPROACH SLABS, STATION ***** (28+33.21 -Y2FLAYAB-)			
0416	8210000000-N	1.000 LS	\$35,000.0000	\$35,000.00
	BRIDGE APPROACH SLABS, STATION ***** (29+89.90 -Y2SBL-)			
0417	8210000000-N	1.000 LS	\$91,000.0000	\$91,000.00
	BRIDGE APPROACH SLABS, STATION ***** (30+02.29 -Y2FLYCA-)			
0418	8210000000-N	1.000 LS	\$58,000.0000	\$58,000.00
	BRIDGE APPROACH SLABS, STATION ***** (30+69.44 -Y1-)			
0419	8210000000-N	1.000 LS	\$91,000.0000	\$91,000.00
	BRIDGE APPROACH SLABS, STATION ***** (39+65.10 -Y2FLYCA-)			
0420	8217000000-E	912235.000 LB	\$1.5000	\$1,368,352.50
	REINFORCING STEEL (BRIDGE)			
0421	8238000000-E	28249.000 LB	\$2.7500	\$77,684.75
	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)			
0422	8274000000-E	571.560 LF	\$525.0000	\$300,069.00
	MODIFIED 63" PRESTRESSED CONC GIRDERS			
0423	8280000000-E	1.000 LS	\$25,071,000.0000	\$25,071,000.00
	APPROX LBS STRUCTURAL STEEL			
0424	8296000000-N	1.000 LS	\$27,000.0000	\$27,000.00
	POLLUTION CONTROL			
0426	8328200000-E	72.000 EA	\$4,100.0000	\$295,200.00
	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)			
0427	8328200000-E	276.000 EA	\$2,000.0000	\$552,000.00
	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)			

0428	8364000000-E	3627.000	LF	\$55.0000	\$199,485.00
	HP 12 X 53 STEEL PILES				
0429	8384000000-E	13618.750	LF	\$80.0000	\$1,089,500.00
	HP 14 X 73 STEEL PILES				
0430	8391000000-N	8.000	EA	\$350.0000	\$2,800.00
	STEEL PILE POINTS				
0431	8392500000-E	200.000	LF	\$86.4600	\$17,292.00
	PREDRILLING FOR PILES				
0432	8503000000-E	6757.030	LF	\$160.0000	\$1,081,124.80
	CONCRETE BARRIER RAIL				
0433	8531000000-E	2425.700	SY	\$150.0000	\$363,855.00
	4" SLOPE PROTECTION				
0434	8559000000-E	43.100	SY	\$591.0000	\$25,472.10
	CLASS II, SURFACE PREPARATION				
0435	8654000000-N	1.000	LS	\$750,000.0000	\$750,000.00
	DISC BEARINGS				
0436	8657000000-N	1.000	LS	\$75,000.0000	\$75,000.00
	ELASTOMERIC BEARINGS				
0437	8664000000-E	111.700	CF	\$921.8200	\$102,967.29
	SHOTCRETE REPAIRS				
0438	8678000000-E	100.800	LF	\$144.9400	\$14,609.95
	EPOXY RESIN INJECTION				
0439	8706000000-N	1.000	LS	\$225,000.0000	\$225,000.00
	EXPANSION JOINT SEALS				
0440	8713000000-N	1.000	LS	\$160,000.0000	\$160,000.00
	MODULAR EXPANSION JOINT SEALS				
0441	8860000000-N	1.000	LS	\$120,108.1400	\$120,108.14
	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE #330394				
0442	8860000000-N	1.000	LS	\$76,869.2100	\$76,869.21
	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE #330394				
0443	8860000000-N	1.000	LS	\$24,000.0000	\$24,000.00
	GENERIC STRUCTURE ITEM POST-TENSIONING ENCASEMENT				
0444	8860000000-N	1.000	LS	\$90,000.0000	\$90,000.00
	GENERIC STRUCTURE ITEM POST-TENSIONING TENDONS				
0445	8860000000-N	1.000	LS	\$45,000.0000	\$45,000.00
	GENERIC STRUCTURE ITEM STRIP SEAL EXPANSION JOINT				
0446	8867000000-E	522.110	LF	\$120.0000	\$62,653.20
	GENERIC STRUCTURE ITEM FOAM JOINT SEALS FOR PRESERVATION				
0447	8867000000-E	445.080	LF	\$120.0000	\$53,409.60
	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT				
0448	8881000000-E	75.200	CY	\$1,100.0000	\$82,720.00
	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE				
0449	8889000000-E	11.800	LB	\$200.0000	\$2,360.00
	GENERIC STRUCTURE ITEM BEAM REPAIR PLATING				
0450	8892000000-E	219.000	SF	\$165.0000	\$36,135.00
	GENERIC STRUCTURE ITEM BRIDGE JOINT DEMOLITION				
0451	8892000000-E	955.500	SF	\$65.0000	\$62,107.50
	GENERIC STRUCTURE ITEM CONCRETE MEDIAN REPLACEMENT				

0452	8892000000-E	1542.100	SF	\$25.0000	\$38,552.50
	GENERIC STRUCTURE ITEM EPOXY COATING				
0453	8893000000-E	43.100	SY	\$770.0000	\$33,187.00
	GENERIC STRUCTURE ITEM CONCRETE DECK REPAIR FOR POLYMER CONCRETE OVERLAY				
0454	8893000000-E	5331.500	SY	\$30.0000	\$159,945.00
	GENERIC STRUCTURE ITEM PLACING AND FINISHING POLYMER CONCRETE OVERLAY				
0455	8893000000-E	4625.500	SY	\$25.0000	\$115,637.50
	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK				
0456	8893000000-E	4625.500	SY	\$11.0000	\$50,880.50
	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK				
0457	8897000000-N	82.000	EA	\$9,750.0000	\$799,500.00
	GENERIC STRUCTURE ITEM 11-3/4" DIA MICROPILES				
0458	8897000000-N	32.000	EA	\$885.0000	\$28,320.00
	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING BEARINGS WITH HIGH RATIO CALCIUM SULFONATE				
0459	8897000000-N	1.000	EA	\$55,000.0000	\$55,000.00
	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES				
0460	8897000000-N	8.000	EA	\$3,025.0000	\$24,200.00
	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS				
0461	8897000000-N	1.000	EA	\$2,500.0000	\$2,500.00
	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS				
0462	8897000000-N	1.000	EA	\$2,200.0000	\$2,200.00
	GENERIC STRUCTURE ITEM STEEL BEARING KEEPER ANGLE ASSEMBLY				
0463	8897000000-N	1.000	EA	\$1,500.0000	\$1,500.00
	GENERIC STRUCTURE ITEM STEEL BEARING RETAINER ANGLE ASSEMBLY				
0464	8881000000-E	121.100	CY	\$4,850.0000	\$587,335.00
AA1	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS				
0465	8881000000-E	121.100	CY		
AA2	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIALS				
Section 0004 Total					\$46,325,409.24
Item Total					\$126,045,009.70

ELECTRONIC BID SUBMISSION

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

=====

NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION

The prequalified bidder declares (or certifies, verifies, or states) under penalty of perjury under the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating N.C.G.S. §133-24 within the last three years, and that the prequalified bidder intends to do the work with his own bonafide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. §133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

DEBARMENT CERTIFICATION OF PREQUALIFIED BIDDER

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.
2. The terms covered transaction, debarred, suspended, ineligible, lower tier

covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal- Aid Provision titled Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or

commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

EXPLANATION:

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Award Limits on Multiple Projects

By answering YES to this statement, the bidder acknowledges that they are using the award limits on multiple projects? **Yes** ☐ **No** ☒

A bidder who desires to bid on more than one project on which bids are to be opened on the same date, and who also desires to avoid receiving an award of more projects than he is equipped to handle, may bid on any number of projects but may limit the total amount of work awarded to him on selected projects by completing the AWARD LIMITS ON MULTIPLE PROJECTS.

The Award Limits on Multiple Projects must be filled in on each project bid for which the Bidder desires protection.

It is the desire of the Bidder to be awarded contracts, the value of which will not exceed a total of for those

projects indicated herein, for which bids will be opened on (MM/DD/YY)

The Award Limits shall apply to the following projects:

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

It is agreed that if I am (we are) the low Bidder(s) on indicated projects, the total value of which is more than the above stipulated award limits, the Board of Transportation will award me (us) projects from among those indicated

that have a total value not to exceed the award limit and will result in the lowest total bids to the Department of Transportation.

DBE List Summary

Project: 0074226

Bidder ID: 3076

Bid Total: 126,045,009.70

Business Name: Flatiron Constructors Inc

Goal: 3.00% (3,781,350.29)

Total Entered: 3.36% (4,234,715.10)

ID	Name	Is Supplier?	Item Count	Amount	Is Complete?
12802	NICKELSTON INDUSTRIES INC	False	10	810,600.50	True
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	40	2,791,985.00	True
11572	CRUZ BROTHERS CONCRETE, INC.	False	6	632,129.60	True

Name: NICKELSTON INDUSTRIES INC ID: 12802

Address: POST OFFICE BOX 133 , LAWSONVILLE, NC 27022

Used As: SubContractor DBE Items Total:\$810,600.50

Items for NICKELSTON INDUSTRIES INC

0001 ROADWAY ITEMS				
0146	3030000000-E	21800.000 LF	\$25.5000	\$555,900.00
	STEEL BEAM GUARDRAIL			
0147	3045000000-E	50.000 LF	\$27.0000	\$1,350.00
	STEEL BEAM GUARDRAIL, SHOP CURVED			
0148	3150000000-N	10.000 EA	\$57.0000	\$570.00
	ADDITIONAL GUARDRAIL POSTS			
0149	3210000000-N	19.000 EA	\$900.0000	\$17,100.00
	GUARDRAIL END UNITS, TYPE CAT-1			
0150	3287000000-N	33.000 EA	\$3,100.0000	\$102,300.00
	GUARDRAIL END UNITS, TYPE TL-3			
0151	3317000000-N	36.000 EA	\$2,843.0000	\$102,348.00
	GUARDRAIL ANCHOR UNITS, TYPE B-77			
0152	3360000000-E	7575.000 LF	\$1.1000	\$8,332.50
	REMOVE EXISTING GUARDRAIL			
0153	3380000000-E	1900.000 LF	\$8.0000	\$15,200.00
	TEMPORARY STEEL BEAM GUARDRAIL			
0154	3387000000-N	5.000 EA	\$500.0000	\$2,500.00
	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ***** (CAT-1)			
0155	3389150000-N	5.000 EA	\$1,000.0000	\$5,000.00
	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)			
Section 0001 Total				\$810,600.50
Item Total				\$810,600.50

Name: TRAFFIC CONTROL SAFETY SERVICES, INC. ID: 4761

Address: POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114

Used As: SubContractor DBE Items Total:\$2,791,985.00

Items for TRAFFIC CONTROL SAFETY SERVICES, INC.

