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

PROPOSAL

INCLUDES ADDENDUM No.1 DATED 10-13-2026

DATE AND TIME OF BID OPENING: **Oct 20, 2026 AT 02:00 PM**

CONTRACT ID	C204338
WBS	44643.3.1

FEDERAL-AID NO.	STATE FUNDED
COUNTY	WAKE
T.I.P NO.	P-5707
MILES	0.799
ROUTE NO.	SR-2052
LOCATION	SR-2052 (ROGERS RD) GRADE SEPARATION OVER CSX RAILROAD #633905Y AT MP-142.53.
TYPE OF WORK	WIDENING, GRADING, DRAINAGE, PAVING, SIGNALS, & STRUCTURES.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $40,000 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. C204338 IN WAKE COUNTY, NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C204338** 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 *2024 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 Contract No. **C204338** in **Wake 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 2024* 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

Signed by:
Jonathan H. Weathersbee
E45DA45396074A0...

10/13/2026

TABLE OF CONTENTS

COVER SHEET
PROPOSAL SHEET

PROJECT SPECIAL PROVISIONS

HAUL ROADS: G-1
CONTRACT TIME AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES: G-2
INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES: G-3
INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES: G-3
PERMANENT VEGETATION ESTABLISHMENT: G-4
MAJOR CONTRACT ITEMS: G-4
SPECIALTY ITEMS: G-5
FUEL PRICE ADJUSTMENT: G-5
STEEL PRICE ADJUSTMENT: G-7
SCHEDULE OF ESTIMATED COMPLETION PROGRESS: G-19
MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE: G-19
RESTRICTIONS ON ITS EQUIPMENT AND SERVICES: G-35
USE OF UNMANNED AIRCRAFT SYSTEM (UAS): G-35
EQUIPMENT IDLING GUIDELINES: G-35
SUBSURFACE INFORMATION: G-36
PORTABLE CONCRETE BARRIER - (Partial Payments for Materials): G-36
REMOVABLE PAVEMENT MARKINGS - (Partial Payments for Materials): G-36
ELECTRONIC BIDDING: G-36
BID DOCUMENTATION: G-37
TWELVE MONTH GUARANTEE: G-41
OUTSOURCING OUTSIDE THE USA: G-41
EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION: G-42
PROCEDURE FOR MONITORING BORROW PIT DISCHARGE: G-47
NOTE TO CONTRACTOR: G-48

ROADWAY R-1

STANDARD SPECIAL PROVISIONS

AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS SSP-1
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY SSP-2
ERRATA SSP-5
PLANT AND PEST QUARANTINES SSP-8
MINIMUM WAGES SSP-9
TITLE VI AND NONDISCRIMINATION: SSP-10
ON-THE-JOB TRAINING SSP-19

UNIT PROJECT SPECIAL PROVISIONS

GEOTECHNICAL.....GT-1.1
TRAFFIC CONTROL TC-1
UTILITY CONSTRUCTION.....UC-1
UTILITY BY OTHERS.....UBO-1
EROSION CONTROL EC-1
TRAFFIC SIGNALS TS-1
STRUCTURE/CULVERTS ST-1
RAILROAD INSURANCE (STRUCTURES).....RR-1

PERMITS P-1

PROPOSAL ITEM SHEET

ITEM SHEET(S)

PROJECT SPECIAL PROVISIONS

GENERAL

HAUL ROADS:
(7-16-24) 105 SP1 G04

Revise the *Standard Specifications* as follows:

Page 1-45, Article 105-15 RESTRICTION OF LOAD LIMITS, line 31, add the following after second sentence of the second paragraph:

At least 30 days prior to use, the Contractor shall notify the Engineer of any public road proposed for use as a haul road for the project.

CONTRACT TIME AND LIQUIDATED DAMAGES:
(8-15-00) (Rev. 5-16-23) 108 SP1 G08 A

The date of availability for this contract is **November 30, 2026**, 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, 2031**.

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 30, 2026**.

The completion date for this intermediate contract time is **October 1, 2030**.

The liquidated damages for this intermediate contract time are **Six Thousand Dollars ($ 6,000.00)** 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 **Any Road** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 A.M. to 7:00 P.M.
Saturday and Sunday, 10:00 A.M. to 8:00 P.M.

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

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

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

2. For **New Year's Day**, between the hours of **6:00 A.M.** December 31st and **7:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **7:00 P.M.** the following Tuesday.

3. For **Easter**, between the hours of **6:00 A.M.** Thursday and **7:00 P.M.** Monday.

4. For **Memorial Day**, between the hours of **6:00 A.M.** Friday and **7:00 P.M.** Tuesday.

5. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **7:00 P.M.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 A.M.** the Thursday before Independence Day and **7:00 P.M.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 A.M.** Friday and **7:00 P.M.** Tuesday.

7. For **Thanksgiving**, between the hours of **6:00 A.M.** Tuesday and **7:00 P.M.** Monday.

8. For **Christmas**, between the hours of **6:00 A.M.** the Friday before the week of Christmas Day and **7:00 P.M.** the following Tuesday after the week of Christmas Day.

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

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase I, Steps #2 thru #7** as shown on Sheet **TMP-3** and shall place and maintain traffic on same.

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

The completion date for this intermediate contract time is the date which is **five hundred fifteen (515)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Two Hundred Fifty Dollars ($ 250.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase IV, Steps #1 thru #4** 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 **three hundred fifty (350)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per calendar day.

PERMANENT VEGETATION ESTABLISHMENT:
(2-16-12)(Rev. 1-16-24) 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 *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 *Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

MAJOR CONTRACT ITEMS:
(2-19-02)(Rev. 1-16-24) 104 SP1 G28

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

Line #	Description
8	Borrow Excavation
272	MSE Retaining Wall No 1
274	MSE Retaining Wall No 4

SPECIALTY ITEMS:
(7-1-95)(Rev. 1-16-24) 108-6 SP1 G37

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

Line #	**Description**
85-96	Guardrail
97-99, 292	Fencing
103-106	Signing
127-132, 141	Long-Life Pavement Markings
133	Removable Tape
147-148	Permanent Pavement Markers
149-150	Lighting
152-193	Utility Construction
194-224, 226	Erosion Control
225	Reforestation
227-267, 295	Signals/ITS System

FUEL PRICE ADJUSTMENT:
(11-15-05)(Rev. 1-16-24) 109-8 SP1 G43

Page 1-82, Article 109-8, FUEL PRICE ADJUSTMENTS, add the following:

The base index price for DIESEL #2 FUEL is **$ 4.4428** 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
Erosion Control Stone	Gal/Ton	0.55
Rip Rap, Class _____	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
Ultra-thin Bonded Wearing Course	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
> 11" Portland Cement Concrete Pavement	Gal/SY	0.327
Concrete Shoulders Adjacent to > 11” Pavement	Gal/SY	0.327
9” to 11" Portland Cement Concrete Pavement	Gal/SY	0.272
Concrete Shoulders Adjacent to 9” to 11” Pavement	Gal/SY	0.272
< 9” Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to < 9” 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%20-%20%20Starting%20Nov%202022%20Lettings.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. 12-20-22) 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 **$ 47.50** per hundredweight.
The bidding index for Category 2 Steel items is **$ 72.05** per hundredweight.
The bidding index for Category 3 Steel items is **$ 81.25** per hundredweight.
The bidding index for Category 4 Steel items is **$ 60.53** per hundredweight.
The bidding index for Category 5 Steel items is **$ 63.19** per hundredweight.
The bidding index for Category 6 Steel items is **$ 83.80** per hundredweight.
The bidding index for Category 7 Steel items is **$ 50.35** per hundredweight.

The bidding index represents a selling price of steel based on Fastmarkets data for the month of **August 2026**.

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.

Product Relationship Table

Steel Product (Title)	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

* BI and MI are in converted units of Dollars per Hundredweight ($/CWT)
** Material Received Date is defined as the date the materials are received on the project site. If a material prepayment is made for a Category 4-6 item, the Adjustment Date to be used will be the date of the prepayment request instead of the Materials Received Date.

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:

SPA = ((MI/ BI) -1) * BI *(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 2019

Submittal Date August 31, 2019

Contract Line Item 237

Line Item Description SUPPORT, OVRHD SIGN STR -DFEB – STA 36+00

Sequential Submittal Number 2

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

SPA = ((MI/ BI) -1) * BI *(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.

BI = $36.12/ CWT

MI = $64.89 / CWT

% change = ((MI/ BI)-1) = ($64.89 / $36.12 – 1) = (1.79651 – 1) = 0.79651162791

Q = 450,000 lbs.

SPA = 0.79651162791x $36.12 x (450,000/100)

SPA = 0.79651162791* $36.12 *4,500

SPA = $129,465 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:

SPA = ((MI/ BI) -1) * BI *(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.

BI = $46.72/ CWT

MI = $27.03 / CWT

% change = ((MI/ BI)-1) = ($27.03/ $46.72–1) = (0.57855–1) = -0.421446917808

Q = 600,000 lbs.

SPA = -0.421446917808 * $46.72 * (600,000/100)

SPA = -0.421446917808 * $46.72 *6,000

SPA = $ 118,140.00 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:

SPA = ((MI/ BI) -1) * BI *(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.

BI = $29.21/ CWT

MI = $43.13 / CWT

% change = ((MI/ BI)-1) = ($43.13 / $29.21 – 1) = (1.47655 – 1) = 0.47654912701

Q = 103932 lbs.

SPA = 0. 47654912701 * $29.21 * (103,932/100)

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-

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:
(7-15-08)(Rev. 6-16-26) 108-2 SP1 G58

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

Fiscal Year	Progress (% of Dollar Value)
2027 (7/01/26 - 6/30/27)	**21**% of Total Amount Bid
2028 (7/01/27 - 6/30/28)	**29**% of Total Amount Bid
2029 (7/01/28 - 6/30/29)	**28**% of Total Amount Bid
2030 (7/01/29 - 6/30/30)	**19**% of Total Amount Bid
2031 (7/01/30 – 6/30/31)	**3**% of Total Amount Bid

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

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE:
(10-16-07)(Rev. 10-21-25) 102-15(J) SP1 G66

Description

The purpose of this Special Provision is to carry out the North Carolina Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with State funds.

Definitions

Additional MBE/WBE Subcontractors - Any MBE/WBE submitted at the time of bid that will not be used to meet the Combined MBE /WBE Goal. No submittal of a Letter of Intent is required.

Combined MBE/WBE Goal: A portion of the total contract, expressed as a percentage that is to be performed by committed MBE/WBE subcontractors.

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

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

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

Manufacturer - A firm that owns (or leases) and operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor. A firm that makes minor modifications to the materials, supplies, articles, or equipment is not a manufacturer.

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

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

Regular Dealer - A firm that owns (or leases), and operates a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in sufficient quantities, 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, concrete or concrete products, gravel, stone, asphalt and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Any supplement of regular dealers' own distribution equipment shall be by a long-term operating lease and not on an ad hoc or contract-by-contract basis.

Distributor – A firm that engages in the regular sale or lease of the items specified by the contract. A distributor assumes responsibility for the items it purchases once they leave the point of origin (e.g., a manufacturer's facility), making it liable for any loss or damage not covered by the carrier's insurance.

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

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program 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.

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

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

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Contractor enters the payments made to MBE and WBE 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 MBE/WBE 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 *MBE/WBE Replacement Request Form* - Form for replacing a committed MBE or WBE. https://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Form%20and%20Instructions.pdf

SAF *Subcontract Approval Form* - Form required for approval to sublet the contract. https://connect.ncdot.gov/projects/construction/Construction%20Forms/SAF%20Form%20-%20Subcontract%20Approval%20Form%20Revised%2004-19.xlsm

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 MBE/WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE/WBE 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 MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet the Combined MBE/WBE goal. This form is for paper bids only. http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs 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 Regular Dealer/Distributor Affirmation Form – Form is used to make a preliminary counting determination for each DBE listed as a regular dealer or distributor to assess its eligibility for 60 or 40 percent credit, respectively of the cost of materials or supplies based on its demonstrated capacity and intent to perform as a regular dealer or distributor, as defined in section 49 CFR 26.55 under the contract at issue. A Contractor will submit the completed form with the Letter of Intent. https://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20Regular%20Dealer-Distributor%20Affirmation%20Form%20-%20USDOT%202024.pdf

Combined MBE/WBE Goal

There is NO MBE/WBE Goal for this project.

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 MBE and WBE certified shall be used to meet the Combined MBE/WBE Goal. The Directory can be found at the following link.

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 MBE/WBE Subcontractors

At the time of bid, bidders shall submit all MBE and WBE participation that they anticipate to use during the life of the contract. Only those identified to meet the Combined MBE/WBE Goal will be considered committed, even though the listing shall include both committed MBE/WBE subcontractors and additional MBE/WBE subcontractors. Any additional MBE/WBE subcontractor participation above the goal will follow the banking guidelines found elsewhere in this provision. All other additional MBE/WBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goals. Only those firms with current MBE and WBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of MBE and WBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of MBE and WBE participation in the appropriate section of the electronic submittal file.

(1) Submit the names and addresses of MBE and WBE firms identified to participate in the contract. If the bidder uses the updated listing of MBE and WBE firms shown in the electronic submittal file, the bidder may use the dropdown menu to access the name and address of the firms.

(2) Submit the contract line numbers of work to be performed by each MBE and WBE firm. When no figures or firms are entered, the bidder will be considered to have no MBE or WBE participation.

(3) The bidder shall be responsible for ensuring that the MBE and WBE are 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 MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE goal.

(B) Paper Bids

(1) *If the Combined MBE/WBE Goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of MBE/WBE participation, including the names and addresses on *Listing of MBE and WBE 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 MBE and WBE participation for the contract.

(b) If bidders have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE 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 MBE and WBE 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 MBE/WBE 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 MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE Goal.