0001	ROADWAY ITEMS			
0001	0000100000-N	1.000 LS	\$353,000.0000	\$353,000.00
	MOBILIZATION			
0164	4048000000-E	24.000 CY	\$1,000.0000	\$24,000.00
	REINFORCED CONCRETE SIGN FOUNDATIONS			
0165	4054000000-E	7.000 CY	\$500.0000	\$3,500.00
	PLAIN CONCRETE SIGN FOUNDATIONS			
0166	4057000000-E	247.000 CY	\$2,000.0000	\$494,000.00
	OVERHEAD FOOTING			
0167	4060000000-E	19264.000 LB	\$8.0000	\$154,112.00
	SUPPORTS, BREAKAWAY STEEL BEAM			
0168	4066000000-E	11317.000 LB	\$8.0000	\$90,536.00
	SUPPORTS, SIMPLE STEEL BEAM			
0169	4072000000-E	3565.000 LF	\$12.0000	\$42,780.00
	SUPPORTS, 3-LB STEEL U-CHANNEL			
0170	4078000000-E	142.000 EA	\$75.0000	\$10,650.00
	SUPPORTS, 2-LB STEEL U-CHANNEL			
0171	4082000000-E	247.000 LF	\$15.0000	\$3,705.00
	SUPPORTS, WOOD			
0172	4082100000-N	1.000 LS	\$71,000.0000	\$71,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-118+00.00 -40E-)			
0173	4082100000-N	1.000 LS	\$120,000.0000	\$120,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (128+35.00 -L-)			
0174	4082100000-N	1.000 LS	\$120,000.0000	\$120,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (16+09.00 -L-)			
0175	4082100000-N	1.000 LS	\$150,000.0000	\$150,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (25+15.00 -Y1-)			
0176	4082100000-N	1.000 LS	\$145,000.0000	\$145,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (31+97.00 -Y2SBL-)			
0177	4082100000-N	1.000 LS	\$60,000.0000	\$60,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-351+06.00 -52S-)			
0178	4082100000-N	1.000 LS	\$72,000.0000	\$72,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-40+00.00 -40E-)			
0179	4082100000-N	1.000 LS	\$95,000.0000	\$95,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (43+96.00 -Y2NBL-)			
0180	4082100000-N	1.000 LS	\$110,000.0000	\$110,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (55+69.00 -L-)			

0181	4082100000-N	1.000 LS	\$68,000.0000	\$68,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(58+00.00 -Y2SBL-)		
0182	4082100000-N	1.000 LS	\$70,000.0000	\$70,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(69+20.00 -Y2SBL-)		
0183	4082100000-N	1.000 LS	\$71,718.0000	\$71,718.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(70+74.00 -Y2NBL-)		
0184	4082100000-N	1.000 LS	\$75,000.0000	\$75,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(71+22.00 -40E-)		
0185	4082100000-N	1.000 LS	\$75,000.0000	\$75,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(82+00.00 -L-)		
0186	4082100000-N	1.000 LS	\$14,000.0000	\$14,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(82+11.00 -Y2SBL-)		
0187	4082100000-N	1.000 LS	\$105,000.0000	\$105,000.00
	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA *****	(86+60.00 -L-)		
0188	4096000000-N	16.000 EA	\$150.0000	\$2,400.00
	SIGN ERECTION, TYPE D			
0189	4102000000-N	63.000 EA	\$65.0000	\$4,095.00
	SIGN ERECTION, TYPE E			
0190	4108000000-N	53.000 EA	\$200.0000	\$10,600.00
	SIGN ERECTION, TYPE F			
0191	4109000000-N	71.000 EA	\$10.0000	\$710.00
	SIGN ERECTION, TYPE *** (OVERHEAD) (A)			
0192	4109000000-N	24.000 EA	\$11.0000	\$264.00
	SIGN ERECTION, TYPE *** (OVERHEAD) (B)			
0193	4110000000-N	58.000 EA	\$800.0000	\$46,400.00
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)			
0194	4110000000-N	26.000 EA	\$400.0000	\$10,400.00
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)			
0195	4114000000-N	140.000 EA	\$50.0000	\$7,000.00
	SIGN ERECTION, MILEMARKERS			
0196	4115000000-N	8.000 EA	\$800.0000	\$6,400.00
	SIGN ERECTION, OVERLAY (OVERHEAD)			
0197	4116000000-N	43.000 EA	\$800.0000	\$34,400.00
	SIGN ERECTION, OVERLAY (GROUND MOUNTED)			
0198	4149000000-N	3.000 EA	\$17,500.0000	\$52,500.00
	DISPOSAL OF SIGN SYSTEM, OVERHEAD			
0199	4152000000-N	31.000 EA	\$500.0000	\$15,500.00
	DISPOSAL OF SIGN SYSTEM, STEEL BEAM			
0200	4155000000-N	153.000 EA	\$1.0000	\$153.00
	DISPOSAL OF SIGN SYSTEM, U-CHANNEL			
0201	4234000000-N	41.000 EA	\$51.0000	\$2,091.00
	DISPOSAL OF SIGN, A OR B (OVERHEAD)			
0202	4236000000-N	21.000 EA	\$51.0000	\$1,071.00
	DISPOSAL OF SIGN, A & B (GROUND MOUNTED)			
Section 0001 Total				\$2,791,985.00
Item Total				\$2,791,985.00

Name: CRUZ BROTHERS CONCRETE, INC. ID: 11572

Address: 1572 PAYNE ROAD/LOT 75 LOT 75 , GRAHAM, NC 27253

Used As: SubContractor DBE Items Total:\$632,129.60

Items for CRUZ BROTHERS CONCRETE, INC.

0001 ROADWAY ITEMS				
0001	0000100000-N MOBILIZATION	1.000 LS	\$12,643.0000	\$12,643.00
0140	2440000000-N CONCRETE TRANSITIONAL SECTION FOR CATCH BASIN	13.000 EA	\$950.0000	\$12,350.00
0141	2549000000-E 2'-6" CONCRETE CURB & GUTTER	2180.000 LF	\$32.7700	\$71,438.60
0142	2556000000-E SHOULDER BERM GUTTER	12000.000 LF	\$40.3800	\$484,560.00
0143	2619000000-E 4" CONCRETE PAVED DITCH	220.000 SY	\$127.5000	\$28,050.00
0144	2647000000-E 5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	260.000 SY	\$88.8000	\$23,088.00
Section 0001 Total				\$632,129.60
Item Total				\$632,129.60

THIS PROPOSAL CONTAINS THE FOLLOWING ERRORS/WARNINGS (IF ANY)

This Bid contains 3 amendment files

- 1 09/28/2022 MODIFY & DELETE ITEMS
- 2 10/03/2022 MODIFY & DELETE ITEMS
- 3 10/12/2022 MODIFY ITEM

Electronic Bid Submission

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

I hereby certify that I have the authority to submit this bid.

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Attachments

Failure to complete and attach the Fuel Usage Factor Adjustment Form will result in using 2.90 gallons per ton as the Fuel Usage Factor for Diesel for the asphalt items included on the form. The contractor will not be permitted to change the option after the bids are submitted.

NOTE: The maximum upload limit is 5 MB.

☐ Verify

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
ROADWAY ITEMS						
0001	0000100000-N	800	MOBILIZATION	LUMP SUM	6,302,000.00	6,302,000.00
0002	0000400000-N	801	CONSTRUCTION SURVEYING	LUMP SUM	1,500,000.00	1,500,000.00
0003	0000700000-N	SP	FIELD OFFICE	LUMP SUM	300,000.00	300,000.00
0004	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	LUMP SUM LS	9,778,000.00	9,778,000.00
0005	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	4 ACR	13,500.00	54,000.00
0006	0015000000-N	205	SEALING ABANDONED WELLS	2 EA	2,567.07	5,134.14
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	435,000 CY	5.50	2,392,500.00
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (20+68.01 -Y2NBL-)	LUMP SUM	20,000.00	20,000.00
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (22+84.09 -Y1-)	LUMP SUM	35,000.00	35,000.00
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (28+33.21 -Y2FLYAB-)	LUMP SUM	90,000.00	90,000.00
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (29+89.90 -Y2SBL-)	LUMP SUM	22,500.00	22,500.00
0012	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (30+02.29 -Y2FLYCA-)	LUMP SUM	50,000.00	50,000.00
0013	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (30+69.44 -Y1-)	LUMP SUM	48,000.00	48,000.00
0014	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ***** (39+65.10 -Y2FLYCA-)	LUMP SUM	47,000.00	47,000.00
0016	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ***** (30+69.44 -Y1-)	LUMP SUM	55,000.00	55,000.00
0017	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ***** (39+65.10 -Y2FLYCA-)	LUMP SUM	53,000.00	53,000.00
0018	0036000000-E	225	UNDERCUT EXCAVATION	1,750 CY	14.00	24,500.00
0019	0106000000-E	230	BORROW EXCAVATION	640,000 CY	0.01	6,400.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0020	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	10 EA	400.00	4,000.00
0021	0134000000-E	240	DRAINAGE DITCH EXCAVATION	7,500 CY	7.50	56,250.00
0022	0141000000-E	240	BERM DITCH CONSTRUCTION	1,050 LF	8.00	8,400.00
0023	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	72,600 SY	5.60	406,560.00
0024	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	3,910 SY	4.25	16,617.50
0025	0192000000-N	260	PROOF ROLLING	30 HR	150.00	4,500.00
0026	0195000000-E	265	SELECT GRANULAR MATERIAL	22,450 CY	0.01	224.50
0027	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	127,000 SY	2.00	254,000.00
0028	0199000000-E	SP	TEMPORARY SHORING	970 SF	148.00	143,560.00
0029	0223000000-E	275	ROCK PLATING	2,550 SY	70.00	178,500.00
0030	0241000000-E	SP	GENERIC GRADING ITEM GEOTEXTILE FOR EMBANKMENT STABILIZATION, TYPE 5	29,390 SY	4.50	132,255.00
0031	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	3,050 TON	45.00	137,250.00
0032	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	10,438 SY	3.50	36,533.00
0033	0342000000-E	310	*** SIDE DRAIN PIPE (30")	1,380 LF	145.00	200,100.00
0034	0342000000-E	310	*** SIDE DRAIN PIPE (36")	1,036 LF	160.00	165,760.00
0035	0342000000-E	310	*** SIDE DRAIN PIPE (42")	180 LF	300.00	54,000.00
0036	0342000000-E	310	*** SIDE DRAIN PIPE (48")	528 LF	325.00	171,600.00
0037	0342000000-E	310	*** SIDE DRAIN PIPE (54")	48 LF	425.00	20,400.00
0038	0342000000-E	310	*** SIDE DRAIN PIPE (60")	108 LF	575.00	62,100.00
0039	0342000000-E	310	*** SIDE DRAIN PIPE (72")	212 LF	800.00	169,600.00
0040	0343000000-E	310	15" SIDE DRAIN PIPE	5,024 LF	90.00	452,160.00
0041	0344000000-E	310	18" SIDE DRAIN PIPE	2,000 LF	100.00	200,000.00

Contract Item Sheets For C204746

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0042	0345000000-E	310	24" SIDE DRAIN PIPE	932 LF	125.00	116,500.00
0043	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (15")	59 EA	560.00	33,040.00
0044	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (18")	32 EA	625.00	20,000.00
0045	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (24")	14 EA	750.00	10,500.00
0046	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (30")	2 EA	1,250.00	2,500.00
0047	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (36")	2 EA	1,500.00	3,000.00
0048	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (48")	2 EA	2,800.00	5,600.00
0049	0348000000-E	310	*** SIDE DRAIN PIPE ELBOWS (54")	2 EA	3,200.00	6,400.00
0050	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	1,344 LF	92.00	123,648.00
0051	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	300 LF	125.00	37,500.00
0052	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	584 LF	145.00	84,680.00
0053	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	608 LF	155.00	94,240.00
0054	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	632 LF	190.00	120,080.00
0055	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	220 LF	290.00	63,800.00
0056	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	132 LF	350.00	46,200.00
0057	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	748 LF	450.00	336,600.00
0058	0448000000-E	310	***** RC PIPE CULVERTS, CLASS IV (48")	236 LF	380.00	89,680.00
0059	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	844 LF	110.00	92,840.00
0060	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	604 LF	115.00	69,460.00
0061	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	136 LF	145.00	19,720.00
0062	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	628 LF	225.00	141,300.00
0063	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	172 LF	240.00	41,280.00
0064	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	248 LF	325.00	80,600.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0065	0576000000-E	310	*** CS PIPE CULVERTS, ***** THICK (48", 0.109")	88 LF	300.00	26,400.00
0066	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	672 LF	105.00	70,560.00
0067	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	40 LF	125.00	5,000.00
0068	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	144 LF	140.00	20,160.00
0069	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (15", 0.064")	6 EA	825.00	4,950.00
0070	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (24", 0.064")	2 EA	1,000.00	2,000.00
0071	0636000000-E	310	*** CS PIPE ELBOWS, ***** THICK (48", 0.109")	2 EA	1,800.00	3,600.00
0072	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (15", 0.500")	128 LF	785.00	100,480.00
0073	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (18", 0.500")	332 LF	815.00	270,580.00
0074	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (24", 0.500")	602 LF	950.00	571,900.00
0075	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (30", 0.500")	284 LF	1,150.00	326,600.00
0076	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (36", 0.500")	308 LF	875.00	269,500.00
0077	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (42", 0.625")	112 LF	1,675.00	187,600.00
0078	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (48", 0.625")	656 LF	1,290.00	846,240.00
0079	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (60", 0.875)	146 LF	2,700.00	394,200.00
0080	0973100000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (72", 1.000")	190 LF	3,100.00	589,000.00
0081	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (15", 0.500")	128 LF	0.01	1.28

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0082	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (18", 0.500")	332 LF	0.01	3.32
0083	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (24", 0.500")	602 LF	0.01	6.02
0084	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (30", 0.500")	284 LF	0.01	2.84
0085	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (36", 0.500")	308 LF	1,808.00	556,864.00
0086	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (42", 0.625")	112 LF	0.01	1.12
0087	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (48", 0.625")	656 LF	2,040.00	1,338,240.00
0088	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (60", 0.875)	146 LF	0.01	1.46
0089	0973300000-E	330	*** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (72", 1.000")	190 LF	4,060.00	771,400.00
0090	0987000000-E	310	GENERIC PIPE ITEM 15" RC PIPE CULVERT, CLASS V	204 LF	140.00	28,560.00
0091	0987000000-E	310	GENERIC PIPE ITEM 18" RC PIPE CULVERT, CLASS V	152 LF	140.00	21,280.00
0092	0987000000-E	310	GENERIC PIPE ITEM 42" RC PIPE CULVERT, CLASS V	328 LF	350.00	114,800.00
0093	0995000000-E	340	PIPE REMOVAL	5,818 LF	24.00	139,632.00
0094	1011000000-N	500	FINE GRADING	LUMP SUM	1,500,000.00	1,500,000.00
0095	1099500000-E	505	SHALLOW UNDERCUT	2,500 CY	15.00	37,500.00
0096	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	100,200 TON	38.00	3,807,600.00
0097	1110000000-E	510	STABILIZER AGGREGATE	500 TON	45.00	22,500.00
0098	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	47,367 SY	4.00	189,468.00
0099	1121000000-E	520	AGGREGATE BASE COURSE	359 TON	70.00	25,130.00
0100	1220000000-E	545	INCIDENTAL STONE BASE	1,000 TON	65.00	65,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0101	1297000000-E	607	MILLING ASPHALT PAVEMENT, **** DEPTH (1-1/2")	15,570 SY	1.95	30,361.50
0102	1308000000-E	607	MILLING ASPHALT PAVEMENT, **** TO ***** (0" TO 1-1/2")	1,730 SY	7.30	12,629.00
0103	1330000000-E	607	INCIDENTAL MILLING	1,750 SY	10.00	17,500.00
0104	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	48,810 TON	46.00	2,245,260.00
0105	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	53,700 TON	44.00	2,362,800.00
0106	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	6,650 TON	57.00	379,050.00
0107	1520000000-E	SP	ASPHALT CONC SURFACE COURSE, TYPE S9.5B (LEVELING COURSE)	100 TON	93.00	9,300.00
0108	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	39,100 TON	44.00	1,720,400.00
0109	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	7,520 TON	915.00	6,880,800.00
0110	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	520 TON	200.00	104,000.00
0111	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	65,500 LF	0.31	20,305.00
0112	2000000000-N	806	RIGHT-OF-WAY MARKERS	48 EA	550.00	26,400.00
0113	2022000000-E	815	SUBDRAIN EXCAVATION	1,344 CY	36.00	48,384.00
0114	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	4,000 SY	14.50	58,000.00
0115	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	672 CY	77.00	51,744.00
0116	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	4,000 LF	18.50	74,000.00
0117	2070000000-N	815	SUBDRAIN PIPE OUTLET	8 EA	407.00	3,256.00
0118	2077000000-E	815	6" OUTLET PIPE	48 LF	46.00	2,208.00
0119	2099000000-E	816	SHOULDER DRAIN	3,100 LF	17.00	52,700.00
0120	2110000000-E	816	4" SHOULDER DRAIN PIPE	3,100 LF	2.20	6,820.00
0121	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	125 LF	24.00	3,000.00
0122	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	5 EA	492.00	2,460.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0123	2143000000-E	818	BLOTTING SAND	500 TON	70.00	35,000.00
0124	2209000000-E	838	ENDWALLS	70 CY	1,400.00	98,000.00
0125	2220000000-E	838	REINFORCED ENDWALLS	34 CY	2,400.00	81,600.00
0126	2253000000-E	840	PIPE COLLARS	8 CY	1,350.00	10,800.00
0127	2275000000-E	SP	FLOWABLE FILL	1,260 CY	250.00	315,000.00
0128	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	183 EA	4,200.00	768,600.00
0129	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	50 CY	3,000.00	150,000.00
0130	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	176.2 LF	900.00	158,580.00
0131	2354000000-N	840	FRAME WITH GRATE, STD 840.22	5 EA	1,150.00	5,750.00
0132	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	58 EA	1,400.00	81,200.00
0133	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	90 EA	1,400.00	126,000.00
0134	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	9 EA	1,400.00	12,600.00
0135	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	2 EA	1,400.00	2,800.00
0136	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	4 EA	1,410.00	5,640.00
0137	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	7 EA	1,410.00	9,870.00
0138	2396000000-N	840	FRAME WITH COVER, STD 840.54	24 EA	1,150.00	27,600.00
0139	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	1 EA	4,000.00	4,000.00
0140	2440000000-N	852	CONCRETE TRANSITIONAL SECTION FOR CATCH BASIN	13 EA	969.39	12,602.07
0141	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	2,180 LF	38.00	82,840.00
0142	2556000000-E	846	SHOULDER BERM GUTTER	12,000 LF	45.50	546,000.00
0143	2619000000-E	850	4" CONCRETE PAVED DITCH	220 SY	133.00	29,260.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0144	2647000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	260 SY	91.00	23,660.00
0145	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	900 LF	110.00	99,000.00
0146	3030000000-E	862	STEEL BEAM GUARDRAIL	21,800 LF	25.50	555,900.00
0147	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	50 LF	27.50	1,375.00
0148	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA	58.00	580.00
0149	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	19 EA	914.00	17,366.00
0150	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	33 EA	3,150.00	103,950.00
0151	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	36 EA	2,843.00	102,348.00
0152	3360000000-E	863	REMOVE EXISTING GUARDRAIL	7,575 LF	1.10	8,332.50
0153	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	1,900 LF	8.15	15,485.00
0154	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ***** (CAT-1)	5 EA	508.00	2,540.00
0155	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	5 EA	1,016.00	5,080.00
0156	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	10,175 LF	4.40	44,770.00
0157	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	637 EA	32.50	20,702.50
0158	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	165 EA	38.60	6,369.00
0159	3557000000-E	866	ADDITIONAL BARBED WIRE	500 LF	1.02	510.00
0160	3628000000-E	876	RIP RAP, CLASS I	8,200 TON	50.50	414,100.00
0161	3635000000-E	876	RIP RAP, CLASS II	720 TON	75.00	54,000.00
0162	3649000000-E	876	RIP RAP, CLASS B	1,100 TON	170.00	187,000.00
0163	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	19,050 SY	3.75	71,437.50
0164	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	24 CY	1,010.10	24,242.40
0165	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	7 CY	506.00	3,542.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0166	4057000000-E	SP	OVERHEAD FOOTING	247 CY	2,021.00	499,187.00
0167	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	19,264 LB	8.10	156,038.40
0168	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	11,317 LB	8.10	91,667.70
0169	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	3,565 LF	12.15	43,314.75
0170	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	142 EA	76.00	10,792.00
0171	4082000000-E	903	SUPPORTS, WOOD	247 LF	15.20	3,754.40
0172	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-118+00.00 -40E-)	LUMP SUM	71,718.00	71,718.00
0173	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (128+35.00 -L-)	LUMP SUM	121,213.00	121,213.00
0174	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (16+09.00 -L-)	LUMP SUM	121,213.00	121,213.00
0175	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (25+15.00 -Y1-)	LUMP SUM	151,516.00	151,516.00
0176	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (31+97.00 -Y2SBL-)	LUMP SUM	146,465.00	146,465.00
0177	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-351+06.00 -52S-)	LUMP SUM	60,607.00	60,607.00
0178	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (-40+00.00 -40E-)	LUMP SUM	72,728.00	72,728.00
0179	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (43+96.00 -Y2NBL-)	LUMP SUM	95,960.00	95,960.00
0180	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (55+69.00 -L-)	LUMP SUM	111,112.00	111,112.00
0181	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (58+00.00 -Y2SBL-)	LUMP SUM	68,687.00	68,687.00
0182	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (69+20.00 -Y2SBL-)	LUMP SUM	70,708.00	70,708.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0183	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (70+74.00 -Y2NBL-)	LUMP SUM	71,718.00	71,718.00
0184	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (71+22.00 -40E-)	LUMP SUM	75,758.00	75,758.00
0185	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (82+00.00 -L-)	LUMP SUM	75,758.00	75,758.00
0186	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (82+11.00 -Y2SBL-)	LUMP SUM	14,142.00	14,142.00
0187	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ***** (86+60.00 -L-)	LUMP SUM	106,061.00	106,061.00
0188	4096000000-N	904	SIGN ERECTION, TYPE D	16 EA	152.00	2,432.00
0189	4102000000-N	904	SIGN ERECTION, TYPE E	63 EA	66.00	4,158.00
0190	4108000000-N	904	SIGN ERECTION, TYPE F	53 EA	203.00	10,759.00
0191	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	71 EA	11.00	781.00
0192	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	24 EA	11.00	264.00
0193	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	58 EA	809.00	46,922.00
0194	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	26 EA	405.00	10,530.00
0195	4114000000-N	904	SIGN ERECTION, MILEMARKERS	140 EA	51.00	7,140.00
0196	4115000000-N	904	SIGN ERECTION, OVERLAY (OVERHEAD)	8 EA	809.00	6,472.00
0197	4116000000-N	904	SIGN ERECTION, OVERLAY (GROUND MOUNTED)	43 EA	809.00	34,787.00
0198	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	3 EA	17,677.00	53,031.00
0199	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	31 EA	506.00	15,686.00
0200	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	153 EA	1.00	153.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0201	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	41 EA	51.00	2,091.00
0202	4236000000-N	907	DISPOSAL OF SIGN, A & B (GROUND MOUNTED)	21 EA	51.00	1,071.00
0203	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	690 SF	6.60	4,554.00
0204	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	1,834 SF	9.00	16,506.00
0205	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	128 SF	8.50	1,088.00
0206	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	509 SF	9.60	4,886.40
0207	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	208 SF	7.00	1,456.00
0208	4415000000-N	1115	FLASHING ARROW BOARD	8 EA	2,630.00	21,040.00
0209	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	6 EA	10,405.00	62,430.00
0210	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	48 DAY	69.00	3,312.00
0211	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	8 EA	4,550.00	36,400.00
0212	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	18 EA	2,830.00	50,940.00
0213	4432000000-N	SP	HIGH VISIBILITY DRUMS	323 EA	60.00	19,380.00
0214	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	24 EA	127.00	3,048.00
0215	4435000000-N	1135	CONES	34 EA	24.00	816.00
0216	4445000000-E	1145	BARRICADES (TYPE III)	388 LF	26.00	10,088.00
0217	4455000000-N	1150	FLAGGER	16 DAY	375.00	6,000.00
0218	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	14 EA	7,750.00	108,500.00
0219	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	9 EA	2,990.00	26,910.00
0220	4480000000-N	1165	TMA	4 EA	81,500.00	326,000.00
0221	4485000000-E	1170	PORTABLE CONCRETE BARRIER	25,200 LF	39.90	1,005,480.00
0222	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	487 LF	64.00	31,168.00
0223	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	16,627 LF	4.90	81,472.30