(2) *If the Combined MBE/WBE Goal is zero,* entries on the *Listing of MBE and WBE Subcontractors* are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

MBE or WBE Prime Contractor

When a certified MBE or WBE firm bids on a contract that contains a Combined MBE/WBE goal, the 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 MBE or WBE bidder on a contract will meet the Combined MBE/WBE Goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the MBE or WBE bidder and any other similarly certified subcontractors will count toward the goal. The MBE or WBE bidder shall list itself along with any MBE or WBE subcontractors, if any, in order to receive credit toward the goal.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE/WBE Subcontractor* just as a non-MBE/WBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each MBE/WBE that will be used to meet the Combined MBE/WBE Goal of the contract, indicating the bidder's commitment to use the

MBE/WBE 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 MBE and WBE to be used toward the Combined MBE/WBE Goal, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the Combined MBE/WBE Goal. If the lack of this participation drops the commitment below the Combined MBE/WBE Goal, the Contractor shall submit evidence of good faith efforts for the goal, 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.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted exceeds the algebraic sum of the Combined MBE /WBE Goal by $1,000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the apparent lowest responsive bidder fails to submit sufficient participation by MBE and WBE firms to meet the advertised goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the Combined MBE/WBE Goal as long as there are adequate funds available from the bidder's MBE and WBE bank accounts.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the Combined MBE/WBE Goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific 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 would be 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 MBE/WBE 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 a Combined MBE/WBE Goal 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 MBE/WBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought MBE/WBE 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 goals 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 MBEs/WBEs that are also prequalified subcontractors. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the MBEs/WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs/WBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the Combined MBE/WBE Goal will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate MBE/WBE 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 advertised goal when the work to be sublet includes potential for MBE/WBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested certified MBEs/WBEs that are also prequalified subcontractors 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 MBEs/WBEs. It is the bidder's responsibility to make a portion of the work available to MBE/WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE subcontractors and suppliers, so as to facilitate MBE/WBE participation. Evidence of such negotiation includes the

names, addresses, and telephone numbers of MBEs/WBEs 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 MBEs/WBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE/WBE subcontractors, and would take a firm's price and capabilities as well as the advertised goal into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs/WBEs is not in itself sufficient reason for a bidder's failure to meet the contract 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 MBEs/WBEs if the price difference is excessive or unreasonable.

(E) Not rejecting MBEs/WBEs 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 MBEs/WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested MBEs/WBEs 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 MBEs/WBEs. 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 MBE or WBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the advertised 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 Combined MBE/WBE Goal.

(2) The bidders' past performance in meeting the contract goal.

(3) The performance of other bidders in meeting the advertised goal. For example, when the apparent successful bidder fails to meet the 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 advertised goal, but meets or exceeds the average MBE and WBE 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 Combined MBE/WBE Goal can be met or that an adequate good faith effort has been made to meet the advertised 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. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting MBE/WBE Participation Toward Meeting the Combined MBE/WBE Goal

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by a committed MBE/WBE will be based upon the value of work performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting MBE/WBE 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 MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the anticipated MBE participation. The same holds true for work that a WBE subcontracts to another WBE firm. Work that a MBE/WBE subcontracts to a non-MBE/WBE firm does <u>not</u> count toward the contract goal requirement. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to

WBEs), in order to fulfill the MBE or WBE participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified firms and there is no interest or availability, and they can get assistance from other certified firms, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE breakdown. If a MBE or WBE 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 MBE or WBE is not performing a commercially useful function.

(D) Joint Venture

When a MBE or WBE 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 MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Manufacturer, Regular Dealer, Distributor

A Contractor may count toward its MBE/WBE requirement 40 percent of its expenditures for materials or supplies (including transportation costs) from a MBE/WBE distributor, 60 percent of its expenditures for materials or supplies (including transportation costs) from a MBE/WBE regular dealer and 100 percent of such expenditures obtained from a MBE/WBE manufacturer.

A Contractor may count toward its MBE/WBE requirement the following expenditures to MBE/WBE firms that are not manufacturers, regular dealers or distributors:

(1) The fees or commissions charged by a MBE/WBE 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 MBE/WBE, which is neither a manufacturer, regular dealer, nor a distributor count the entire amount of fees or commissions charged that the Department deems to be reasonable, including transportation charges for the delivery of materials or supplies. Do not count any portion of the cost of the materials and supplies themselves.

A Contractor will submit a completed *DBE Regular Dealer/Distributor Affirmation Form* with the Letter of Intent to the State Contractor Utilization Engineer or DBE@ncdot.gov. The State Contractor Utilization Engineer will make a preliminary assessment as to whether a MBE/WBE supplier has the demonstrated capacity to perform a commercially useful function (CUF) on a contract-by-contract basis *prior* to its participation.

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE 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 MBE/WBE 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 performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors. If it is determined that a MBE or WBE is not performing a Commercially Useful Function, the contractor may present evidence to rebut this presumption to the Department.

(B) MBE/WBE Utilization in Trucking

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

(1) The MBE/WBE 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 the Combined MBE/WBE Goal.

(2) The MBE/WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

(3) The MBE/WBE 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 MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith

effort has been made to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE participation breakdown.

(5) The MBE/WBE may also subcontract the work to a non-MBE/WBE firm, including from an owner-operator. The MBE/WBE who subcontracts the work to a non-MBE/WBE is entitled to credit for the total value of transportation services provided by the non-MBE/WBE subcontractor not to exceed the value of transportation services provided by MBE/WBE-owned trucks on the contract. Additional participation by non-MBE/WBE 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 MBE/WBE and the Contractor will not count towards the MBE/WBE contract requirement.

(6) A MBE/WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE/WBE 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 MBE/WBE, so long as the lease gives the MBE/WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE/WBE's credit as long as the driver is under the MBE/WBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the MBE/WBE 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.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE subcontractor (or an approved substitute MBE or WBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE subcontractor or any portion of its work 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 MBE/WBE subcontractor, a non-MBE/WBE 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 MBE/WBE subcontractor, with a copy to the Engineer of its intent to request to terminate a MBE/WBE subcontractor or any portion of its work, and the reason for the request. The Contractor must give the MBE/WBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the MBE/WBE subcontractor objects to the intended termination/substitution, the MBE/WBE, 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 MBE/WBE subcontractor.

A committed MBE/WBE subcontractor may only be terminated or any portion of its work after receiving the Department's written approval based upon a finding of good cause for the proposed termination and/or substitution. Good cause does not exist if the Contractor seeks to terminate a MBE/WBE or any portion of its work that it relied upon to obtain the contract so that the Contractor can self-perform the work for which the MBE/WBE was engaged, or so that the Contractor can substitute another MBE/WBE or non- MBE/WBE contractor after contract award. For purposes of this section, good cause shall include the following circumstances:

(a) The listed MBE/WBE subcontractor fails or refuses to execute a written contract;
(b) The listed MBE/WBE 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 MBE/WBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
(c) The listed MBE/WBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
(d) The listed MBE/WBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
(e) The listed MBE/WBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR parts 180, 215 and 1200 or applicable State law;
(f) The listed MBE/WBE subcontractor is not a responsible contractor;
(g) The listed MBE/WBE voluntarily withdraws from the project and provides written notice of withdrawal;
(h) The listed MBE/WBE is ineligible to receive MBE/WBE credit for the type of work required;
(i) A MBE/WBE owner dies or becomes disabled with the result that the listed MBE/WBE contractor is unable to complete its work on the contract; and
(j) Other documented good cause that compels the termination of the MBE/WBE subcontractor.

The Contractor shall comply with the following for replacement of a committed MBE/WBE:

(A) Performance Related Replacement

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

If a replacement MBE/WBE is not found that can perform at least the same amount of work as the terminated MBE/WBE, 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 MBE/WBEs that their interest is solicited in contracting the work defaulted by the previous MBE/WBE or in subcontracting other items of work in the contract.

(2) Efforts to negotiate with MBE/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBE/WBEs who were contacted.
(b) A description of the information provided to MBE/WBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why MBE/WBE quotes were not accepted.

(4) Efforts made to assist the MBE/WBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

(1) When a committed MBE/WBE 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 MBE/WBE 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 but not the overall goal.

(i) If the MBE/WBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract. The Department may continue to count participation equal to the remaining work performed by the decertified firm which will count toward the contract goal requirement and overall goal.

(ii) If the MBE/WBE's ineligibility is caused solely by its acquisition by or merger with a non- MBE/WBE during the performance of the contract. The Department may not continue to count the portion of the decertified firm's performance on the contract remaining toward either the contract goal or the overall goal, even if the Contractor has executed a subcontract with the firm or the Department has executed a prime contract with the MBE/WBE that was later decertified.

(2) When a committed MBE/WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE/WBE firm, the

Contractor shall take all necessary and reasonable steps to replace the MBE/WBE subcontractor with another MBE/WBE subcontractor to perform at least the same amount of work to meet the Combined MBE/WBE goal requirement. If a MBE/WBE 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).

All requests for replacement of a committed MBE/WBE 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 MBE/WBE, 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 MBE/WBE based upon the Contractor's commitment, the MBE/WBE shall participate in additional work to the same extent as the MBE/WBE 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 MBEs/WBEs 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 MBE/WBE, the Contractor shall seek participation by MBEs/WBEs 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 MBE/WBE, the Contractor shall seek additional participation by MBEs/WBEs equal to the reduced MBE/WBE 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 MBE/WBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving MBE/WBE 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 MBE/WBE 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 MBE/WBE credit.

Reporting Minority and Women Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all MBE/ WBE 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 MBEs/WBEs, 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-MBE/WBE 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 Payment Tracking System.

Failure to Meet Contract Requirements

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

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)(Rev. 3-17-26) 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, NC GS 15A-300*,* American Security Drone Act of 2023 (ASDA), Office of Management and Budget (OMB) Memorandum M-26-02, all FAA rules, regulations and policies and all NCDOT UAS Policies. The required operator certifications include possessing a current Federal Aviation Administration (FAA) Remote Pilot Certificate, as well as operating a UAS registered with the FAA.

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.

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. 1-16-24) 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 *Standard Specifications* have been furnished to the Engineer.

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

REMOVABLE PAVEMENT MARKINGS - (Partial Payments for Materials):
(7-1-95)(Rev. 1-16-24) 1205-10 SP1 G124

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of pavement marking tape, provided that these materials have been delivered on or in the vicinity of the project, stored in an acceptable manner, not to exceed the shelf life recommended by the manufacturer, and further provided the documents listed in Subarticle 109-5(C) of the *Standard Specifications* have been furnished to the Engineer.

The Contractor shall be responsible for the material and the satisfactory performance of the material when used in the work.

The provisions of Article 109-6 of the *Standard Specifications* will not apply to removable pavement marking materials.

ELECTRONIC BIDDING:
(8-18-26) 101, 102, 103 SP1 G140

Revise the *Standard Specifications* as follows:

Page 1-4, Article 101-3, DEFINITIONS, BID (OR PROPOSAL) ***Electronic Bid,*** **line 3,** replace "electronic bidding software" with "electronic bidding website".

Page 1-16, Subarticle 102-8(B), Electronic Bids, lines 13-14, replace "electronic bidding software" with "electronic bidding website".

Page 1-18, Article 102-10, BID BOND OR BID DEPOSIT, line 43, replace "electronic bidding software" with "electronic bidding website".

Page 1-18, Article 102-11, DELIVERY OF BIDS, line 47, replace "electronic bidding software" with "electronic bidding website".

Page 1-25, Subarticle 103-4(B)(2), Electronic Bids, line 20, replace the first paragraph with the following:

This form is located on the electronic submittal website. The bidder shall click on yes or no to indicate whether or not the bidder desires to limit the award, provide the award limit if desiring to limit the award, and provide the project number and county of the projects associated with the award limit.

BID DOCUMENTATION:

(1-1-02) (Rev.8-20-24) 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 14 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 State Contract Officer acting directly or through a duly authorized representative 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 State Contract Officer acting directly or through a duly authorized representative with any other needed bid documentation. The State Contract Officer acting directly or through a duly authorized representative 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 State Contract Officer acting directly or

through a duly authorized representative 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.

OUTSOURCING OUTSIDE THE USA:
(9-21-04) (Rev. 5-16-06) SP1 G150

All work on consultant contracts, services contracts, and construction contracts shall be performed in the United States of America. No work shall be outsourced outside of the United States of America.

Outsourcing for the purpose of this provision is defined as the practice of subcontracting labor, work, services, staffing, or personnel to entities located outside of the United States.

The North Carolina Secretary of Transportation shall approve exceptions to this provision in writing.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev. 10-15-24) 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 C*ease and Desist Order* for erosion and sediment control/stormwater related issues.

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

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

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

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

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

Failure to appeal within 10 calendar days will result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified

will result in a waiver of all future appeal rights regarding the adverse action taken. The certificant will not be allowed to perform duties associated with the certification during the appeal process.

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

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

Measurement and Payment

All work described within this provision and the role of 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. 1-16-24) 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 *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:

If dead bats are observed during clearing, demolition, or any construction related activities, the contractor shall immediately notify the Engineer, who will then inform the Division Environmental Officer (DEO) who will collect and preserve the bats for identification.

The Contractor shall notify the Engineer if historic, cultural, archeological, and / or human remains are discovered during ground disturbance activities in accordance with Section 225-3,

Page 2-15 lines 27-30 of the *Standard Specifications*. The Engineer will then notify the agencies including USACE, FRA and NC SHPO.

PROJECT SPECIAL PROVISIONS

ROADWAY

FIELD OFFICE (Month):
(6-1-07)(Rev. 2-15-22) SPI 8-02

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 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 that are constructed of plywood, fiber board, gypsum board, or other suitable materials. Have the exterior walls, ceiling, and floor insulated.

Provide a field office with a minimum floor space of 1000 square feet and that is equipped with the following:

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

Number	Item
1	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	Telephone.
1	Print/Copy/Scan/Fax machine (11 inch x 17 inch copies).

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 extinguishers 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, pay internet and utility service fees and bills, and handle the 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 64 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 six vehicles, including graveled access to the paved surface.