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0224	4510000000-N	1190	LAW ENFORCEMENT	208 HR	80.00	16,640.00
0225	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	2,965 EA	5.05	14,973.25
0226	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	21,563 LF	1.00	21,563.00
0227	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	108,682 LF	1.10	119,550.20
0228	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	18,262 LF	2.05	37,437.10
0229	4709000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	55 LF	15.15	833.25
0230	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	44 EA	101.00	4,444.00
0231	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	51 EA	137.00	6,987.00
0232	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (II)	5,619 LF	3.05	17,137.95
0233	4775000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (II)	8,157 LF	4.05	33,035.85
0234	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (II)	62 LF	7.10	440.20
0235	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	53,663 LF	0.30	16,098.90
0236	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	1,862 LF	0.76	1,415.12
0237	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	206 LF	3.05	628.30
0238	4840000000-N	1205	PAINT PAVEMENT MARKING CHARACTER	88 EA	36.00	3,168.00
0239	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	112 EA	36.00	4,032.00
0240	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	236,251 LF	0.60	141,750.60
0241	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	13,248 LF	1.11	14,705.28
0242	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	8,247 LF	0.45	3,711.15
0243	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	151,529 LF	0.45	68,188.05
0244	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	600 LF	1.01	606.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0245	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	7,447 LF	1.01	7,521.47
0246	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	44 LF	5.05	222.20
0247	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	33 EA	66.00	2,178.00
0248	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	58 EA	10.10	585.80
0249	4905100000-N	SP	NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	1,670 EA	47.00	78,490.00
0250	5255000000-N	1413	PORTABLE LIGHTING	LUMP SUM	75,000.00	75,000.00
0251	5325600000-E	1510	6" WATER LINE	32 LF	540.00	17,280.00
0252	5325800000-E	1510	8" WATER LINE	165 LF	300.00	49,500.00
0253	5327400000-E	1510	24" WATER LINE	74 LF	1,475.00	109,150.00
0254	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	6,175 LB	15.00	92,625.00
0255	5540000000-E	1515	6" VALVE	4 EA	3,025.00	12,100.00
0256	5648000000-N	1515	RELOCATE WATER METER	3 EA	1,725.00	5,175.00
0257	5666000000-N	1515	FIRE HYDRANT	3 EA	9,000.00	27,000.00
0258	5673000000-E	1515	FIRE HYDRANT LEG	83 LF	103.00	8,549.00
0259	5686500000-E	1515	WATER SERVICE LINE	39 LF	39.00	1,521.00
0260	5691300000-E	1520	8" SANITARY GRAVITY SEWER	1,461 LF	218.00	318,498.00
0261	5691600000-E	1520	16" SANITARY GRAVITY SEWER	1,080 LF	433.00	467,640.00
0262	5691800000-E	1520	20" SANITARY GRAVITY SEWER	39 LF	588.00	22,932.00
0263	5692000000-E	1520	30" SANITARY GRAVITY SEWER	2,062 LF	990.00	2,041,380.00
0264	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	4 EA	1,415.00	5,660.00
0265	5768500000-E	1520	SEWER SERVICE LINE	400 LF	79.00	31,600.00
0266	5775000000-E	1525	4' DIA UTILITY MANHOLE	10 EA	8,140.00	81,400.00
0267	5776000000-E	1525	5' DIA UTILITY MANHOLE	19 EA	16,500.00	313,500.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0268	5777000000-E	1525	6' DIA UTILITY MANHOLE	3 EA	22,500.00	67,500.00
0269	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	54 LF	432.00	23,328.00
0270	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	144 LF	528.00	76,032.00
0271	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	18 LF	720.00	12,960.00
0272	5798000000-E	1530	ABANDON *** UTILITY PIPE (15")	1,704 LF	29.00	49,416.00
0273	5804000000-E	1530	ABANDON 12" UTILITY PIPE	465 LF	24.00	11,160.00
0274	5810000000-E	1530	ABANDON 16" UTILITY PIPE	38 LF	134.00	5,092.00
0275	5812000000-E	1530	ABANDON 20" UTILITY PIPE	1,455 LF	34.00	49,470.00
0276	5813000000-E	1530	ABANDON 24" UTILITY PIPE	63 LF	107.00	6,741.00
0277	5814000000-E	1530	ABANDON 30" UTILITY PIPE	659 LF	68.00	44,812.00
0278	5815000000-N	1530	REMOVE WATER METER	2 EA	972.00	1,944.00
0279	5815500000-N	1530	REMOVE FIRE HYDRANT	4 EA	778.00	3,112.00
0280	5816000000-N	1530	ABANDON UTILITY MANHOLE	15 EA	820.00	12,300.00
0281	5828000000-N	1530	REMOVE UTILITY MANHOLE	2 EA	1,035.00	2,070.00
0282	5835000000-E	1540	*** ENCASEMENT PIPE (54")	260 LF	940.00	244,400.00
0283	5835700000-E	1540	16" ENCASEMENT PIPE	100 LF	280.00	28,000.00
0284	6000000000-E	1605	TEMPORARY SILT FENCE	62,925 LF	3.15	198,213.75
0285	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	3,640 TON	73.00	265,720.00
0286	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	13,760 TON	70.00	963,200.00
0287	6012000000-E	1610	SEDIMENT CONTROL STONE	9,110 TON	60.00	546,600.00
0288	6015000000-E	1615	TEMPORARY MULCHING	415.5 ACR	940.00	390,570.00
0289	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	22,600 LB	3.60	81,360.00
0290	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	114.5 TON	1,220.00	139,690.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0291	6024000000-E	1622	TEMPORARY SLOPE DRAINS	9,585 LF	23.00	220,455.00
0292	6029000000-E	SP	SAFETY FENCE	800 LF	3.55	2,840.00
0293	6030000000-E	1630	SILT EXCAVATION	23,690 CY	7.00	165,830.00
0294	6036000000-E	1631	MATting FOR EROSION CONTROL	59,405 SY	1.80	106,929.00
0295	6037000000-E	SP	COIR FIBER MAT	180 SY	9.15	1,647.00
0296	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	5,000 SY	5.10	25,500.00
0297	6042000000-E	1632	1/4" HARDWARE CLOTH	9,410 LF	6.35	59,753.50
0298	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	50 LF	175.00	8,750.00
0299	6069000000-E	1638	STILLING BASINS	2,309 CY	7.00	16,163.00
0300	6070000000-N	1639	SPECIAL STILLING BASINS	10 EA	900.00	9,000.00
0301	6071012000-E	SP	COIR FIBER WATTLE	3,480 LF	11.00	38,280.00
0302	6071014000-E	SP	COIR FIBER WATTLE BARRIER	490 LF	33.00	16,170.00
0303	6071020000-E	SP	POLYACRYLAMIDE (PAM)	3,405 LB	5.10	17,365.50
0304	6071030000-E	1640	COIR FIBER BAFFLE	2,275 LF	12.20	27,755.00
0305	6071050000-E	SP	*** SKIMMER (1-1/2")	12 EA	1,000.00	12,000.00
0306	6071050000-E	SP	*** SKIMMER (2")	2 EA	1,200.00	2,400.00
0307	6071050000-E	SP	*** SKIMMER (2-1/2")	3 EA	1,400.00	4,200.00
0308	6084000000-E	1660	SEEDING & MULCHING	333 ACR	2,362.00	786,546.00
0309	6087000000-E	1660	MOWING	270 ACR	184.00	49,680.00
0310	6090000000-E	1661	SEED FOR REPAIR SEEDING	4,200 LB	3.60	15,120.00
0311	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	11.5 TON	1,220.00	14,030.00
0312	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	8,200 LB	3.60	29,520.00
0313	6108000000-E	1665	FERTILIZER TOPDRESSING	246 TON	1,117.00	274,782.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0314	6111000000-E	SP	IMPERVIOUS DIKE	710 LF	120.00	85,200.00
0315	6114500000-N	1667	SPECIALIZED HAND MOWING	10 MHR	138.00	1,380.00
0316	6114800000-N	SP	MANUAL LITTER REMOVAL	1 MHR	50.00	50.00
0317	6114900000-E	SP	LITTER DISPOSAL	2 TON	425.00	850.00
0318	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	75 EA	80.00	6,000.00
0319	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	10 EA	2,000.00	20,000.00
0320	6120000000-E	SP	CULVERT DIVERSION CHANNEL	1,400 CY	14.00	19,600.00
0321	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	88 EA	101.00	8,888.00
0322	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	88 EA	100.00	8,800.00
0323	7279000000-E	1715	TRACER WIRE	20,451 LF	1.00	20,451.00
0324	7300000000-E	1715	UNPAVED TRENCHING (***** (1, 2")	1,447 LF	10.10	14,614.70
0325	7300000000-E	1715	UNPAVED TRENCHING (***** (2, 2")	13,448 LF	11.00	147,928.00
0326	7300000000-E	1715	UNPAVED TRENCHING (***** (3, 2")	1,488 LF	14.20	21,129.60
0327	7301000000-E	1715	DIRECTIONAL DRILL (***** (2, 2")	5,515 LF	25.00	137,875.00
0328	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	29 EA	1,215.00	35,235.00
0329	7360000000-N	1720	WOOD POLE	7 EA	1,516.00	10,612.00
0330	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (144)	14,730 LF	4.05	59,656.50
0331	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (72)	6,074 LF	3.35	20,347.90
0332	7528000000-E	1730	DROP CABLE	1,689 LF	3.05	5,151.45
0333	7540000000-N	1731	SPLICE ENCLOSURE	8 EA	3,030.00	24,240.00
0334	7552000000-N	1731	INTERCONNECT CENTER	11 EA	5,455.00	60,005.00
0335	7566000000-N	1733	DELINEATOR MARKER	37 EA	93.00	3,441.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0336	7980000000-N	SP	GENERIC SIGNAL ITEM 10KVA SINGLE PHASE TRANSFORMER	1 EA	3,536.00	3,536.00
0337	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	43 EA	248.00	10,664.00
0338	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV EXTENSION POLE	1 EA	7,455.00	7,455.00
0339	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE (50')	5 EA	14,647.00	73,235.00
0340	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	6 EA	4,445.00	26,670.00
0341	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	3 EA	12,590.00	37,770.00
0342	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	3 EA	80,420.00	241,260.00
0343	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)	3 EA	116,162.00	348,486.00
0344	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	10 EA	1,820.00	18,200.00
0345	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	8 EA	1,520.00	12,160.00
0346	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	5 EA	5,556.00	27,780.00
0347	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET	1 EA	32,324.00	32,324.00
0348	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER	1 EA	925.00	925.00
0349	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION	1 EA	2,829.00	2,829.00
0350	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVERSIZED)	8 EA	2,021.00	16,168.00
0351	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (STANDARD SIZE)	26 EA	607.00	15,782.00
0352	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINATION PANEL	7 EA	4,041.00	28,287.00
0353	7980000000-N	SP	GENERIC SIGNAL ITEM SOIL TEST	5 EA	1,213.00	6,065.00
0354	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	1 EA	800.00	800.00
0355	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR	430 LF	12.00	5,160.00
0356	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS	2,239 LF	8.10	18,135.90

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0357	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS	1,897 LF	9.10	17,262.70
0358	7992000000-E	SP	GENERIC SIGNAL ITEM DRILLED PIER FOUNDATION	40 CY	1,617.00	64,680.00
0359	7992000000-E	SP	GENERIC SIGNAL ITEM OVERHEAD FOOTINGS	24 CY	1,617.00	38,808.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
CULVERT ITEMS						
0360	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (32+77.50 -L-)	LUMP SUM	35,000.00	35,000.00
0361	8065000000-N	SP	ASBESTOS ASSESSMENT	LUMP SUM	3,000.00	3,000.00
0362	8126000000-N	414	CULVERT EXCAVATION, STA ***** (32+77.50 -L-)	LUMP SUM	150,000.00	150,000.00
0363	8126000000-N	414	CULVERT EXCAVATION, STA ***** (36+27.30 -L-)	LUMP SUM	140,000.00	140,000.00
0364	8126000000-N	414	CULVERT EXCAVATION, STA ***** (78+68.93 -Y2-)	LUMP SUM	75,000.00	75,000.00
0365	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	1,293 TON	85.00	109,905.00
0366	8196000000-E	420	CLASS A CONCRETE (CULVERT)	2,144 CY	900.00	1,929,600.00
0367	8245000000-E	425	REINFORCING STEEL (CULVERT)	262,053 LB	1.75	458,592.75
0368	8590000000-E	876	RIP RAP, CLASS ** (I)	722 TON	59.50	42,959.00
0369	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	1,195 SY	5.50	6,572.50

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
WALL ITEMS						
0370	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	1,875 SF	150.00	281,250.00
0371	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	4,205 SF	177.00	744,285.00
0372	8801000000-E	SP	MSE RETAINING WALL NO **** (3)	9,155 SF	214.00	1,959,170.00
0373	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	2,625 SF	164.00	430,500.00
0374	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	275 SF	200.00	55,000.00
0375	8802010000-E	SP	SOIL NAIL RETAINING WALLS	2,560 SF	97.00	248,320.00
0376	8802015100-N	SP	SOIL NAIL VERIFICATION TESTS	2 EA	775.00	1,550.00
0377	8802015110-N	SP	SOIL NAIL PROOF TESTS	8 EA	276.00	2,208.00
0378	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT (SOUND BARRIER WALL)	57,008 SF	1.18	67,269.44
0379	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL -NW7-	29,793 SF	50.00	1,489,650.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
STRUCTURE ITEMS						
0380	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (20+68.01 -Y2NBL-)	LUMP SUM	60,000.00	60,000.00
0381	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ***** (29+89.90 -Y2SBL-)	LUMP SUM	45,000.00	45,000.00
0382	8065000000-N	SP	ASBESTOS ASSESSMENT	LUMP SUM	3,200.00	3,200.00
0383	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (1, 20+68.01 -Y2NBL-)	LUMP SUM	4,000.00	4,000.00
0384	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (1, 29+89.90 -Y2SBL-)	LUMP SUM	4,000.00	4,000.00
0385	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (2, 20+68.01 -Y2NBL-)	LUMP SUM	4,000.00	4,000.00
0386	8084000000-N	410	FOUNDATION EXCAVATION FOR END BENT ** AT STATION ***** (2, 29+89.90 -Y2SBL-)	LUMP SUM	4,000.00	4,000.00
0387	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 20+68.01 -Y2NBL-)	LUMP SUM	30,000.00	30,000.00
0388	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 28+33.21 -Y2FLYAB-)	LUMP SUM	4,300.00	4,300.00
0389	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1, 29+89.90 -Y2SBL-)	LUMP SUM	70,000.00	70,000.00
0390	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,30+02.29 -Y2FLYCA-)	LUMP SUM	12,000.00	12,000.00
0391	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,30+69.44 -Y1-)	LUMP SUM	10,500.00	10,500.00
0392	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (1,39+65.10 -Y2FLYCA-)	LUMP SUM	5,000.00	5,000.00
0393	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2, 28+33.21 -Y2FLYAB-)	LUMP SUM	10,000.00	10,000.00
0394	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,20+68.01 -Y2NBL-)	LUMP SUM	30,000.00	30,000.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0395	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,29+89.90 -Y2SBL-)	LUMP SUM	60,000.00	60,000.00
0396	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,30+02.29 -Y2FLYCA-)	LUMP SUM	9,500.00	9,500.00
0397	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (2,39+65.10 -Y2FLYCA-)	LUMP SUM	18,500.00	18,500.00
0398	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (3, 28+33.21 -Y2FLYAB-)	LUMP SUM	8,000.00	8,000.00
0399	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (3,39+65.10 -Y2FLYCA-)	LUMP SUM	10,500.00	10,500.00
0400	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (4,39+65.10 -Y2FLYCA-)	LUMP SUM	11,000.00	11,000.00
0401	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ***** (5,39+65.10 -Y2FLYCA-)	LUMP SUM	10,500.00	10,500.00
0402	8096000000-E	450	PILE EXCAVATION IN SOIL	50 LF	278.90	13,945.00
0403	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	39 LF	390.00	15,210.00
0404	8105500000-E	411	***_*** DIA DRILLED PIERS IN SOIL (5'-0")	293.42 LF	1,435.00	421,057.70
0405	8105600000-E	411	***_*** DIA DRILLED PIERS NOT IN SOIL (5'-0")	135 LF	1,850.00	249,750.00
0406	8111000000-E	411	PERMANENT STEEL CASING FOR ***- *** DIA DRILLED PIER (5'-0")	156.4 LF	525.00	82,110.00
0407	8112730000-N	450	PDA TESTING	3 EA	5,000.00	15,000.00
0408	8113000000-N	411	SID INSPECTIONS	1 EA	1,100.00	1,100.00
0409	8115000000-N	411	CSL TESTING	2 EA	15,000.00	30,000.00
0410	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	140,631 SF	43.00	6,047,133.00
0411	8161000000-E	420	GROOVING BRIDGE FLOORS	167,767.5 SF	1.20	201,321.00
0412	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	4,235 CY	950.00	4,023,250.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0413	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (20+68.01 -Y2NBL-)	LUMP SUM	28,000.00	28,000.00
0414	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (22+84.09 -Y1-)	LUMP SUM	55,000.00	55,000.00
0415	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (28+33.21 -Y2FLAYAB-)	LUMP SUM	91,000.00	91,000.00
0416	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (29+89.90 -Y2SBL-)	LUMP SUM	35,000.00	35,000.00
0417	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (30+02.29 -Y2FLYCA-)	LUMP SUM	91,000.00	91,000.00
0418	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (30+69.44 -Y1-)	LUMP SUM	58,000.00	58,000.00
0419	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ***** (39+65.10 -Y2FLYCA-)	LUMP SUM	91,000.00	91,000.00
0420	8217000000-E	425	REINFORCING STEEL (BRIDGE)	912,235 LB	1.50	1,368,352.50
0421	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	28,249 LB	2.75	77,684.75
0422	8274000000-E	430	MODIFIED 63" PRESTRESSED CONC GIRDERS	571.56 LF	525.00	300,069.00
0423	8280000000-E	440	APPROX LBS STRUCTURAL STEEL	7,832,823 LS	25,071,000.00	25,071,000.00
0424	8296000000-N	442	POLLUTION CONTROL	LUMP SUM	27,000.00	27,000.00
0426	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	72 EA	4,100.00	295,200.00
0427	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)	276 EA	2,000.00	552,000.00
0428	8364000000-E	450	HP 12 X 53 STEEL PILES	3,627 LF	55.00	199,485.00
0429	8384000000-E	450	HP 14 X 73 STEEL PILES	13,618.75 LF	80.00	1,089,500.00
0430	8391000000-N	450	STEEL PILE POINTS	8 EA	350.00	2,800.00
0431	8392500000-E	450	PREDRILLING FOR PILES	200 LF	86.46	17,292.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0432	8503000000-E	460	CONCRETE BARRIER RAIL	6,757.03 LF	160.00	1,081,124.80
0433	8531000000-E	462	4" SLOPE PROTECTION	2,425.7 SY	150.00	363,855.00
0434	8559000000-E	SP	CLASS II, SURFACE PREPARATION	43.1 SY	591.00	25,472.10
0435	8654000000-N	SP	DISC BEARINGS	LUMP SUM	750,000.00	750,000.00
0436	8657000000-N	430	ELASTOMERIC BEARINGS	LUMP SUM	75,000.00	75,000.00
0437	8664000000-E	SP	SHOTCRETE REPAIRS	111.7 CF	921.82	102,967.29
0438	8678000000-E	SP	EPOXY RESIN INJECTION	100.8 LF	144.94	14,609.95
0439	8706000000-N	SP	EXPANSION JOINT SEALS	LUMP SUM	225,000.00	225,000.00
0440	8713000000-N	SP	MODULAR EXPANSION JOINT SEALS	LUMP SUM	160,000.00	160,000.00
0441	8860000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE #330394	LUMP SUM	120,108.14	120,108.14
0442	8860000000-N	SP	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE #330394	LUMP SUM	76,869.21	76,869.21
0443	8860000000-N	SP	GENERIC STRUCTURE ITEM POST-TENSIONING ENCASEMENT	LUMP SUM	24,000.00	24,000.00
0444	8860000000-N	SP	GENERIC STRUCTURE ITEM POST-TENSIONING TENDONS	LUMP SUM	90,000.00	90,000.00
0445	8860000000-N	SP	GENERIC STRUCTURE ITEM STRIP SEAL EXPANSION JOINT	LUMP SUM	45,000.00	45,000.00
0446	8867000000-E	SP	GENERIC STRUCTURE ITEM FOAM JOINT SEALS FOR PRESERVATION	522.11 LF	120.00	62,653.20
0447	8867000000-E	SP	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT	445.08 LF	120.00	53,409.60
0448	8881000000-E	SP	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE	75.2 CY	1,100.00	82,720.00
0449	8889000000-E	SP	GENERIC STRUCTURE ITEM BEAM REPAIR PLATING	11.8 LB	200.00	2,360.00
0450	8892000000-E	SP	GENERIC STRUCTURE ITEM BRIDGE JOINT DEMOLITION	219 SF	165.00	36,135.00
0451	8892000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE MEDIAN REPLACEMENT	955.5 SF	65.00	62,107.50
0452	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATING	1,542.1 SF	25.00	38,552.50