Measurement and Payment

Measurement for use of the *Field Office* will be based on the time it is used, expressed in calendar months. The unit bid price shall include furnishing, erecting, equipping, maintaining, and removing the field office. Payment will not be made for any month during which the office is furnished for less than 15 calendar days or for any time in excess of the time limit established in the Contract as extended in accordance with the requirements of Section 108-10 of the *Standard Specifications.*

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

Payment will be made under:

Pay Item	**Pay Unit**
Field Office	Month

CONSTRUCTION SEQUENCE:

(7-1-95) (Rev. 8-21-12) 560 SP1 R34R

Pave each section of roadway begun in a continuous operation. Do not begin work on another section of roadway unless satisfactory progress is being made toward completion of intersections and all other required incidental work by satisfactorily furnishing additional paving equipment and personnel, except for milling and patching operations.

CLEARING AND GRUBBING - METHOD III:

(4-6-06)(Rev. 3-19-24) 200 SP2 R02B

Perform clearing on this project to the limits established by Method - III shown on Standard Drawing No. 200.03 of the *Roadway Standard Drawings*. Conventional clearing methods may be used except where permit drawings or conditions have been included in the proposal which require certain areas to be cleared by hand methods.

BURNING RESTRICTIONS:

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

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

TEMPORARY DETOURS:

(7-1-95) (Rev. 11-19-13) 1101 SP2 R30B

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

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

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

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

AGGREGATE BASE COURSE MODIFIED:

Description

The work covered by this provision consists of placing aggregate shoulder material between the sidewalk and shoulder point as directed by the plans and in accordance with Standard Drawing No. 560.01 and 560.02 of the *Roadway Standard Drawings.* The width will be shown on typical sections, or as directed by the Engineer. Seeding and mulching shall be performed upon completion of shoulder grading when earth borrow is used.

This work shall be performed during shoulder construction or as directed by the Engineer.

Materials

The Contractor shall furnish all earth material necessary for the construction of the shoulders in accordance with Section 1019 of the *Standard Specifications*. All soil is subject to test and acceptance or rejection by the Engineer.

The Contractor **is required to use Aggregate Base Course Modified, ABC (M), on shoulders as detailed in the typical sections. Borrow excavation shall be used in lieu of ABC (M) if directed by the contract or Engineer.**

ABCM shall meet the following gradation:

Sieve	Percent Passing
1-1/2"	100
1”	75-100
1/2”	45-79
#4	20-40
#10	0-25
#200	0-12

Construction Methods

Obtain material from within the project limits or approved source. The contractor shall construct the shoulder in accordance with Section 560 of the *Standard Specifications.*

Any excess material generated by the shoulder reconstruction shall be disposed of by the Contractor in an approved disposal site.

Measurement and Payment

Aggregate Base Course Modified will be measured and paid at the contract unit price per ton that has been incorporated into the completed work that is accepted by the Engineer. The number of tons of material is determined by weighing the material in trucks in accordance with Article 106-7. No deductions will be made for any moisture contained in the aggregate at time of weighing.

Borrow Excavation will be measured and paid in accordance with Section 230 of the *Standard Specifications* for earth material furnished by the Contractor. The requirements of Article 104-5 of the *Standard Specifications* pertaining to revised contract prices for overrunning minor items will not apply to the item of *Borrow Excavation*.

Seeding and Mulching will be measured and paid as provided in Article 1660-8 of the *Standard Specifications*.

Where ABC (M) is used, seeding and mulching will not be required.

Payment will be made under:

Pay Item	**Pay Unit**
Aggregate Base Course Modified	Ton

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02)(Rev. 1-16-24) 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 *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 *Standard Specifications*.

ROADWAY EXCAVATION:
(10-20-26) 225 SP2 R50

Revise the *Standard Specifications* as follows:

Page 2-12, Article 225-1, DESCRIPTION, add the following after line 42:

When excavation operations encounter graves, temporarily discontinue operations in the vicinity of the graves and do not resume until directed by the Engineer.

When excavation operations encounter contaminated soils, temporarily discontinue operations in the vicinity of the contamination and do not resume until directed by the Engineer.

When excavation operations encounter artifacts or remains of historical, cultural, or archeological significance, temporarily discontinue operations in the vicinity of the artifacts or remains and do not resume until directed by the Engineer. Disposition of the artifacts shall be in accordance with the requirements of the Division of Archives and History.

Discontinuing operations shall include promptly ceasing all work in the vicinity, immediately notifying the Engineer as to the discovery for legally required authority notification, taking all precautions to protect the discovery from further disturbance to include securing the area and preventing access to it, and preserving all materials as found as directed by the Engineer.

Page 2-15, Article 225-3, UNCLASSIFIED EXCAVATION, lines 23-30, delete the last three paragraphs.

BORROW EXCAVATION (Truck Measurement):
(7-1-95)(Rev. 1-16-24) 230 SP2 R57

The borrow material used on this project will be measured for payment by truck measurement as provided in Article 230-5 of the *Standard Specifications*.

MANUFACTURED QUARRY FINES IN EMBANKMENTS:
(01-17-17)(Rev. 4-16-24) 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 subgrade stabilization in accordance with the contract. Geotextile for subgrade 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.*

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.

In embankments where MQFs are incorporated, geotextile for subgrade stabilization shall be used. Refer to Article 505-2 of the *Standard Specifications* for geotextile type and Article 505-3 of the *Standard Specifications* for the geotextile construction methods.

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *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 for *Borrow Excavation* is not included in the original contract then no separate payment will be made for this item and payment will be included in the lump sum price bid for *Grading*.

Geotextile for Subgrade Stabilization will be measured and paid in accordance with Article 505-4 of the *Standard Specifications*. When the pay item for *Geotextile for Subgrade 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. 1-16-24) 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 *Standard Specifications*.

Item	**Section**
Flowable Fill	1000-7

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	**Pay Unit**
Flowable Fill	Cubic Yard

REINFORCED CONCRETE PIPE CULVERT (CONTRACTOR DESIGN):

(10-20-09)(Rev. 1-16-24) SPI 3-06

Description

This work consists of the design, manufacture and installation of reinforced concrete pipes in locations that require fill heights greater than 40 feet and less than or equal to 80 feet.

Materials

(A) Design

When the design of a reinforced concrete pipe is required in the contract plans, design the reinforced concrete pipe in accordance with the current edition of the AASHTO LRFD Bridge Design Specifications. Provide the diameter of pipe as indicated on the plans and manufacture the pipe in accordance with ASTM C1417. Provide a reinforced concrete pipe that meets the requirements of Section 1032-6(B), Section 1077 and any other applicable parts of the Standard Specifications.

The design of the reinforced concrete pipe is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to fabricate the reinforced concrete pipe. Include checked design calculations for the reinforced concrete pipe. Have a North Carolina Registered Professional Engineer seal the plans and design calculations. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22 inch x 34 inch sheets to become part of the contract plans.

(B) Reinforced Concrete Pipe Sections

(1) Class

Reinforced concrete pipe sections manufactured in accordance with this Special Provision are designated by inside pipe diameter and design earth cover.

(2) Design Criteria

The design of the reinforced concrete pipe shall be in accordance with Article 12.10.4.2 “Direct Design Method” of the current edition of the AASHTO LRFD Bridge Design Specifications. The following assumptions shall be used in the design calculations:

NCDOT Criteria for Direct Design Method
Process and Material Factors,

Radial Tension, F_{rp}=1.0 Shear Strength, F_{vp}=1.0
Design Concrete Strength - f'$_c$ 5,000 psi < f'c < 7,000 psi
Heger Pressure Distribution - Type 2 Installation Vertical Arching Factor = 1.40 Horizontal Arching Factor = 0.40
Soil Unit Weight = 120 lb/ft^3
Depth of Fluid = Inside Pipe Diameter
Minimum Concrete Cover = 1.00"
Crack Control = 0.90 (maximum)

(C) Joints

Produce the reinforced concrete pipe sections with spigot and bell ends. Design and form the ends of the pipe section so, when the sections are laid together, they make a continuous line of pipe with a smooth interior free of appreciable irregularities in the flow line, and compatible with the permissible variations given in Standard Specifications and ASTM C1417.

(D) Manufacture

In addition to the requirements of the *Standard Specifications* and ASTM C1417, devices or holes are permitted in each pipe section for the purpose of handling and placement. 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 plug.

Measurement and Payment

____ *" RC Pipe Culverts, Contractor Design* will be measured and paid for in linear feet. Such price and payment will be full compensation for all work and will include, but not be limited to, furnishing all labor, materials, equipment and other incidentals necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
___" RC Pipe Culverts, Contractor Design	Linear Feet

BRIDGE APPROACH FILLS:

(10-19-10)(Rev. 1-16-24) 422 SP4 R02

Description

Bridge approach fills consist of backfilling behind bridge end bents with select material or aggregate to support all or part of bridge approach slabs. Install outlets and grade bridge approach fills to drain water through and away from approach fills. Install geotextiles to allow for possible future slab jacking and separate approach fills from embankment fills, natural ground and pavement sections 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 as required. Construct bridge approach fills in accordance with the contract, accepted submittals and bridge approach fill *Roadway Standard Drawings*.

Define bridge approach fill types as follows:

Type 1 Approach Fill – Approach fill for bridge abutment in accordance with *Roadway Standard Drawing* No. 423.01;

Type 1A Approach Fill – Alternate approach fill for integral bridge abutment in accordance with *Roadway Standard Drawing* No. 423.02;

Type 2 Approach Fill – Approach fill for bridge abutment with MSE wall in accordance with *Roadway Standard Drawing* No. 423.03 and

Type 2A Approach Fill – Alternate approach fill for integral bridge abutment with MSE wall in accordance with *Roadway Standard Drawing* No. 423.04.

At the Contractors option, use Type 1A or 2A approach fills instead of Type 1 or 2 approach fills, respectively, for integral bridge abutments. Type 1A and 2A approach fills 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 construction surcharge, remains in place and is aligned so the wall face functions as a form for the integral end bent cap backwall and wing walls.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	**Section**
Geotextiles	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044
Welded Wire Reinforcement	1070-3

Provide Type 1 geotextile for separation geotextiles, Type 4a geotextile for under bridge approach slabs and Class B concrete for outlet pads. Use Class V or Class VI select material for

Type 1 and 1A approach fills and the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal for Type 2 and 2A approach fills. For MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide outlet pipes and fittings for subsurface drainage materials. Provide 1/4" hardware cloth with 1/4 inch openings constructed from 24 gauge wire.

For temporary geotextile walls, use welded wire reinforcement for welded wire facing and Type 5a geotextile for reinforcement geotextiles. Use Type 5a geotextile with lengths as shown in *Roadway Standard Drawing* No. 423.02 or 423.04.

Construction Methods

Excavate as necessary for approach fills and, if applicable, temporary geotextile walls in accordance with the contract. Ensure limits of approach fills are graded to drain as shown in the bridge approach fill *Roadway Standard Drawings*. For Type 1 and 1A approach fills in embankment fills, place and compact a temporary 1.5:1 (H:V) fill slope in accordance with *Roadway Standard Drawing* No. 423.01 or 423.02 and in accordance with Subarticle 235-3(B) and 235-3(C) of the *Standard Specifications*. Density testing is required within the temporary fill slope and additional more frequent density testing is also required for bridge approach embankments. Wait 3 days before cutting the slope back to complete the approach fill excavation. Use excavated material elsewhere on the project to form embankments, subgrades, or shoulders. If a slope for an approach fill is excavated to flatter than what is required for access or any other reason, that same slope is required for the entire approach fill excavation. Do not backfill overexcavations that extend outside the approach fill limits shown on the *Roadway Standard Drawings* with embankment soils. Instead, expand approach fill limits to include overexcavations.

Notify the Engineer when embankment fill placement and approach fill excavation is complete. Do not place separation geotextiles or aggregate until approach fill dimensions and embankment materials below and outside approach fills are approved.

For Type 2 approach fills, cast MSE wall reinforcement or connectors into end bent cap backwalls within 3 inches 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 Type 2 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 over any MSE wall geosynthetic reinforcement, pull reinforcement taut so that it is in tension and free of kinks, folds, wrinkles or creases.

For Type 1 and 1A approach fills, place pipe sleeves in wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads. Insert outlet pipes into pipe sleeves to direct water towards outlets. Attach hardware cloth in front of the outlet pipe at the wing. Connect outlet pipes and fittings with solvent cement in accordance with Article 815-3 of the *Standard Specifications* and place outlet pads in accordance with Roadway Standard Drawing No. 815.03.

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent geotextiles of the same type at least 18 inches. Cover select material or aggregate with Type 4a geotextile at an elevation 6 inches below the bridge approach slab. 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 or MSE wall reinforcement.

For Type 1A and 2A approach fills, install temporary geotextile walls as shown in *Roadway Standard Drawing* No. 423.02 or 423.04. At the Contractor's option, construct the bottom portion of integral end bents before temporary geotextile walls as shown in the plans. Erect and set welded wire facing for temporary geotextile walls so facing functions as a form for the integral end bent cap backwall. Place welded wire facing adjacent to each other in the horizontal and vertical directions to completely cover the temporary geotextile 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 wall face in accordance with *Roadway Standard Drawing* No. 423.02 or 423.04 and cover geotextiles with at least 3 inches of select material or aggregate. Place layers of reinforcement geotextiles within 3 inches of locations shown in *Roadway Standard Drawing* No. 423.02 or 423.04. Install reinforcement geotextiles with the direction shown in *Roadway Standard Drawing* No. 423.02 or 423.04. Orient overlapping seams in reinforcement geotextiles perpendicular to the integral end bent cap backwall. Do not overlap reinforcement geotextiles so seams are parallel to the wall face. Before placing select material or aggregate over reinforcement geotextiles, pull geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Temporary geotextile walls are designed for a surcharge pressure in accordance with *Roadway Standard Drawing* No. 423.02 or 423.04. If loads from construction equipment will be more than what the wall is designed for, contact the Engineer before positioning equipment on top of temporary geotextile walls.