Contract Item Sheets For C204746

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0453	8893000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE DECK REPAIR FOR POLYMER CONCRETE OVERLAY	43.1 SY	770.00	33,187.00
0454	8893000000-E	SP	GENERIC STRUCTURE ITEM PLACING AND FINISHING POLYMER CONCRETE OVERLAY	5,331.5 SY	30.00	159,945.00
0455	8893000000-E	SP	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK	4,625.5 SY	25.00	115,637.50
0456	8893000000-E	SP	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK	4,625.5 SY	11.00	50,880.50
0457	8897000000-N	SP	GENERIC STRUCTURE ITEM 11-3/4" DIA MICROPILES	82 EA	9,750.00	799,500.00
0458	8897000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING BEARINGS WITH HIGH RATIO CALCIUM SULFONATE	32 EA	885.00	28,320.00
0459	8897000000-N	SP	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES	1 EA	55,000.00	55,000.00
0460	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS	8 EA	3,025.00	24,200.00
0461	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS	1 EA	2,500.00	2,500.00
0462	8897000000-N	SP	GENERIC STRUCTURE ITEM STEEL BEARING KEEPER ANGLE ASSEMBLY	1 EA	2,200.00	2,200.00
0463	8897000000-N	SP	GENERIC STRUCTURE ITEM STEEL BEARING RETAINER ANGLE ASSEMBLY	1 EA	1,500.00	1,500.00
***** BEGIN SCHEDULE AA*****						
***** (2 ALTERNATES) *****						
0464 AA1	8881000000-E	SP	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS	121.1 CY		587,335.00
*** OR ***						
0465 AA2	8881000000-E	SP	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIALS	121.1 CY		
*** END SCHEDULE AA***						
TOTAL AMOUNT OF BID FOR ENTIRE PROJECT						\$126,045,009.70

Contract No. C204746
County Forsyth

Rev. 1-16-18

**EXECUTION OF CONTRACT
NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION**

CORPORATION

The Contractor declares (or certifies, verifies, or states) under penalty of perjury under the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with this Contract, that the Contractor has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Contractor intends to do the work with its own bona fide employees or subcontractors and did not bid for the benefit of another contractor.

By submitting this Execution of Contract, Non-Collusion and Debarment Certification, the Contractor is certifying his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

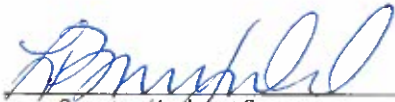
Flatiron Constructors, Inc

Full name of Corporation

860 Aviation Parkway, Suite 1000, Morrisville, NC 27560

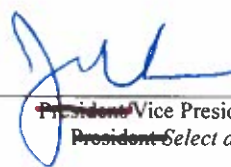
Address as Prequalified

Attest



~~Secretary~~ Assistant Secretary
Select appropriate title

By



~~President~~ Vice President/Assistant Vice
President Select appropriate title

Linda Brumfield

Print or type Signer's name

Jim Schneiderman

Print or type Signer's name

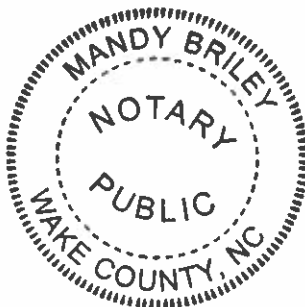


STATE OF NORTH CAROLINA
COUNTY OF WAKE

The foregoing instrument was acknowledged before me this 31st day of October, 2022
by Linda Brumfield + Jim Schneiderman of Flatiron Constructors, Inc.


Notary Signature

Dec. 15th 2024
My Commission Expiration



DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.
2. The terms *covered transaction*, *debarred*, *suspended*, *ineligible*, *lower tier covered transaction*, *participant*, *person*, *primary covered transaction*, *principal*, *proposal*, and *voluntarily excluded*, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.
3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.
4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273)* provided by the Department, without subsequent modification, in all lower tier covered transactions.
5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.
6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and
- d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐

Check here if an explanation is attached to this certification.

Contract No. C204746

County (ies): Forsyth

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

DocuSigned by:


F81B6038A47A442...

Contract Officer

11/14/2022

Date

Execution of Contract and Bonds
Approved as to Form:

DocuSigned by:

8BD7716388C4431...

Attorney General

11/14/2022

Date

Signature Sheet (Bid - Acceptance by Department)

Contract No. C204746
County Forsyth

Liberty Bond No. 015217193
Travelers Bond No. 107664828
F&D/Zurich Bond No. 9404394
Federal Bond No. K41613919
Continental Bond No. 30151688
Berkshire Bond No. 47-SUR-300033-01-0664

Executed in Two (2) Originals

Rev 5-17-11

CONTRACT PAYMENT BOND

Date of Payment Bond Execution November 1, 2022

Name of Principal Contractor Flatiron Constructors, Inc.
Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America,
Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company,
The Continental Insurance Company and Berkshire Specialty Insurance Company

Name of Surety:

Name of Contracting Body: North Carolina Department of Transportation
Raleigh, North Carolina
One Hundred Twenty-Six Million, Forty-Five Thousand, Nine and 70/100
(\$126,045,009.70)

Amount of Bond:

Contract ID No.: C204746

County Name: Forsyth

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No.
County

C204746
Forsyth

Rev 5-17-11

CONTRACT PAYMENT BOND

Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America, Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company, The Continental Insurance Company and Berkshire Specialty Insurance Company


Affix Seal of Surety Company

Print or type Surety Company Name

By

Lisa M. Scavetta

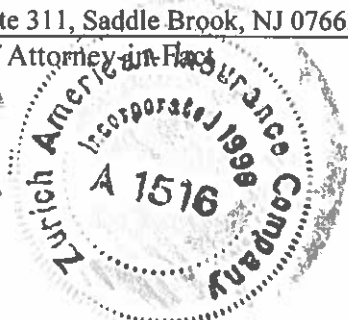
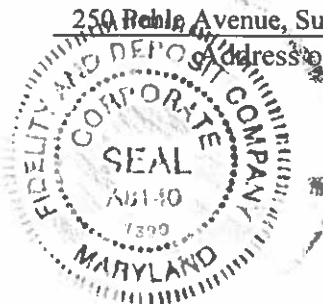
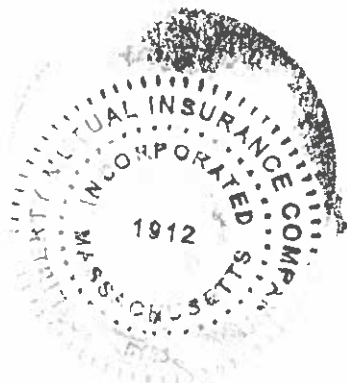
Print, stamp or type name of Attorney-in-Fact


Signature of Attorney-in-Fact


Signature of Witness

Sherryanne M. DePirro

Print or type Signer's name



250 Route 1 Avenue, Suite 311, Saddle Brook, NJ 07663

Address of Attorney-in-Fact

Contract No.
County

C204746
Forsyth

Rev 5-17-11

CONTRACT PAYMENT BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

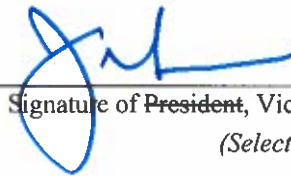
Flatiron Contractors, Inc

Full name of Corporation

860 Aviation Parkway, Ste 1000, Morrisville, NC 27560

Address as prequalified

By




Signature of ~~President~~, Vice President, ~~Assistant Vice President~~
(Select appropriate title)