Place select material or aggregate in 6 inch to 8 inch thick lifts. Compact fine aggregate for Type 2 and 2A approach fills in accordance with Subarticle 235-3(C) of the *Standard Specifications* except compact fine aggregate to a density of at least 98%. Compact select material for Type 1 and 1A approach fills and coarse aggregate for Type 2 and 2A approach fills with at least 4 passes of a trench roller in a direction parallel to the end bent cap backwall. Do not displace or damage geosynthetics or MSE wall reinforcement when placing and compacting select material or aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics until they are covered with at least 8 inches of select material or aggregate. Replace any damaged geosynthetics to the satisfaction of the Engineer. When approach fills extend beyond bridge approach slabs, wrap Type 4a geotextiles over select material or aggregate and back under approach slabs as shown in *Roadway Standard Drawing* No. 423.03 or 423.04.

Measurement and Payment

Type 1 and 1A approach fills will be paid for at the contract lump sum price for *Type 1 Bridge Approach Fill, Station* _____ and Type 2 and 2A approach fills will be paid for at the contract lump sum price for *Type 2 Bridge Approach Fill, Station* _____. 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 wall facing, geotextiles and outlets, compacting backfill and supplying select material, aggregate, geotextiles, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct approach fills behind bridge end bents.

Compensation for the material placed within the temporary 1.5:1 (H:V) fill slopes will be made in accordance with Section 225, 226, or 230 of the *Standard Specifications*. The cost of removal, including excavating, hauling, placement, and compaction of the material elsewhere on or off the project will be included in the contract lump sum price for *Type 1 Bridge Approach Fill, Station* _____.

The contract lump sum price for *Type 2 Bridge 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 Type 2 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	Pay Unit
Type 1 Bridge Approach Fill, Station _____	Lump Sum
Type 2 Bridge Approach Fill, Station _____	Lump Sum

INCIDENTAL STONE BASE:

(7-1-95)(Rev.1-16-24) 545 SP5 R28R

Description

Place incidental stone base on driveways, mailboxes, etc. immediately after paving and do not have the paving operations exceed stone base placement by more than one week without written permission of the Engineer.

Materials and Construction

Provide and place incidental stone base in accordance with Section 545 of the *Standard Specifications*.

Measurement and Payment

Incidental Stone Base will be measured and paid in accordance with Article 545-6 of the *Standard Specifications*.

ASPHALT CONCRETE PLANT MIX PAVEMENTS MILL AND FILL:
(6-16-26) 610 SP6 R04R

Revise the *Standard Specifications* as follows:

Page 6-21 and 6-22, Article 610-8, **SPREADING AND FINISHING, lines 46-47 and lines 1-2**, replace the eighth paragraph with the following:

Operate the paver as continuously as possible. Sequence paving operations to promote uniformity, minimize longitudinal joints, and maintain ride quality. Pave the mainline roadway prior to paving intersections, auxiliary lanes, ramps, turn lanes, and other irregular areas, unless otherwise approved by the Engineer.

For mill and fill resurfacing operations where the existing pavement surface is milled and replaced in kind, the Contractor may sequence paving operations in any order, including paving intersecting roads, ramps, auxiliary lanes, and adjacent areas in advance of the mainline, provided the sequence does not adversely affect longitudinal joint construction, density, or surface smoothness, and all requirements of the contract are met.

Place wedging or leveling courses where required by the contract or as directed by the Engineer.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:
(11-21-00)(Rev. 1-16-24) 620 SP6 R25

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

The base price index for asphalt binder for plant mix is **$ 762.50** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **September 1, 2026**.

DELETION OF FINAL SURFACE TESTING REQUIREMENTS:
(1-20-25) 610 SP6 R045A

Revise the *Standard Specifications* as follows:

Pages 6-24 to 6-30, Article 610-13 FINAL SURFACE TESTING AND ACCEPTANCE, delete Article 610-13 in its entirety.

DETECTABLE WARNING SURFACE AT CURB RAMPS:
(8-19-25) 848 SP8 R52A

Description

Install detectable warning surface at curb ramps as shown in the plans or as directed by the Engineer, in accordance with Section 848 of the *Standard Specifications* and this special provision.

Materials

Detectable warning surface materials shall consist of raised truncated domes found on the NCDOT APL, meet the requirements of Article 848-2 of the *Standard Specifications* and be capable of being affixed to or anchored in the concrete sidewalk, including green concrete defined as concrete that has set but not appreciably hardened, cured concrete, or asphalt pavement. Surface applied such as glued or stick down applications are prohibited for permanent installations unless approved by the Engineer.

The detectable warning surface shall be uniform in color and texture, be free of cracks or other defects. The color shall be an approximate visual match to the color specified in the contract or as approved by the Engineer.

Construction Methods

Install all detectable warning surface in accordance with the manufacturer's recommendations, Article 848-3 of the *Standard Specifications* and as approved by the Engineer. Ensure the surface is free of debris and irregularities prior to placing the detectable warning on the surface. Place in fresh concrete, before the concrete has reached initial set, or on a hardened cement concrete surface or asphalt pavement surface. Secure permanent installations with mechanical fasteners. No cutting of the coated colored truncated domes is allowed. Embossing or stamping the wet concrete to achieve the truncated dome pattern or using a mold into which a catalyst-hardened material is applied is not allowed. Detectable warning surfaces shall be 24 inches in the direction of travel and extend the full width of the flush surface. The detectable warning surface shall show no appreciable fading, lifting or shrinkage and fit contours, breaks and faults of concrete and asphalt surfaces and show no significant tearing, rollback, lifting or other signs of poor adhesion.

Remove and replace any damaged or misaligned detectable warning surfaces and repair any damage to adjacent facilities prior to final acceptance at no cost to the Department. The finished installation shall meet all applicable ADA and Public Right-of-Way Accessibility Guidelines (PROWAG) requirements for placement, orientation, surface condition, and visual contrast.

Measurement and Payment

The detectable warning surface at curb ramps are incidental to *Concrete Curb Ramps*, *Retrofit Existing Curb Ramps*, and/or *Remove and Replace Curb Ramps* in accordance with Article 848-4 of the *Standard Specifications*.

REMOVE TEMPORARY IMPACT ATTENUATOR UNITS, TYPE :

(3-18-25) SP8 R74

Description

Dismantle, remove and dispose of existing impact attenuator unit at locations shown on the plans or as directed by the Engineer.

Construction Methods

Remove the existing impact attenuator unit in accordance with the plans without damaging adjoining structures or other appurtenances. Remove concrete or asphalt base in accordance with the plans without damaging adjoining pavement. Repair all damage at no cost to the Department as directed by the Engineer. All impact attenuator components and concrete or asphalt removed are the property of the Contractor. Do not remove traffic control if there are any exposed end of adjacent rail at the end of any day's operation. Protect the exposed end of adjacent rail at the end of any day's operations as directed by the Engineer. Backfill with compacted material to finish graded section or as directed by the Engineer.

Measurement and Payment

Remove Temporary Impact Attenuator Units, Type _____ will be measured and paid in units of each. Such price and payment will be full compensation for the removal of the unit and base, disposal of unit and base, damage repair, backfilling and any incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Remove Temporary Impact Attenuator Units, Type _____	Each

IMPACT ATTENUATOR UNITS, TYPE TL- :

(4-20-04)(Rev. 8-20-24) SP8 R75

Description

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

Materials

Furnish attenuator units listed on the NCDOT APL. Units shall not be modified by the manufacturer and installer once approved and on the NCDOT APL.

Prior to installation the Contractor shall submit to the Engineer certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the *Standard Specifications*.

Construction Methods

Perform installation in accordance with the plans and details and assembling instructions furnished by the manufacturer.

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Impact Attenuator Units, Type TL-___	Each

TEMPORARY IMPACT ATTENUATOR UNITS, TYPE TL-3:

(4-20-04)(Rev. 8-20-24) SP8 R75

Description

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

Materials

Furnish attenuator units listed on the NCDOT APL. Units shall not be modified by the manufacturer and installer once approved and on the NCDOT APL.

Prior to installation the Contractor shall submit to the Engineer certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the *Standard Specifications*.

Construction Methods

Perform installation in accordance with the plans and details and assembling instructions furnished by the manufacturer.

Measurement and Payment

Temporary Impact Attenuator Units, Type TL-3 will be measured and paid at the contract unit price per each. Such prices and payment will be full compensation for all work covered by this provision including, but not limited to, furnishing, installing and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Temporary Impact Attenuator Units, Type TL-3	Each

WELDED STEEL PIPE SILLS AND BAFFLES (SPECIAL)

DESCRIPTION

This special provision addresses the sills and baffles to be installed in the welded steel pipe in accordance with the structure plans.

MATERIALS

Welded sills and baffles shall meet ASTM A139 for the grade of pipe called for in the plans. Use suppliers of metal pipe culverts, fittings and all other accessories covered by this section that meet the Department's Brand Certification program requirements for metal pipe culverts and are listed on Materials and Tests Unit's pre-approved producer/suppliers list as listed on the NCDOT APL. The pre-approved list is available on the Department's website.

INSTALLATION

Sills and baffles shall be installed per the dimensions on the sill and baffle layout sheet in the headwall and junction box plans. Sills and baffles may be installed prior to boring and jacking the pipe if installation after boring and jacking is deemed unsafe or not feasible. The sills and baffles shall be allowed to backfill naturally. Any damage to the protective coating of the sills, baffles, or pipes during installation shall be repaired.

INSPECTION AND TESTING

The applicable parts of sections 1072-18(E) and 1072-18(F) of the 2024 Standard Specifications shall apply as required by the engineer.

MEASUREMENT AND PAYMENT

Culvert sills and baffles will be measured and paid for as the actual number of units installed and accepted.

The contract unit price paid per each shall be full compensation for furnishing all labor, tools, equipment, materials, incidentals, and any miscellaneous grading or excavation necessary to complete the work.

Installations that become damaged or are abandoned shall be replaced at no additional cost to the Department.

Pay Item	**Pay Unit**
Welded Steel Pipe Sills and Baffles	Each

VINYL COATED CHAIN LINK FENCE:

(1-1-02)(Rev. 6-17-25) 866 SP8 R101

Revise the *Standard Specifications* as follows:

Page 8-48, Article 866-4, MEASUREMENT AND PAYMENT, add the following paragraphs after line 35:

____ *Vinyl Coated Chain Link Fence, ___" Fabric* will be measured and paid in linear feet of fence measured in place from center of each post or gate post to center of end post or gate post exclusive of gate sections, that has been completed and accepted.

____ *Vinyl Coated Metal Line Posts for ___" Chain Link Fence* will be measured and paid in units of each for the several sizes and kinds of posts actually installed on the project. For extra length metal posts, the actual length of post in place in excess of the standard pay length for each post shall be measured in linear feet, and half of such length shall be converted to an equivalent number of standard length posts of the same size for which a pay item has been established. In converting to equivalent numbers of standard length posts, any fractional portion of a post remaining from the division of a total number of linear feet by a standard post length shall be considered as equal to one post.

____ *Vinyl Coated Metal Terminal Posts for ___" Chain Link Fence* will be measured and paid in units of each for all end, corner and brace posts installed on the project.

____ *Vinyl Coated Metal Gate Posts for ___" Chain Link Fence, Double Gate* will be measured and paid in units of each for gateposts installed on the project.

____ *Vinyl Coated Metal Gate Posts for ___" Chain Link Fence, Single Gate* will be measured and paid in units of each for gate posts installed on the project.

____ *Vinyl Coated Double Gates, ___" High, ___' Wide, ___' Opening* will be measured and paid in units of each for the number of gates actually erected on the project. Double gates will be measured as one gate.

____ *Vinyl Coated Single Gates, ___" High, ___' Wide, ___' Opening* will be measured and paid in units of each for the number of gates actually erected on the project.

Page 8-49, Article 866-4, MEASUREMENT AND PAYMENT, add the following after line 1:

Pay Item	**Pay Unit**
____ Vinyl Coated Chain Link Fence, __" Fabric	Linear Foot
____ Vinyl Coated Metal Line Posts for __" Chain Link Fence	Each
____ Vinyl Coated Metal Terminal Posts for __" Chain Link Fence	Each
____ Vinyl Coated Metal Gate Posts for __" Chain Link Fence, Double Gate	Each
____ Vinyl Coated Metal Gate Posts for __" Chain Link Fence, Single Gate	Each
____ Vinyl Coated Double Gates, ___" High, ___' Wide, ___' Opening	Each
____ Vinyl Coated Single Gates, ___" High, ___' Wide, ___' Opening	Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12)(Rev. 1-16-24) 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 *Standard Specifications* and Roadway Standard Drawing No. 1743.01.

Materials

Refer to the *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 *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:
https://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 *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 *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 *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 *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 *Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *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 *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 *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 *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 *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
≤ 1 1/2	1/3 turn (2 flats)
> 1 1/2	1/6 turn (1 flat)

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

(11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.

(12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS

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

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

(13) Do not grout under base plate.

Measurement and Payment

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

ELECTRONIC TICKETING SYSTEM:

(7-16-24)(Rev. 12-17-24) 1020 SP10 R20

Description

At the contractor's option, the use of an electronic ticketing system for reporting individual and cumulative asphalt material deliveries may be utilized on this project. At the preconstruction conference, the contractor shall notify the Engineer if they intend to utilize an electronic ticketing system for reporting individual and cumulative asphalt material deliveries to the project.