Jim Schneiderman

Print or type Signer's name



Attest



Signature of ~~Secretary~~, Assistant Secretary
Select appropriate title

Linda Brumfield

Print or type Signer's name

Contract No. C204746
County Forsyth

Liberty Bond No. 015217193
Travelers Bond No. 107664828
F&D/Zurich Bond No. 9404394
Federal Bond No. K41613919
Continental Bond No. 30151688
Berkshire Bond No. 47-SUR-300033-01-0664

Executed in Two (2) Originals

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Date of Performance Bond Execution: November 1, 2022

Name of Principal Contractor: Flatiron Constructors, Inc.
Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America,
Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company,
The Continental Insurance Company and Berkshire Specialty Insurance Company

Name of Surety:

Name of Contracting Body: North Carolina Department of Transportation
Raleigh, North Carolina

Amount of Bond: One Hundred Twenty-Six Million, Forty-Five Thousand, Nine and 70/100
(\$126,045,009.70)

Contract ID No.: C204746

County Name: Forsyth

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No.
County

C204746
Forsyth

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Affix Seal of Surety Company

Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America,
Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance
Company, The Continental Insurance Company and Berkshire Specialty Insurance Company

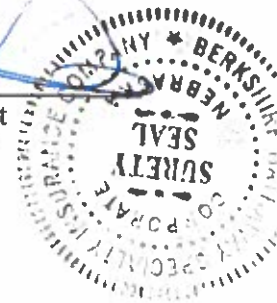
Print or type Surety Company Name

By

Lisa M. Scavetta

Print, stamp or type name of Attorney-in-Fact


Signature of Attorney-in-Fact




Signature of Witness

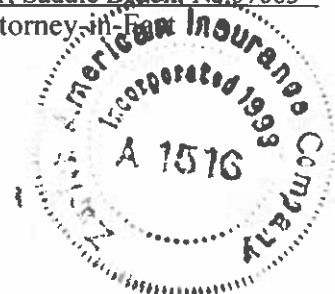
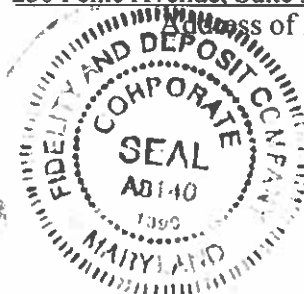


Sherryanne M. DePirro
Print or type Signer's name



250 Pehle Avenue, Suite 311, Saddle Brook, NJ 07663

Print or type Address of Attorney-in-Fact



Contract No.
County

C204746
Forsyth

Rev 5-17-11

CONTRACT PERFORMANCE BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

Flatiron Constructors, Inc.
Full name of Corporation

860 Aviation Parkway, Ste. 1000, Morrisville, NC 27560
Address as prequalified

By



Signature of ~~President~~, Vice President, ~~Assistant Vice President~~
Select appropriate title

Jim Schneiderman

Print or type Signer's name



Attest



Signature of ~~Secretary~~, Assistant Secretary
Select appropriate title

Linda Brumfield

Print or type Signer's name



This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8208613-974450**

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Bianca L. Meli; Charo J. Rosemond; James Baldassare, Jr.; John F. Surano; Krista A. Burke; Lisa M. Scavetta; Maria L. Spadaccini; Michael Dugan; Nicholas F. Walsh; Sherryanne M. DePirro

all of the city of Saddle Brook state of NJ each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 18th day of August, 2022.



Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

State of PENNSYLVANIA ss
County of MONTGOMERY

On this 18th day of August, 2022 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.



Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV - OFFICERS: Section 12. Power of Attorney.

Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.

Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation - The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

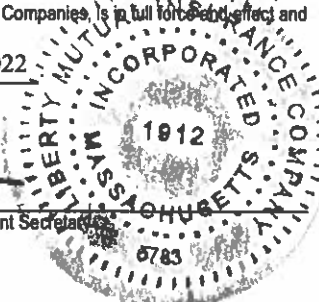
Authorization - By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 1st day of November, 2022.



By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary





Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Lisa M. Scavetta** of **SADDLE BROOK**, their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April**, 2021.



State of Connecticut

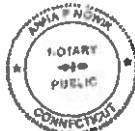
City of Hartford ss.

By: 
 Robert L. Raney, Senior Vice President

On this the **21st** day of **April**, 2021, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, 2026




 Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of each of the Companies, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

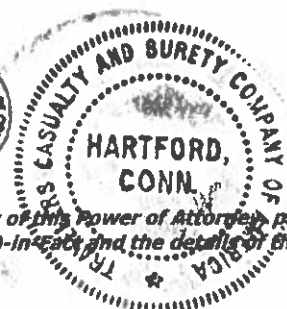
FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of each of the Companies, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **1st** day of **November**, 2022.




 Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.

**ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY**

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Krista A. BURKE, Charo J. ROSEMOND, Maria L. SPADACCINI, Sherryanne M. DEPIRRO, Nicholas F. WALSH, Lisa M. SCAVETTA, James BALDASSARE, JR., John F. SURANO, Bianca L. MELI of Saddle Brook, New Jersey**, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND, this 17th day of August, A.D. 2022.



ATTEST:
**ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**

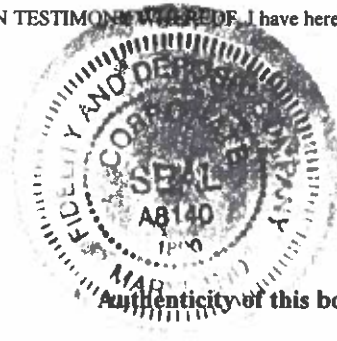
By: **Robert D. Murray**
Vice President

By: **Dawn E. Brown**
Secretary

**State of Maryland
County of Baltimore**

On this 17th day of August, A.D. 2022, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.



Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify or revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 1st day of November, 2022.



MJ Pethick

By: Mary Jean Pethick
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
Ph: 800-626-4577

If your jurisdiction allows for electronic reporting of surety claims, please submit to reportsfclaims@zurichna.com

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790



Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, **PACIFIC INDEMNITY COMPANY**, a Wisconsin corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint James Baldassare Jr., Krista A. Burke, Sherryanne M. DePirro, Bianca L. Mell, Charo J. Rosemond, Lisa M. Scavetta, Maria L. Spadaccini, John F. Surano and Nicholas F. Walsh of Saddle Brook, New Jersey -----

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, **PACIFIC INDEMNITY COMPANY**, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this 17th day of August, 2022.

Dawn M. Chloros

Dawn M. Chloros, Assistant Secretary



Stephen M. Haney

Stephen M. Haney, Vice President



STATE OF NEW JERSEY

County of Hunterdon

SS.

On this 17th day of August, 2022 before me, a Notary Public of New Jersey, personally came Dawn M. Chloros and Stephen M. Haney, to me known to be Assistant Secretary and Vice President, respectively, of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, **PACIFIC INDEMNITY COMPANY**, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY**, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros and Stephen M. Haney, being by me duly sworn, severally and each for herself and himself did depose and say that they are Assistant Secretary and Vice President, respectively, of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, **PACIFIC INDEMNITY COMPANY**, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal



KATHERINE J. ADELAAR
NOTARY PUBLIC OF NEW JERSEY
No. 2316665
Commission Expires July 18, 2024

Katherine J. Adelaar

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY** on August 30, 2016; **WESTCHESTER FIRE INSURANCE COMPANY** on December 11, 2006; and **ACE AMERICAN INSURANCE COMPANY** on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

- (1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.
- (2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.
- (3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.
- (4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.
- (5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Dawn M. Chloros, Assistant Secretary of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, **PACIFIC INDEMNITY COMPANY**, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** (the "Companies") do hereby certify that

- (i) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
- (ii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 1st November 2022



Dawn M. Chloros

Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF ANY INSTRUMENT OR ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 993-2272 Fax (908) 993-2657 e-mail: surety@chubb.com



POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That The Continental Insurance Company, a Pennsylvania insurance company, is a duly organized and existing insurance company having its principal office in the City of Chicago, and State of Illinois, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Maria L Spadaccini, James Baldassare Jr, Michael Dugan, Krista A Burke, Charo J Rosemond, Sherryanne M DePirro, John F Surano, Bianca L Meli, Lisa M Scavetta, Nicholas F Walsh, Individually

of Saddle Brook, NJ, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the insurance company and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Board of Directors of the insurance company.

In Witness Whereof, The Continental Insurance Company has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 7th day of September, 2022.

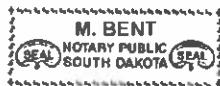


The Continental Insurance Company


Paul T. Bruffat Vice President

State of South Dakota, County of Minnehaha, ss:

On this 7th day of September, 2022, before me personally came Paul T. Bruffat to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of The Continental Insurance Company, a Pennsylvania insurance company, described in and which executed the above instrument; that he knows the seal of said insurance company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said insurance company and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said insurance company.



My Commission Expires March 2, 2026


M. Bent Notary Public

CERTIFICATE

I, D. Johnson, Assistant Secretary of The Continental Insurance Company, a Pennsylvania insurance company, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the insurance company printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said insurance company this 1st day of November 2022



The Continental Insurance Company


D. Johnson Assistant Secretary

Form F6850-4/2012



Go to www.cnasurety.com > Owner / Obligor Services > Validate Bond Coverage, if you want to verify bond authenticity.



Berkshire Hathaway
Specialty Insurance

47-SUR-300033-01-0664

Power Of Attorney

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY NATIONAL INDEMNITY COMPANY / NATIONAL LIABILITY & FIRE INSURANCE COMPANY

Know all men by these presents, that **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at One Lincoln Street, 23rd Floor, Boston, Massachusetts 02111, **NATIONAL INDEMNITY COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at 3024 Harney Street, Omaha, Nebraska 68131 and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Connecticut and having an office at 100 First Stamford Place, Stamford, Connecticut 06902 (hereinafter collectively the "Companies"), pursuant to and by the authority granted as set forth herein, do hereby name, constitute and appoint: Lisa M. Scavetta, Sherryanne M. DePirro, Maria L. Spadaccini, Nicholas F. Walsh, James Beklassare, Jr., Krista A. Burke, Charo J. Rosemond, John F. Surano, Blanca L. Meli, 250 Peble Avenue, Suite 311 of the city of Saddle Brook, State of New Jersey, their true and lawful attorney(s)-in-fact to make, execute, seal, acknowledge, and deliver, for and on their behalf as surety and as their act and deed, any and all undertakings, bonds, or other such writings obligatory in the nature thereof, in pursuance of these presents, the execution of which shall be as binding upon the Companies as if it has been duly signed and executed by their regularly elected officers in their own proper persons. This authority for the Attorney-in-Fact shall be limited to the execution of the attached bond(s) or other such writings obligatory in the nature thereof.