Electronic Ticketing Requirements

a. The electronic ticketing system must be fully integrated with the load read-out system at the plant. The system shall be designed so data inputs from scales cannot be altered by either the Contractor or the Department.

b. Material supplier must test to confirm that ticketing data can be shared from the originating system no less than 30 days prior to project start.

c. After each truck is loaded, ticket data must be electronically captured, and ticket information uploaded via Application Programming Interface (API) to the Department.

d. Obtain security token from NCDOT for access to E-Ticketing portal (to send tickets). To request a Security Key, fill out the below E-Ticketing Security Request Form: https://forms.office.com/g/XnT7QeRtgt

e. Obtain API from NCDOT containing the required e-ticketing data fields and format. Download the API from the NCDOT E-ticketing Webpage: https://connect.ncdot.gov/projects/construction/E-Ticketing/Pages/default.aspx

f. Provide all ticket information in real time and daily summaries to the Department's designated web portal. If the project contains locations with limited cellular service, an alternative course of action must be agreed upon.

g. Electronic ticketing submissions must be sent between the Material Supplier and the Department.

h. The electronic ticket shall contain the following information:

Date
Contract Number
Supplier Name
Contractor Name
Material
JMF
Gross Weight

Tare Weight
Net Weight
Load Number
Cumulative Weight
Truck Number
Weighmaster Certification
Weighmaster Expiration
Weighmaster Name
Facility Name
Plant Certification Number
Ticket Number
Hauling Firm (optional)
Voided Ticket Number (if necessary)
Original Ticket Number (if necessary)
Supplier Revision (If necessary)

The Contractor/supplier can use the electronic ticketing system of their choice to meet the requirements of this provision.

Measurement and Payment

No measurement or payment will be made for utilizing an electronic ticketing system as the cost of such shall be included in the contract price bid for the material being provided.

TIMBER AND LUMBER:
(4-21-26) 235, 866, 1046, 1050, 1082, 1084, 1089, 1540 SP10 R82

Revise the *Standard Specifications* as follows:

Page 2-23, Article 235-2 MATERIALS, line 26, add the following as the third sentence of the fourth paragraph.

Use pressure treated wood bases meeting the requirements of Section 1082.

Page 8-45, Article 866-2 MATERIALS, line 26, replace "1076-7" with "1050-8".

Page 10-73, Subarticle 1046-3(C) Treated Timber Posts, line 8, replace "treated southern pine" with "pressure treated southern pine".

Page 10-76, Subarticle 1050-2(A) General, line 3, replace "Use treated southern pine meeting Articles 1082-2 and 1082-3" with "Use pressure treated southern pine meeting Articles 1082-2 and 1082-3".

Page 10-76, Subarticle 1050-2(A) General, lines 15-16, replace "All round posts" with "All round wood posts and braces".

Page 10-76, Subarticle 1050-2(A) General, lines 19-20, delete the last sentence of the third paragraph and replace with the following:

The pieces shall show at least 3 annual rings per inch and shall be at least 30% summerwood. All timber and lumber shall conform to the material characteristics detailed in the Southern Pine Inspection Bureau (SPIB) grading rules for the designated grade and may bear the mark of an American Lumber Standards Committee (ALSC) accredited agency.

Page 10-177, Article 1082-1 GENERAL, lines 32-33, delete the first sentence of the first paragraph and replace with the following:

Use southern pine timber and lumber graded in accordance with the current grading rules of the SPIB and manufactured by a Department pre-approved producer/supplier. All timber and lumber shall conform to the material characteristics detailed in the SPIB grading rules for No. 1 Dense or Select Structural (Sel Str.) and bear the mark of an ALSC-accredited agency.

Page 10-177 and 10-178, Article 1082-1 GENERAL, lines 38-42 and line 1, delete the second through fourth sentence of the second paragraph and replace with the following:

Use approved inspection companies listed on the Department's pre-approved producer/suppliers list. The inspection agency must perform inspections of preservative treated materials in accordance with AWPA Standard M2. Each item shall bear the brand, hammer mark, ink stamp or tag of the inspection agency to indicate it has been inspected. In lieu of commercial inspection, materials in Section 1082 manufactured by a facility that is audited by an ALSC-accredited agency and bearing the quality mark of that agency shall be acceptable for use. In addition, the Supplier must furnish Type 4 – Certified Test Reports and Type 6 – Supplier's Certifications in accordance with Article 106-3. Type 6 – Supplier's Certifications are required for each producer/supplier to include any chain of custody changes from the mill to the Department.

Page 10-178, Article 1082-2 UNTREATED TIMBER AND LUMBER, line 7, replace "Dense" with "Grade No. 1 Dense MC19".

Page 10-178, Subarticle 1082-3(A) General, line 13, replace "lumber" with "timber and lumber" and replace "will not" with "with".

Page 10-178, Subarticle 1082-3(B) Bridges, Fender Systems and Piles, lines 22 and 24, replace "Grade No. 1 Dense" with "Grade No. 1 Dense or Select Structural (Sel Str.)".

Page 10-178, Subarticle 1082-3(B) Bridges, Fender Systems and Piles, lines 24-27, delete the third and fourth sentence of the first paragraph and replace with the following:

Timbers for bridges or fender systems that are 5 inches and thicker along the least dimension shall conform to Grade No. 1 Dense or Select Structural (Sel Str.).

Page 10-178, Subarticle 1082-3(B) Bridges, Fender Systems and Piles, line 28, delete and replace the second paragraph with the following:

Timber for piles shall be southern pine and meet the requirements of ASTM D25.

Page 10-178, Subarticle 1082-3(C) Guardrail Posts, Blockouts and related components, lines 33-34, replace "Southern Pine, conforming to Grade No. 1. Rough lumber will be acceptable." with "southern pine, conforming to Grade No. 1 Dense.".

Page 10-178, Subarticle 1082-3(D) Fence Posts and Braces, lines 37-39, delete the first paragraph and replace with the following:

Sawn fence posts and braces shall be southern pine, S4S, and conform to Grade No. 1 Dense.

Page 10-178, Subarticle 1082-3(E) Sign Posts and Battens, lines 42-44, delete the first and second sentence of the first paragraph and replace with the following:

Lumber or timbers for sign posts shall conform to Structural Light Framing, Grade No. 1 Dense.

Page 10-178, Subarticle 1082-3(E) Sign Posts and Battens, line 46, delete the first sentence of the second paragraph.

Page 10-179, Subarticle 1082-3(F) Poles, lines 2-3, delete the first sentence of the first paragraph and replace with the following:

Timber for poles shall be either treated southern pine or coastal douglas-fir and meet the requirements of ANSI O5.1.

Page 10-179, Subarticle 1082-4(A) General, line 8, replace "AASHTO M 133 or AWPA Standards" with "AASHTO M 133 and AWPA Standards".

Page 10-179, Subarticle 1082-4(A) General, lines 14-15, delete the third paragraph.

Page 10-179, Subarticle 1082-4(A) General, line 19, replace ""areas include" with "areas including, but not limited to,".

Page 10-179, Subarticle 1082-4(B) Timber Preservatives, line 24, replace "AASHTO M 133 or AWPA Standards U1" with "AASHTO M 133 and AWPA Standards U1".

Page 10-179, Subarticle 1082-4(C) Bridges, Fender Systems and Piles, lines 27-28, replace "AASHTO M-133 or AWPA Standard U1" with "AASHTO M 133 and AWPA Standard U1".

Page 10-179, Subarticle 1082-4(D) Guardrail Posts, Blockouts and Related Components, lines 32-33, replace "AASHTO M-133 or AWPA Standard U1" with "AASHTO M 133 and AWPA Standard U1".

Page 10-179, Subarticle 1082-4(E) Fence Posts and Braces, lines 36 and 38, replace "AASHTO M-133 or AWPA Standard U1" with "AASHTO M 133 and AWPA Standard U1".

Page 10-179, Subarticle 1082-4(E) Fence Posts and Braces, line 39, replace "except require retention of preservative as below" with "Commodity Specification B. Posts, UC4A".

Page 10-180, Subarticle 1082-4(F) Sign Posts and Battens, line 2, replace "AASHTO M-133 or AWPA Standard U1" with "AASHTO M 133 and AWPA Standard U1".

Page 10-180, Subarticle 1082-4(G) Poles, line 9, replace "AASHTO M-133 or AWPA Standard U1" with "AASHTO M 133 and AWPA Standard U1".

Page 10-180, Subarticle 1084-1(A) Treated Timber Pile, line 16-17, delete and replace the first paragraph with the following:

Treated timber piles shall meet the requirements of Section 1082.

Page 10-195, Subarticle 1089-2(A)(1) Work Zone Signs (Stationary), line 44, add the following sentence to the second paragraph:

Pressure treat wood posts in accordance with Section 1082.

Page 15-18, Article 1540-2 MATERIALS, line 8, replace "1082-3" with "1082".

ELECTRICAL JUNCTION BOXES:

(6-18-24) 1091 SP10 R91

Revise the *Standard Specifications* as follows:

Page 10-209, Subarticle 1091-5(A) General, add the following after line 27:

Boxes and covers shall meet all requirements and specifications of ANSI/SCTE 77. Structural load tests shall meet the Tier 15 application type.

Page 10-209, Subarticle 1091-5(B) Polymer Concrete (PC) Junction Boxes, lines 28, delete and replace the subarticle title with the following:

(B) Polymer Concrete (PC), Composite and Thermoplastic Junction Boxes

Page 10-209, Subarticle 1091-5(B) Polymer Concrete (PC) Junction Boxes, add the following after line 28:

For PC junction boxes, 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.

Page 10-209, Subarticle 1091-5(B) Polymer Concrete (PC) Junction Boxes, line 29 replace "polymer concrete (PC) boxes" with "junction boxes".

Page 10-209, Subarticle 1091-5(B) Polymer Concrete (PC) Junction Boxes, lines 31-37, delete the second and third paragraph.

Page 10-209, Subarticle 1091-5(B) Polymer Concrete (PC) Junction Boxes, lines 40-41, delete the fourth sentence of the fourth paragraph and replace with the following:

Bodies of junction boxes shall be a single piece.

Polymer concrete, composite and thermoplastic junction boxes are not required to be listed electrical devices.

GROUND MOUNTED SIGN SUPPORTS:
(9-15-26) 1094 SP10 R94

Revise the *Standard Specifications* as follows:

Page 10-214, Subarticle 1094-1(B) 3 lb Steel U-Channel Supports, line 12 and 15, replace "3/8" with "7/16".

Page 10-214, Subarticle 1094-1(B) 3 lb Steel U-Channel Supports, line 16, replace "5/16" with "3/8".

Page 10-214, Subarticle 1094-1(B) 3 lb Steel U-Channel Supports, lines 14-15, delete the fifth sentence of the first paragraph and replace with the following:

These supports shall be galvanized in accordance with ASTM A653 or ASTM A123 depending on the manufacturing process.

Page 10-214, Subarticle 1094-1(C) 2 lb Steel U-Channel Supports, lines 26-29, delete the third and fourth sentence of the second paragraph with the following:

Punch or drill 7/16 inch diameter holes on 1 inch centers, beginning 1 inch from the top of the post, for a minimum distance equal to the vertical dimension of the respective sign or mile marker. These supports shall be galvanized in accordance with ASTM A653 or ASTM A123 depending on the manufacturing process.

Page 10-214, Subarticle 1094-1(C) 2 lb Steel U-Channel Supports, line 30, replace "3/8" with "7/16".

Page 10-214, Subarticle 1094-1(C) 2 lb Steel U-Channel Supports, line 31, replace "5/16" with "3/8".

Page 10-214, Subarticle 1094-1(D) Steel Square Tube Supports, lines 36-43, delete and replace the first two paragraphs with the following:

Use steel square tube supports of variable length galvanized steel. The support cross section and gauge shall be in accordance with the plans. These supports shall be manufactured using domestic steel conforming to ASTM 1011, Grade 50. Minimum yield strength after cold forming shall be 60,000 psi. These supports shall be galvanized in accordance with ASTM A653 or ASTM A123 depending on the manufacturing process and meet G90 galvanizing requirements. Both the interior and exterior of the post shall be galvanized and all coating applications shall occur in the United States.

The posts shall be corner welded and scarfed as necessary to allow sections to telescope within each other. The finished posts shall be machine straightened and have a smooth uniform finish free from cracks, flaws, injurious seams, laps, blisters, and edges which are ragged, sharp, and imperfect, or other defects affecting their strength, durability, or appearance. The maximum variation in straightness shall be no more than 1/4 inch in any 5 foot of length. For perforated square tubes, cut holes or knockout holes of 7/16 inch diameter shall be spaced on 1 inch centers, on the centerlines of all four sides in true alignment, and opposite to each other for back to back applications. All holes and sheared ends shall be free from burrs. The steel shall also be coated with a conversion coating and a clear organic polymer topcoat.

The zinc coating nor manufacturing process shall interfere with the telescoping properties of steel square supports. The zinc coating inside of the 7/16 inch diameter holes of perforated supports shall not exceed specification requirements enough to prevent a 3/8 inch diameter bolt from freely passing through. These supports should contain a manufacturer's mark for traceability after installation. Provide a Type 2 material certification in accordance with Article 106-3 upon Engineer request.

WORK ZONE INSTALLER:

(7-20-21)(Rev. 4-21-26) 1101 SP11 R04

Revise the *Standard Specifications* as follows:

Page 11-4, Article 1101-14 WORK ZONE INSTALLER, lines 25-26, delete the first sentence of the first paragraph and replace with the following:

When temporary traffic control consists of more than flagging operations, the Contractor shall 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.

TEMPORARY CRASH CUSHIONS:

(4-21-26) 1089, 1160 SP11 R06

Revise the *Standard Specifications* as follows:

Page 10-204, Subarticle 1089-8(A) General, lines 26-29, delete the third and fourth paragraph.

Page 10-204, Subarticle 1089-8(A) General, line 34, delete the last sentence of the fifth paragraph.

Page 11-14, Article 1160-2 MATERIALS, lines 32-35, delete the second and third sentence of the first paragraph.

Page 11-15, Article 1160-3 CONSTRUCTION METHODS, add the following after line 1:

Use a redirective, non-gating temporary crash cushion when adequate space for the lateral displacement of the crash cushion is not available or as required in the TMP.

Page 11-15, Article 1160-3 CONSTRUCTION METHODS, line 7, add the following to the second paragraph:

Temporary crash cushion shall not be placed on an unpaved surface.