In witness whereof, this Power of Attorney has been subscribed by an authorized officer of the Companies, and the corporate seals of the Companies have been affixed hereto this date of December 20, 2018. This Power of Attorney is made and executed pursuant to and by authority of the Bylaws, Resolutions of the Board of Directors, and other Authorizations of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, **NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, which are in full force and effect, each reading as appears on the back page of this Power of Attorney, respectively. The following signature by an authorized officer of the Company may be a facsimile, which shall be deemed the equivalent of and constitute the written signature of such officer of the Company for all purposes regarding this Power of Attorney, including satisfaction of any signature requirements on any and all undertakings, bonds, or other such writings obligatory in the nature thereof, to which this Power of Attorney applies.

**BERKSHIRE HATHAWAY SPECIALTY
INSURANCE COMPANY,**

By:

David Fields, Executive Vice President



**NATIONAL INDEMNITY COMPANY,
NATIONAL LIABILITY & FIRE INSURANCE COMPANY,**

By:

David Fields, Vice President

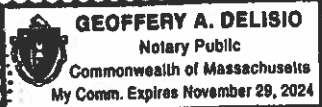


NOTARY

State of Massachusetts, County of Suffolk, ss:

On this 20th day of December, 2018, before me appeared David Fields, Executive Vice President of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY** and Vice President of **NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, who being duly sworn, says that his capacity is as designated above for such Companies; that he knows the corporate seals of the Companies; that the seals affixed to the foregoing instrument are such corporate seals; that they were affixed by order of the board of directors or other governing body of said Companies pursuant to its Bylaws, Resolutions and other Authorizations, and that he signed said instrument in that capacity of said Companies.

(Notary Seal)



Notary Public

I, Ralph Torrella, the undersigned, Officer of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, **NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies which is in full force and effect and has not been revoked. IN TESTIMONY WHEREOF, see hereunto affixed the seals of said Companies this November 1, 2022.



Officer

Certificate Of Completion

Envelope Id: 43361800AC0E4143972B108DE07D91E5
 Subject: Complete with DocuSign: FORSYTH, C204746
 Source Envelope:
 Document Pages: 716
 Certificate Pages: 5
 AutoNav: Enabled
 Envelope Stamping: Disabled
 Time Zone: (UTC-05:00) Eastern Time (US & Canada)

Status: Completed

Envelope Originator:
 Michelle Taylor
 1020 Birch Ridge Dr
 Raleigh, NC 27610-4328
 mataylor@ncdot.gov
 IP Address: 152.22.36.25

Record Tracking

Status: Original
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 Security Appliance Status: Connected
 Storage Appliance Status: Connected

Holder: Michelle Taylor
 mataylor@ncdot.gov
 Pool: StateLocal
 Pool: North Carolina Department of Transportation

Location: DocuSign
 Location: DocuSign

Signer Events

Alan McInnes
 amcinnes@ncdoj.gov
 Security Level: Email, Account Authentication (None)

Signature

DocuSigned by:

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Signature Adoption: Pre-selected Style
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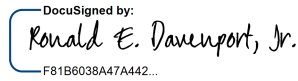
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Electronic Record and Signature Disclosure:

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Ronald E. Davenport, Jr.
 rondavenport@ncdot.gov
 Contract Officer
 North Carolina Department of Transportation
 Security Level: Email, Account Authentication (None)

DocuSigned by:

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Signature Adoption: Pre-selected Style
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Electronic Record and Signature Disclosure:

Not Offered via DocuSign

In Person Signer Events**Signature****Timestamp****Editor Delivery Events****Status****Timestamp****Agent Delivery Events****Status****Timestamp****Intermediary Delivery Events****Status****Timestamp****Certified Delivery Events****Status****Timestamp****Carbon Copy Events****Status****Timestamp**

Beth McKay
 agodotcontractreview@ncdoj.gov
 North Carolina Department of Transportation
 Security Level: Email, Account Authentication (None)

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Sent: 11/10/2022 9:51:55 AM

Electronic Record and Signature Disclosure:

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Carbon Copy Events	Status	Timestamp
Lori Strickland lastrickland@ncdot.gov Administrative Specialist I North Carolina Department of Transportation Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign	COPIED	Sent: 11/14/2022 12:59:57 PM
Michelle Taylor mataylor@ncdot.gov North Carolina Department of Transportation Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign	COPIED	Sent: 11/14/2022 12:59:59 PM Resent: 11/14/2022 1:00:07 PM Viewed: 11/14/2022 1:07:14 PM
Malcolm J Bell mjbell1@ncdot.gov Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign	COPIED	Sent: 11/14/2022 1:00:01 PM
Nancy L Gay nlgay@ncdot.gov CC+Contract Standards and Development Unit Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign	COPIED	Sent: 11/14/2022 1:00:02 PM
Mike Gwyn wmgwyn@ncdot.gov Administration Officer I North Carolina Department of Transportation Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign	COPIED	Sent: 11/14/2022 1:00:04 PM Viewed: 11/14/2022 1:23:57 PM
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Notary Events	Signature	Timestamp
Envelope Summary Events	Status	Timestamps
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Certified Delivered	Security Checked	11/14/2022 12:59:41 PM
Signing Complete	Security Checked	11/14/2022 12:59:44 PM
Completed	Security Checked	11/14/2022 1:00:04 PM
Payment Events	Status	Timestamps
Electronic Record and Signature Disclosure		

CONSUMER DISCLOSURE

From time to time, North Carolina Department of Transportation (we, us or Company) may be required by law to provide to you certain written notices or disclosures. Described below are the terms and conditions for providing to you such notices and disclosures electronically through your DocuSign, Inc. (DocuSign) Express user account. Please read the information below carefully and thoroughly, and if you can access this information electronically to your satisfaction and agree to these terms and conditions, please confirm your agreement by clicking the "I agree" button at the bottom of this document.

Getting paper copies

At any time, you may request from us a paper copy of any record provided or made available electronically to you by us. For such copies, as long as you are an authorized user of the DocuSign system you will have the ability to download and print any documents we send to you through your DocuSign user account for a limited period of time (usually 30 days) after such documents are first sent to you. After such time, if you wish for us to send you paper copies of any such documents from our office to you, you will be charged a \$0.00 per-page fee. You may request delivery of such paper copies from us by following the procedure described below.

Withdrawing your consent

If you decide to receive notices and disclosures from us electronically, you may at any time change your mind and tell us that thereafter you want to receive required notices and disclosures only in paper format. How you must inform us of your decision to receive future notices and disclosure in paper format and withdraw your consent to receive notices and disclosures electronically is described below.

Consequences of changing your mind

If you elect to receive required notices and disclosures only in paper format, it will slow the speed at which we can complete certain steps in transactions with you and delivering services to you because we will need first to send the required notices or disclosures to you in paper format, and then wait until we receive back from you your acknowledgment of your receipt of such paper notices or disclosures. To indicate to us that you are changing your mind, you must withdraw your consent using the DocuSign "Withdraw Consent" form on the signing page of your DocuSign account. This will indicate to us that you have withdrawn your consent to receive required notices and disclosures electronically from us and you will no longer be able to use your DocuSign Express user account to receive required notices and consents electronically from us or to sign electronically documents from us.

All notices and disclosures will be sent to you electronically

Unless you tell us otherwise in accordance with the procedures described herein, we will provide electronically to you through your DocuSign user account all required notices, disclosures, authorizations, acknowledgements, and other documents that are required to be provided or made available to you during the course of our relationship with you. To reduce the chance of you inadvertently not receiving any notice or disclosure, we prefer to provide all of the required notices and disclosures to you by the same method and to the same address that you have given us. Thus, you can receive all the disclosures and notices electronically or in paper format through the paper mail delivery system. If you do not agree with this process, please let us know as described below. Please also see the paragraph immediately above that describes the consequences of your electing not to receive delivery of the notices and disclosures electronically from us.

How to contact North Carolina Department of Transportation:

You may contact us to let us know of your changes as to how we may contact you electronically, to request paper copies of certain information from us, and to withdraw your prior consent to receive notices and disclosures electronically as follows:

To contact us by email send messages to: bledwards1@ncdot.gov

To advise North Carolina Department of Transportation of your new e-mail address

To let us know of a change in your e-mail address where we should send notices and disclosures electronically to you, you must send an email message to us at bledwards1@ncdot.gov and in the body of such request you must state: your previous e-mail address, your new e-mail address. We do not require any other information from you to change your email address..

In addition, you must notify DocuSign, Inc to arrange for your new email address to be reflected in your DocuSign account by following the process for changing e-mail in DocuSign.

To request paper copies from North Carolina Department of Transportation

To request delivery from us of paper copies of the notices and disclosures previously provided by us to you electronically, you must send us an e-mail to bledwards1@ncdot.gov and in the body of such request you must state your e-mail address, full name, US Postal address, and telephone number. We will bill you for any fees at that time, if any.

To withdraw your consent with North Carolina Department of Transportation

To inform us that you no longer want to receive future notices and disclosures in electronic format you may:

- i. decline to sign a document from within your DocuSign account, and on the subsequent page, select the check-box indicating you wish to withdraw your consent, or you may;
- ii. send us an e-mail to bledwards1@ncdot.gov and in the body of such request you must state your e-mail, full name, IS Postal Address, telephone number, and account number. We do not need any other information from you to withdraw consent.. The consequences of your withdrawing consent for online documents will be that transactions may take a longer time to process..

Required hardware and software

Operating Systems:	Windows2000 or WindowsXP
Browsers (for SENDERS):	Internet Explorer 6.0 or above
Browsers (for SIGNERS):	Internet Explorer 6.0, Mozilla FireFox 1.0, NetScape 7.2 (or above)
Email:	Access to a valid email account
Screen Resolution:	800 x 600 minimum

Enabled Security Settings:	<ul style="list-style-type: none"> ò Allow per session cookies ò Users accessing the internet behind a Proxy Server must enable HTTP 1.1 settings via proxy connection
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** These minimum requirements are subject to change. If these requirements change, we will provide you with an email message at the email address we have on file for you at that time providing you with the revised hardware and software requirements, at which time you will have the right to withdraw your consent.

Acknowledging your access and consent to receive materials electronically

To confirm to us that you can access this information electronically, which will be similar to other electronic notices and disclosures that we will provide to you, please verify that you were able to read this electronic disclosure and that you also were able to print on paper or electronically save this page for your future reference and access or that you were able to e-mail this disclosure and consent to an address where you will be able to print on paper or save it for your future reference and access. Further, if you consent to receiving notices and disclosures exclusively in electronic format on the terms and conditions described above, please let us know by clicking the "I agree" button below.

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