CONES:
(3-19-24) 1135 SP11 R35

Revise the *Standard Specifications* as follows:

Page 11-11, Article 1135-3 CONSTRUCTION METHODS, lines 19-20, delete the third sentence of the first paragraph, "Do not use cones in the upstream taper of lane or shoulder closures for multi-lane roadways.".

FLAGGERS:
(12-17-24)(Rev. 12-23-25) 1150 SP11 R50

Revise Section 1150 of the *Standard Specification* as follows:

Page 11-13, Article 1150-1, DESCRIPTION, add the following after line 31:

Alternatively, at the discretion of the Contractor, the Contractor may furnish, install, place in operation, repair, maintain, relocate, and remove remotely controlled Automated Flagging Assistance Devices (AFAD) or Temporary Portable Traffic Signal units (PTS units) to assist, supplement, or replace human flaggers for one-lane, two-way traffic maintenance during construction in accordance with this provision and the *Standard Specifications*.

For the purpose of this provision, an "approach" refers to a single lane of traffic moving in one direction toward a point of control or work zone. Flaggers, AFAD and PTS units are only used to control one lane of approaching traffic in a specific direction.

Page 11-13, Article 1150-2, MATERIALS, add the following after line 34:

Provide documentation to the Engineer that the AFAD or PTS units meets or exceeds the requirements of this special provision and is on the NCDOT APL or ITS and Signals QPL.

(A) Automated Flagging Assistance Devices (AFAD)

(1) AFAD General

Cover the automated gate arm with Department approved Type VII, VIII or IX retroreflective sheeting of vertical alternating red and white stripes at 16 inch intervals measured horizontally. When the gate arm is in the down position the minimum vertical aspect of the arm and sheeting shall be 4 inches. The retroreflectorized sheeting shall be on both sides of the gate arm. With the AFAD parked or positioned 2 feet outside or in a location deemed acceptable for the lane being controlled, the gate arm shall reach at least to the center of the lane but shall not exceed the width of the lane being controlled.

Design the system to be fail-safe. Provide a conflict monitor, malfunction monitoring unit, or similar device that monitors for malfunctions and prevents the display of conflicting indications. This system shall be electronic and operated by remote control.

(2) AFAD Type I System: RED/YELLOW

Provide a Red/Yellow AFAD with at least one set of CIRCULAR RED and CIRCULAR YELLOW lenses in a vertical configuration that are 12 inches in diameter. The bottom of the housing (including brackets) shall be at least 7 feet (2.1 meters) above the pavement.

This system is required to have yellow 12 inch aluminum or polycarbonate vehicle signal heads with 10 inch tunnel visors, backplates, and Light Emitting Diode (LED) modules. Provide signal heads, backplates, and LED modules listed on the ITS and Signals QPL available on the Department's website.

Provide an automated gate arm on the AFAD that descends to a down position across the approaching lane of traffic when the **s**teady CIRCULAR RED lens is illuminated and then ascends to an upright position when the flashing CIRCULAR YELLOW lens is illuminated. The automated gate arm is to be designed such that if a motorist pulls underneath the gate arm while lowering, no damage to the vehicle occurs.

A STOP HERE ON RED (R10-6 or R10-6a) sign shall be installed on the right-hand side of the approach at the point at which drivers are expected to stop when the steady CIRCULAR RED lens is illuminated.

To stop traffic, the AFAD shall transition from the flashing CIRCULAR YELLOW lens by initiating a minimum 5 second steadily illuminated CIRCULAR YELLOW lens followed by the CIRCULAR RED lens.

Once the CIRCULAR RED lens is displayed, the system is to have a minimum 2 second delay between the time the steady CIRCULAR RED is displayed and the time the gate arm begins to lower. The maximum delay between CIRCULAR RED and the time the gate arm lowers is 4 seconds. To permit stopped road users to proceed, the AFAD shall display the flashing CIRCULAR YELLOW lens and the gate arm shall be placed in the upright position.

Ensure the system monitors for a lack of yellow or red signal voltage, total loss of indication in any direction, presence of multiple indications on any approach and low power conditions.

Additional sets of CIRCULAR RED and CIRCULAR YELLOW lenses located over the roadway or on the left side of the approach and operated in unison with the primary set, may be used to improve visibility of the AFAD. If the set of lenses is located over any portion of the roadway that can be used by motor vehicles, the bottom of the housing (including brackets) shall be at least 15 feet (4.6 meters) above the pavement.

(3) AFAD Type II System: STOP/SLOW

Provide STOP/SLOW signs that are octagonal in shape, made of rigid material, and at least 36 inch x 36 inch in size. Letters shall be a minimum of 8 inches high. The STOP face shall have a red background with white letters and border.

The SLOW face shall be diamond shaped, orange, or yellow background with black letters and border. Cover both faces in a Department approved Type VII, VIII or IX retroreflective sheeting. The minimum mounting height for the sign faces shall be 7 feet above the pavement to the bottom of the sign.

The AFAD's STOP/SLOW signs shall be supplemented with active conspicuity devices by incorporating a stop beacon (red lens) and a warning beacon (yellow lens). The stop beacon shall be no more than 24 inches above the STOP face. Mount the warning beacon no more than 24 inches above or beside of the SLOW face. Except for the mounting locations, the beacons shall conform to the provisions of Chapter 4L of the MUTCD and have 12 inch signal lenses.

Strobe/flashing lights are an acceptable alternative to flashing beacons. If utilized, they shall be either white or red flashing lights located within the STOP face and white or yellow flashing lights within the SLOW face and conform to the provisions of Chapter 6D of the MUTCD. If used, the lens diameter shall be a minimum of 5 inches with a minimum height of 6 inches. Equip strobes/flashing lights for both dual and quad flash patterns.

Type B warning lights shall not be used in lieu of the beacons or the strobe lights.

The faces of the AFADs STOP/SLOW sign may include louvers. If louvers are used, design the louvers such that the aspect of the sign face to approaching traffic is a full sign face at a distance of 50 feet or greater.

A WAIT ON STOP (R1-7) sign and a GO ON SLOW (R1-8) sign shall be displayed to traffic approaching the AFAD. Position signs on the same support structure as the AFAD. Both signs shall have black legends and borders on white Type III sheeting backgrounds. Each of these signs shall be rectangular in shape and be at least 24 inch x 30 inch size with letters at least 6 inches high.

Provide an automated gate arm on the AFAD that descends to a down position across the approaching lane of traffic when the STOP face is displayed and then ascends to an upright position when the SLOW face is displayed.

The automated gate arm is to be designed such that if a motorist pulls underneath the gate arm while lowering, no damage to the vehicle occurs.

A STOP HERE ON RED (R10-6 or R10-6a) sign shall be installed on the right-hand side of the approach at the point at which drivers are expected to stop when the STOP face is displayed.

When approaching motorists are to proceed, display the SLOW face and the warning beacon or strobes are to flash on the AFAD. When approaching motorists are will be stopped, display the STOP face and the stop beacon or strobes are to flash on the AFAD.

To stop traffic, the AFAD will transition from the SLOW face to the STOP face by initiating a minimum 5 second change cycle. First, the warning beacon is to be steadily illuminated for the change cycle. If strobes are used in lieu of a warning beacon, they are to be placed in the quad flash pattern. At the end of the change cycle, the STOP face is to be displayed with the stop beacon flashing and the warning beacon or strobes are to stop flashing. Once the STOP face is displayed, the system is to have a minimum 2 second delay between the time the STOP face is displayed and the time the gate arm begins to lower. The maximum delay between the time the STOP face is displayed and the time the gate arm lowers is 4 seconds.

To permit stopped road users to proceed, the gate arm shall be placed in the upright position and the AFAD shall display the SLOW face and the warning beacon or strobes are to flash in the dual flash pattern.

Do not flash the stop beacon when the SLOW face is displayed, and do not flash the warning beacon when the STOP face is displayed.

(B) Portable Traffic Signals (PTS) Units

Provide PTS units with at least one set of CIRCULAR RED, CIRCULAR YELLOW, and CIRCULAR GREEN lenses in a vertical configuration that are 12 inch diameter aluminum or polycarbonate vehicle signal heads with 10 inch tunnel visors, backplates, and Light Emitting Diode (LED) modules. All signal heads, tunnel visors, and backplates shall be yellow in color.

The bottom of the housing (including brackets) shall be at least 7 feet above the pavement for single set units. Additional signal heads on units with more than one signal head shall be capable of extending over the travel lane.

Communication Requirements

All PTS units within the signal set up systems shall maintain communication at all times by either hardwire cable or wireless radio link communication. If the hardwire cable communication is utilized the communication cable shall be deployed in a manner that will not intrude in the direct work area of the project or obstruct vehicular and pedestrian traffic. Utilize radio communication with 900MHz frequency band and frequency hopping capability. The radio link communication system shall have a minimum range of 1 mile.

Fault Mode Requirements

Revert PTS units to a flashing red mode upon system default unless otherwise specified by the Engineer. Equip the PTS units with a remote monitoring system. Where cell

communication availability exists, the remote monitoring system shall adhere to the remote monitoring system section of this provision.

Remote Monitoring System

The remote monitoring system (RMS) shall be capable of reporting signal location, battery voltage / battery history and system default. Provide a password protected website viewable from any computer with internet capability for the RMS. In the event of a system default, the RMS shall provide specific information concerning the cause of the system default (i.e. red lamp on signal number 1). Equip the RMS with a mechanism capable of immediately contacting a minimum of three previously designated individuals via text messaging and/or email upon a default.

The running program operating the PTS units shall be always available and viewable through the RMS website. Maintain a history of the RMS operating system in each signal including operating hours and events and the location of the PTS units.

Trailer / Cart

The AFAD and PTS units may be mounted on either a trailer or a moveable cart system.

Finish all exterior metal surfaces with Federal orange enamel per AMS-STD-595, color chip ID# 13538 or 12473 respectively with a minimum paint thickness of 2.5 mils (64 microns).

Design and test the AFAD or PTS units trailer / cart to withstand an 80 MPH wind load while in the operational position. Provide independent certification that the assembly meets the design wind load.

Equip the AFAD or PTS units with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

Equip trailers in compliance with North Carolina Law governing motor vehicles and include a 12-volt trailer lighting system complying *with Federal Motor Carrier Safety Regulations 393*, safety chains and a minimum 2 inch ball hitch.

Provide a minimum 4 inch wide strip of fluorescent conspicuity sheeting retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The sheeting shall meet the ASTM requirements of Type VII, VIII or IX.

Power System

Design the systems to operate both with and without an external power source. Furnish transmitters, generators, batteries, controls and all other components necessary to operate the device.

Provide equipment that is solar powered and supplemented with a battery backup system that includes a minimum 110/120 VAC powered on-board charging system capable of powering the

unit for 7 continuous days with no solar power. Each unit shall also be capable of being powered by standard 110/120 VAC power sources, if applicable.

Locate batteries and electronic controls in a locked, weather and vandal resistant housings.

Page 11-14, Article 1150-3, CONSTRUCTION METHODS, add the following after line 11:

Flaggers shall have a path to escape an errant approaching vehicle at all times, unimpeded by barrier, guardrail, guiderail, parked vehicles, construction materials, slopes steeper than 2:1, or any other obstruction at all times. If an unimpeded path cannot be maintained, the Contractor shall use AFAD or PTS units in lieu of a flagger.

Provide documentation to the Engineer prior to deploying the device that the AFAD or PTS units operator(s) are qualified flagger(s) that have been properly trained through an NCDOT approved training agency or other NCDOT approved training provider and that the qualified flagger(s) have received manufacturer training to operate that specific device. This training shall include proper installation, remote control operation, central control systems and maintenance of the AFAD or PTS units. The training shall take place off the project site where training conditions are removed from live traffic. The documentation shall include the names of the authorized trainer, the trainees, the device on which they have been trained and the date of the training. Provide updated documentation to the Engineer prior to deploying any additional operators.

Install advance warning signs and operate AFADs in accordance with the attached detail drawings in this provision.

Install advance warning signs and operate PTS units in accordance with *NCDOT Roadway Standard Drawings* No. 1101.02, Sheet 17.

AFAD and PTS units shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled. **At no time shall an AFAD unit controlling traffic through the work area be placed in an autonomous mode and/or left unattended.**

Signal timing and operation of PTS units shall be field verified and accepted by the Engineer before use.

Do not use AFAD or PTS units in locations where queueing from the AFAD or PTS units will extend to within 150 feet of a signalized intersection or railroad crossing. Do not use AFAD and PTS units as a substitute for or a replacement for a continuously operating temporary traffic control signal as described in Section 6F.84 of the MUTCD.

If used at night, illuminate each AFAD or PTS units as described in Section 6D of the MUTCD.

Provide a complete AFAD or PTS units that is capable of being relocated as traffic conditions demand.

If AFADs or PTS units become inoperative, be prepared at all times to replace the unit with the same type and model of AFAD or PTS units, revert to human flagging operations or terminate all

construction activities requiring the use of the AFAD or PTS units until the AFAD or PTS units become operative or qualified human flaggers are available.

When the work requiring the AFAD or PTS units is not pursued for 30 minutes or longer, power off each AFAD or PTS units. Removed the AFAD or PTS units from the travel lane and relocated to a minimum of 5 feet from the edge line. AFAD gate arms shall be in the upright position. Remove all traffic control devices from the road, place two cones by each AFAD or PTS units and all signs associated with the lane closure operation shall be removed or laid down. At the end of each workday, remove all AFADs or PTS units from the roadway and shoulder areas.

Ensure the system's wireless communication links continuously monitor and verify proper transmission and reception of data used to monitor and control each AFAD or PTS units. Ensure ambient mobile or other radio transmissions or adverse weather conditions do not affect the system.

In the event of a loss of communications, immediately display the flashing RED or STOP indication on all AFAD or PTS units.

AFAD Specific Construction Methods

The flagger/operator controlling the AFAD units shall be on the project site at all times. If multiple AFAD units are used, one AFAD unit shall be the Main AFAD unit and all other units shall be remote AFAD units. Ensure that each device meets the physical display and operational characteristics as specified in the MUTCD.

Multiple AFAD units may be controlled with **one** flagger/operator when the AFAD units meet each of the following requirements:

(1) AFAD units are spaced no greater than the manufacturer's recommendations.

(2) Both AFAD units can be seen at the same time from the flagger/operator's position, or the AFAD is operating on its own secure network with malfunction detection and notification to the flagger/operator.

(3) The flagger/operator has an unobstructed view of approaching traffic in both directions from the flagger/operator position or the AFAD is operating on its own secure network, with cameras that provide the flagger/operator an unobstructed view of approaching traffic from both directions. The flagger/operator may control the AFAD units from a pilot vehicle.

If any of the above requirements are not met, flagger/operator control each AFAD unit.

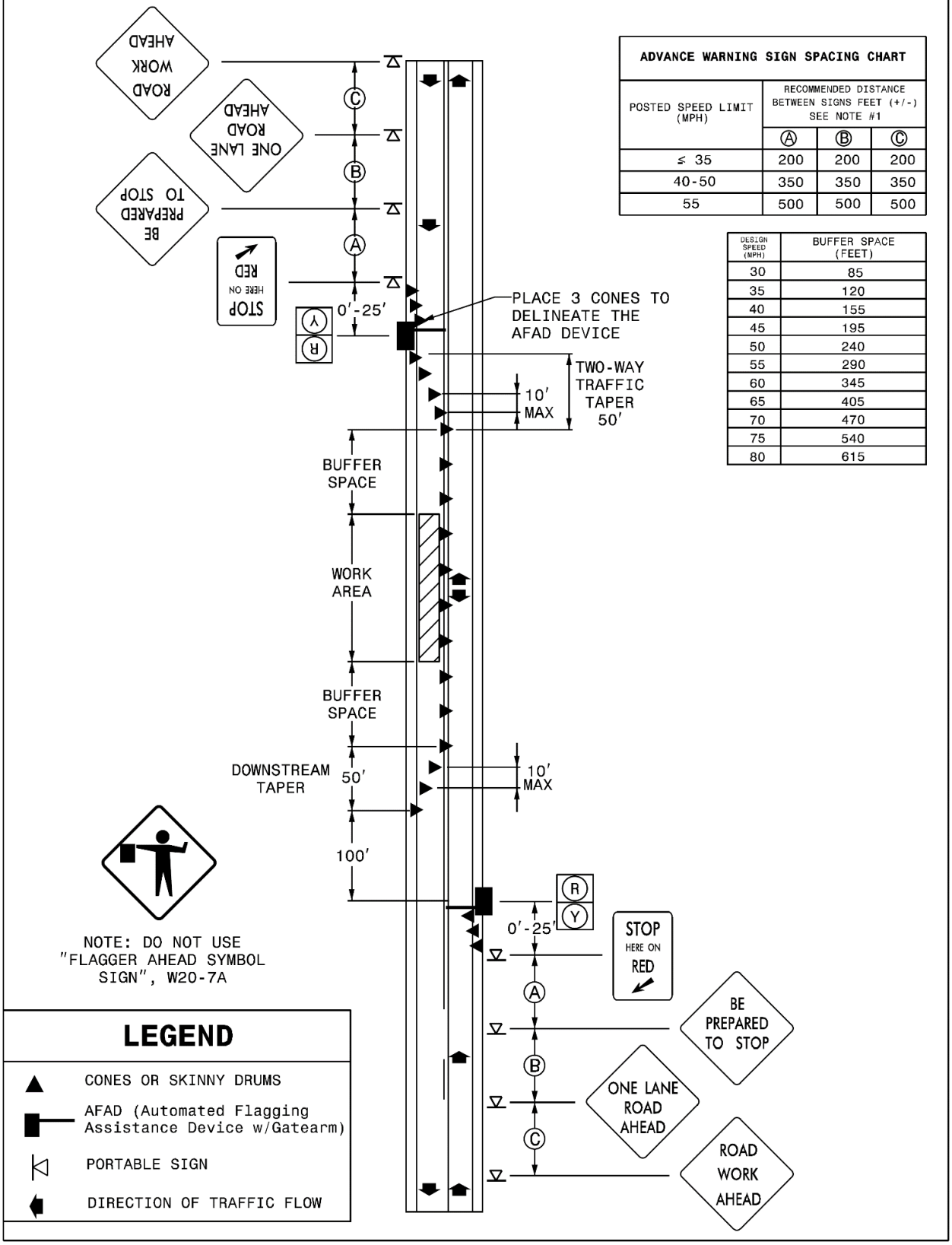
AFAD operators may either control traffic at side streets or driveways between the AFAD units or operate the pilot car while operating the AFAD system if approved by the Engineer. AFAD units must continue to be within clear sight of the operator during these work activities.

Page 11-14, Article 1150-4, MEASUREMENT AND PAYMENT, add the following after line 24:

Each AFAD or PTS unit will be measured and paid for as *Flaggers* paid by day in accordance with Article 1150-4 of the *Standard Specifications*. Where the pay item for *Flaggers* is not included in the original contract then no separate payment will be made for this item and payment will be included in the lump sum price bid for *Temporary Traffic Control* found elsewhere in this contract. Each approach controlled by AFAD or PTS units will be measured and paid as one flagger, irrespective of the number of devices used. If multiple PTS units are required to control a single approach, these units will collectively be considered as replacing one flagger.

No separate measurement or payment will be made for AFAD or PTS unit operators, as the cost of such including their training and operational costs shall be included in the unit or lump sum price for *Flaggers* or *Temporary Traffic Control*. Such price and payment also includes the relocation, maintenance, and removal during repair periods of AFAD or PTS units as well as the signal controller, communication, vehicle detection system, traffic signal software of PTS units and any other incidentals necessary to complete the work.

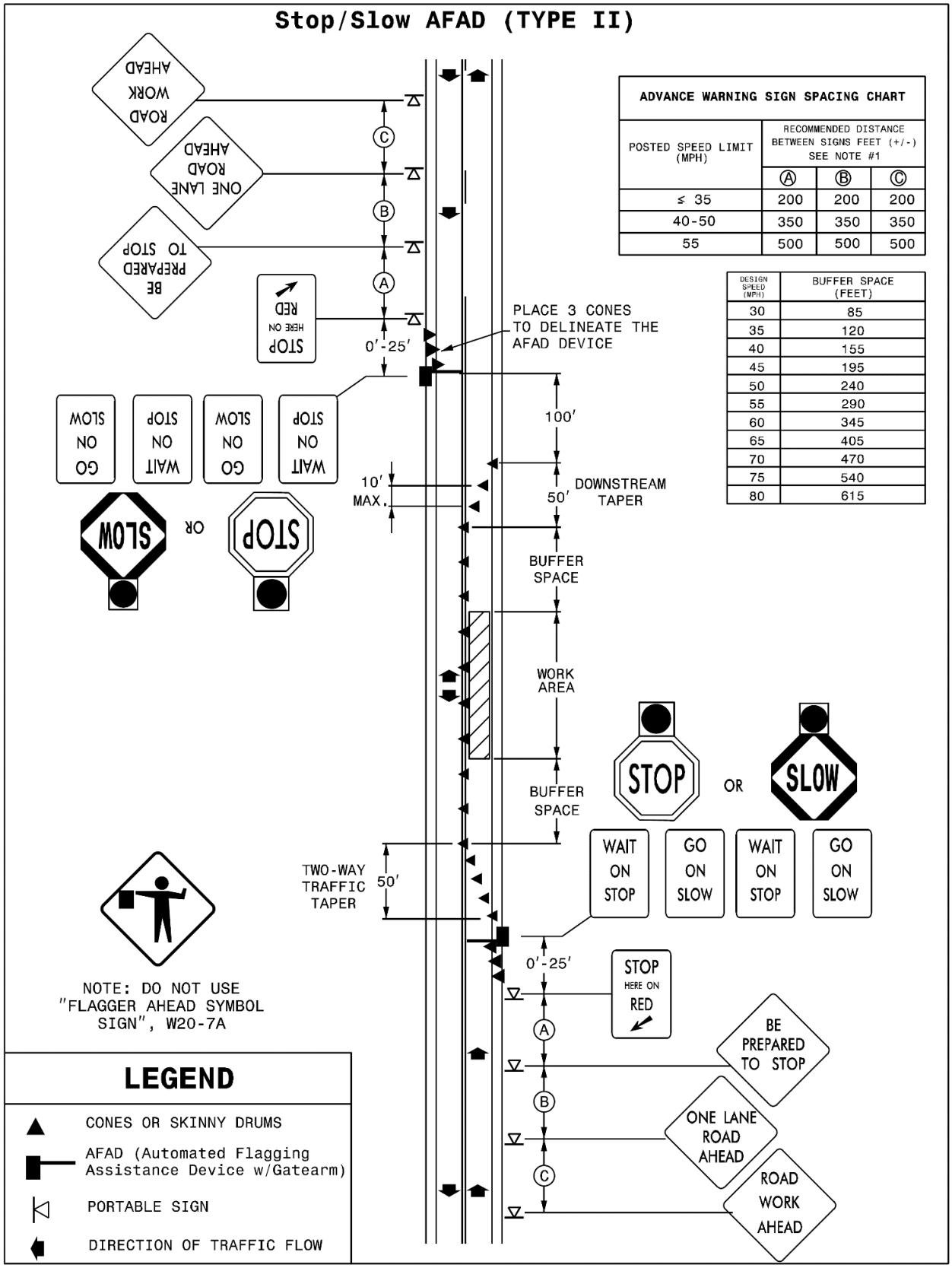
Red/Yellow Lens AFAD (TYPE I)



ADVANCE WARNING SIGN SPACING CHART			
POSTED SPEED LIMIT (MPH)	RECOMMENDED DISTANCE BETWEEN SIGNS FEET (+/-) SEE NOTE #1		
	Ⓐ	Ⓑ	Ⓒ
≤ 35	200	200	200
40-50	350	350	350
55	500	500	500

DESIGN SPEED (MPH)	BUFFER SPACE (FEET)
30	85
35	120
40	155
45	195
50	240
55	290
60	345
65	405
70	470
75	540
80	615

Stop/Slow AFAD (TYPE II)



ADVANCE WARNING SIGN SPACING CHART			
POSTED SPEED LIMIT (MPH)	RECOMMENDED DISTANCE BETWEEN SIGNS FEET (+/-) SEE NOTE #1		
	Ⓐ	Ⓑ	Ⓒ
≤ 35	200	200	200
40-50	350	350	350
55	500	500	500

DESIGN SPEED (MPH)	BUFFER SPACE (FEET)
30	85
35	120
40	155
45	195
50	240
55	290
60	345
65	405
70	470
75	540
80	615

PORTABLE CONCRETE BARRIER:
(12-17-24) 1170 SP11 R70

Revise the *Standard Specifications* as follows:

Page 11-17, Subarticle 1170-3(A)(1) Portable Concrete Barrier, after line 25, add the following:

For MASH approved F-Shape K-Wall, install anchorage transitions between unanchored portable concrete barrier and temporary crash cushions, and between unanchored portable concrete barrier and portable concrete barrier (anchored) as shown in the *Roadway Standard Drawings*, No. 1170.01.

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 16, after the second sentence of the first paragraph add the following:

Crash cushion to unanchored concrete requires a transition

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 13, delete and replace "*Portable Concrete Barrier (____)*" with "*Portable Concrete Barrier*".

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 16, after the second sentence of the first paragraph add the following:

As shown in the *Roadway Standard Drawings*, No. 1170.01, anchorage transition sections between *Portable Concrete Barrier* and *Temporary Crash Cushions* as found in Section 1160 will be measured and paid as *Portable Concrete Barrier*. No additional payment will be made for equipment, materials or labor to meet the anchorage transition requirements.

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 16, after the first paragraph add the following:

Portable Concrete Barrier (Anchored) will be measured and paid as the maximum number of linear feet furnished, satisfactorily installed, accepted by the Engineer, maintained and removed, at any one time during the life of the project, including anchorage transition sections between portable concrete barrier and portable concrete barrier (anchored) as shown in the Roadway Standard Drawings, No. 1170.01. Measurement will be made by counting the number of barrier units used and multiplying by the length of a unit.

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 21, delete and replace "*Remove and Reset Portable Concrete Barrier (____)*" with "*Remove and Reset Portable Concrete Barrier*".

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 24, after the second sentence of the third paragraph add the following:

As shown in the *Roadway Standard Drawings*, No. 1170.01, anchorage transition sections between *Portable Concrete Barrier* and *Temporary Crash Cushions* as found in Section 1160 will be measured and paid as *Remove and Reset Portable Concrete Barrier*. No additional

payment will be made for equipment, materials or labor to meet the anchorage transition requirements.

Page 11-19, Article 1170-4 MEASUREMENT AND PAYMENT, line 28, after the third paragraph add the following:

Remove and Reset Portable Concrete Barrier (Anchored) will be measured and paid as the number of linear feet of barrier moved from one location on the project to another location on the project, including anchorage transition sections between portable concrete barrier and portable concrete barrier (anchored) as shown in the Roadway Standard Drawings, No. 1170.01. Measurement will be made by counting the number of barrier units moved during any one move and multiplying by the length of a unit. Where barrier units are moved more than once, each move will be measured separately. Whenever the Engineer directs the Contractor to move barrier units from an installed location to a stockpile either on or off the project and then back to another installed location, the complete move from the first installed location to the next installed location will be measured as 2 moves.

PAVEMENT MARKINGS:

(5-19-26)(Rev. 6-16-26) 1087, 1205 SP12 R04

Revise the *Standard Specifications* as follows:

Page 10-185, Subarticle 1087-2(A) Paint Composition, line 15, replace "TT--P-1952" with "TT--P-1952, Type III".

Page 10-185, Subarticle 1087-2(C) Thermoplastic Composition, lines 28-33, replace the first through third paragraph and the table with the following:

(C) Thermoplastic and Integrated Multipolymer (IMP) Composition

Use thermoplastic alkyd/maleic pavement markings composed of the materials in Table 1087-1A and integrated multipolymer markings composed of the materials in Table 1087-1B.

TABLE 1087-1A
PHYSICAL PROPERTIES
OF THERMOPLASTIC PAVEMENT MARKINGS

Component	By Weight
Alkyd/Maleic Binder	18.0% Min
Premixed Glass Beads (AASHTO M 247 – Type 3)	40.0% Min
Titanium Dioxide Pigment (ASTM D476 Type 2)	10.0% Min. (white) 1.5% Min. (yellow)

TABLE 1087-1B
PHYSICAL PROPERTIES
OF INTEGRATED MULTIPOLYMER (IMP) PAVEMENT MARKINGS

Component	By Weight
Binder	21.0% Min
Premixed Glass Beads (AASHTO M 247 – Type 3)	40.0% Min
Titanium Dioxide Pigment (ASTM D476 Type 2)	10.0% Min. (white only)
Inert Filler	15% Max white / 24% Max Yellow

Use white material that does not contain anatase titanium dioxide pigment. Use yellow material that does not contain any intentionally added lead chromate.

Calcium carbonate and inert fillers may be used by the manufacturer, providing all other qualifications are met.

Page 10-185, Subarticle 1087-2(C) Thermoplastic Composition, line 34, replace "thermoplastic" with "material".

Page 10-185, Subarticle 1087-2(C) Thermoplastic Composition, line 36, replace "alkyd/maleic binder" with "binder".

Page 10-185, Subarticle 1087-2(C) Thermoplastic Composition, line 38, replace "maleic-modified glycerol of resin" with "rosin ester".

Page 10-186, Subarticle 1087-2(C) Thermoplastic Composition, insert the following paragraph after line 2:

The integrated multipolymer binder shall consist of a mixture of modified rosin ester, polyamide and a copolymer (e.g. EVA) with waxes and/or plasticizers. At least 3% of the total formulation weight shall be 100% polyamide. The binder shall contain no petroleum hydrocarbon resins.

Page 10-186, Subarticle 1087-2(C) Thermoplastic Composition, lines 3, 6, 9 and 11, replace "thermoplastic material" with "material".

Page 10-186, Article 1087-3 COLOR, after line 27, replace "Crystal: Color No. 17886 (White)" with "White: Color No. 17925".

Page 10-186, Subarticle 1087-4(A) Composition, lines 31-34, replace the second paragraph with the following:

Manufacture the beads from 100% recycled or virgin non-pigmented glass from a composition designed to be highly resistant to traffic wear and to the effects of weathering. All intermix and drop-on glass beads shall be manufactured using 100% North American recycled glass cullet, virgin North American glass or a combination of the two.

Page 10-187, Subarticle 1087-4(C) Gradation & Roundness, lines 4-6, replace the first paragraph and table with the following:

Use drop-on and intermixed glass beads in all pavement markings with at least 80% true spheres when tested in accordance with ASTM D1155. Drop-on glass beads for permanent pavement markings shall be high performance glass beads listed on the NCDOT APL. If otherwise specified, or at the direction of the Engineer, other drop-on reflective media may be used on permanent markings. Drop-on glass beads used on any interim or temporary pavement markings shall meet Table 1087-2.

TABLE 1087-2
GLASS BEAD GRADATION REQUIREMENTS

Sieve Size	Gradation Requirements	
	Minimum	**Maximum**
Passing #20	95%	100%
Retained on #30	5%	20%
Retained on #50	40%	80%
Retained on #80	15%	50%
Passing #80	0%	10%
Retained on #200	0%	5%

Page 10-187, Article 1087-5 PACKAGING FOR SHIPMENT, line 31, replace "Thermoplastic pavement marking materials" with "Thermoplastic and integrated multipolymer pavement marking materials".

Page 10-188, Subarticle 1087-7(B) Thermoplastic Pavement Marking Material Composition, line 17, replace **"(B) Thermoplastic Pavement Marking Material Composition**" with
"**(B) Thermoplastic and Integrated Multipolymer Pavement Marking Material Composition**".

Page 10-188, Subarticle 1087-7(C) Flash Point, line 22, replace "thermoplastic" with "thermoplastic and integrated multipolymer material".

Page 10-188, Subarticle 1087-7(D) Requirements, line 25, replace "thermoplastic material" with "thermoplastic and integrated multipolymer material".

Page 10-189, Subarticle 1087-7(D), after line 15, add the following:

(9) Tensile Elongation

The integrated multipolymer material shall have an elongation of at least 10% when tested in accordance with ASTM D638 (1"x 6", 0.25"/min).

(10) Abrasion Resistance

The integrated multipolymer material shall have no more than 0.40 g weight loss following taber abrasion with CS17 wheels for 1000 cycles with 1 kg weight per ASTM D4060.

Page 10-189, Article 1087-8 MATERIAL CERTIFICATION, lines 22-23, replace the third

paragraph with the following:

Reflective media not covered in this, or other specifications must meet AASHTO M 247 Type 3 or 4 and a NCDOT Type 2 Material Certification must be provided.

Page 10-189, Article 1087-8 MATERIAL CERTIFICATION, after line 23, add the following to the table:

Integrated Multipolymer	Type 2 Material Certification and Type 3 Material Certification

Page 12-3, Subarticle 1205-3(F) Surface Preparation and Curing Compound Removal, line 8, add the following as a second sentence of the first paragraph:

Only apply markings to dry clean surfaces.

Page 12-4, Subarticle 1205-3(G)(1) General for all types of Pavement Markings, line 16, replace the first sentence of the eighth paragraph with the following:

Protect the pavement markings until they are track free before exposing them to traffic.

Page 12-4, Subarticle 1205-3(G)(1) General for all types of Pavement Markings, lines 22-24, delete the second sentence of the tenth paragraph.

Page 12-4, Subarticle 1205-3(G)(1) General for all types of Pavement Markings, after line 24, replace "White: Color No. 17886" with "White: Color No. 17295".

Page 12-5, Subarticle 1205-3(I) Removal of Pavement Markings, line 32, add the following as the third sentence of the seventh paragraph:

Before applying integrated multipolymer (IMP) pavement markings over existing thermoplastic pavement markings, remove at least 85% of the oxidized existing thermoplastic.

Page 12-5, Subarticle 1205-3(I) Removal of Pavement Markings, line 35, replace "thermoplastic" with "thermoplastic or IMP".

Page 12-6, Article 1205-4 THERMOPLASTIC, line 3, replace "**1205-4 THERMOPLASTIC**" with **"1205-4THERMOPLASTIC AND INTEGRATED MULTIPOLYMER (IMP)".**

Page 12-6, Subarticle 1205-4(A) Application Equipment, lines 7, 16, 20, 24, 25, 27 and 29, delete "thermoplastic"

Page 12-6, Subarticle 1205-4(B) Weather Limitations and Seasonal Limitations, line 38, replace "thermoplastic pavement markings" with "thermoplastic or integrated multipolymer pavement markings".

Page 12-6, Subarticle 1205-4(B) Weather Limitations and Seasonal Limitations, line 42, delete "thermoplastic".

Page 12-7, Subarticle 1205-4(C) Application, lines 2, 3, 10, 21 and 31, delete "thermoplastic".

Page 12-7, Subarticle 1205-4(C) Application, after line 17, in Table 1205-2 MINIMUM REFLECTOMETER REQUIREMENTS FOR THERMOPLASTIC replace "Standard Glass Beads" with "High Performance Glass Beads" and for the Reflectivity of White replace "375 mcd/lux/m^2" with "425 mcd/lux/m^2" and Yellow replace "250 mcd/lux/m^2" with "325 mcd/lux/m^2"

Page 12-7, Subarticle 1205-4(C) Application, line 23, replace "thermoplastic pavement marking" with "final pavement marking".

Page 12-7, Subarticle 1205-4(C) Application, after line 32, replace "**TABLE 1205-3 THICKNESS REQUIREMENTS FOR THERMOPLASTIC**" with "**TABLE 1205-3 THICKNESS REQUIREMENTS FOR THERMOPLASTIC AND INTEGRATED MULTIPOLYMER**".

Page 12-9, Subarticle 1205-5(C) Observation Period, before line 1, replace "375 mcd/lux/m^2" with "425 mcd/lux/m^2" and replace "250 mcd/lux/m^2" with "325 mcd/lux/m^2".

Page 12-11, Subarticle 1205-8(C) Application, lines 17-20, replace the first paragraph with the following:

Final pavement marking application of paint shall be placed in 1 application of 30 mils wet each and consist of reflective media applied at a rate to immediately obtain the minimum retroreflective values.

Page 12-11, Subarticle 1205-8(C) Application, line 26, delete "15 mil".

Page 12-11, Subarticle 1205-8(C) Application, after line 31, replace Table 1205-6 with the following:

TABLE 1205-6
REFLECTOMETER REQUIREMENTS
FOR PAINT

Item	Color	Reflectivity
Standard Glass Beads	White	225 mcd/lux/m^2
	Yellow	200 mcd/lux/m^2
High Performance Glass Beads	White	425 mcd/lux/m^2
	Yellow	325 mcd/lux/m^2

Page 12-12, Article 1205-10 MEASUREMENT AND PAYMENT, lines 5-7, delete and replace the second sentence of the first paragraph with the following:

In addition, *Paint Pavement Marking Lines* will be paid per linear foot for each 15 mil application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns.

Page 12-12, Article 1205-10 MEASUREMENT AND PAYMENT, lines 12-14, delete and replace the second sentence of the second paragraph with the following:

In addition, *Paint Pavement Marking Symbols* will be paid for each 15 mil application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns.

Page 12-12, Article 1205-10 MEASUREMENT AND PAYMENT, lines 17-19, delete and replace the third sentence of the third paragraph with the following:

In addition, *Paint Pavement Marking Characters* will be paid for each 15 mil application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns.

Page 12-12, Article 1205-10 MEASUREMENT AND PAYMENT, lines 17-19, replace the second sentence of the ninth paragraph with the following:

No direct payment will be made for the work involved in applying the lines, including but not limited to surface preparation, reapplication of molten pavement marking crossed by a vehicle, removal of all pavement marking materials spilled on the roadway surface, and repair of markings tracked by a vehicle.

Page 12-13, Article 1205-10 MEASUREMENT AND PAYMENT, after line 12, add the following to the pay item and pay unit list:

Pay Item	**Pay Unit**
Integrated Multipolymer Pavement Marking Lines, __", __ mils	Linear Foot
Integrated Multipolymer Pavement Marking Symbols, __ mils	Each
Integrated Multipolymer Pavement Marking Characters, __ mils	Each

SNOWPLOWABLE DELINEATION:

(10-15-24) 1253 SP12 R53

Description

Furnish, install and maintain snowplowable delineation.

There are five snowplowable delineation alternate options approved for use in North Carolina. They include the following markers and markings options:

(1) Polycarbonate H-shaped Markers
(2) Inlaid Raised Pavement Markers
(3) 10' Rumble Skips
(4) Inlaid Cradle Markers
(5) 10' Inlaid Pavement Markings

Only one type of snowplowable delineation will be allowed on a single project.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Epoxy	1081
Pavement Markings	1087
Snowplowable Pavement Markers	1086-3

Any snowplowable pavement delineation shall conform to the applicable requirements of Sections 1086, 1087, and 1081 of the *Standards and Specifications.* Use snowplowable delineation markers and markings listed on the NCDOT APL. Any treatment that requires pavement cutting or milling shall be installed within 7 calendar days of the pavement cutting or milling operation.

Construction Methods

(A) General

For any snowplowable delineation, prior to installation, by brushing, blow cleaning, vacuuming or other suitable means, ensure that all materials and the pavement surface are free of dirt, grease, dust, oil, moisture, mud, grass, or any other material that would prevent adhesion to the pavement by brushing blow cleaning, or vacuuming. If required, apply a primer per manufactures recommendations to pavement surfaces before applying pavement marking material.

Install snowplowable delineation per manufacturers specifications every 80 feet. Make sure pavement markers are oriented to traffic correctly and pavement markings are applied in a uniform thickness. Do not apply markings over longitudinal joints. Protect the pavement markings until they are tack free. Apply applicable Sections 1205 and 1250 of the *Standards Specifications*.

If damage occurs during installation the effected treatments shall be corrected or replaced. This work shall be considered incidental to the installation of the marking or marker.

(B) Polycarbonate H-shaped Markers and Inlaid Cradle Markers

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.

Install polycarbonate H-shaped markers and inlaid cradle markers castings into slots sawcut into the pavement. Make slots in the pavement to exactly duplicate the shape of the casting of the polycarbonate H-shaped markers and inlaid cradle markers.

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 polycarbonate H-shaped markers and inlaid cradle markers according to the manufacturer's recommendations.

Protect the polycarbonate H-shaped markers or inlaid cradle markers until the epoxy has initially cured and is track free.

Construct inlaid cradle markers in accordance with the details in the plans and as directed by the Engineer.

(C) Reflector Replacement

The following requirements only apply to polycarbonate H-shaped markers and inlaid cradle markers.

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 polycarbonate H-shaped markers or inlaid cradle markers specified in this section.

If during reflector replacement it is discovered that the housing is missing or broken this will be paid as *Polycarbonate H-shaped Markers* or *Inlaid Cradle Markers*. 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.

(D) Inlaid Raised Pavement Markers

Cut groove in accordance with the details in the plans and as directed by the Engineer.

Use adhesive recommended by the manufacturer to install markers into the groove in accordance with Section 1251. The raised pavement markers are incidental to inlaid raised pavement markers.

(E) 10' Rumble Skips

Construct 10' rumble skips on asphalt concrete in accordance with Section 665 for all centerline and shoulder rumble skips, details in the plans and as directed by the Engineer. Construct 10' rumble skips on Portland cement concrete in accordance with Section 730 for all centerline and shoulder rumble skips, details in the plans and as directed by the Engineer. The milled rumble strips are incidental to the rumble skips. Using polyurea or extruded 90 mil thermoplastic construct pavement markings in accordance with Section 1205.

(F) 10' Inlaid Pavement Markings

The groove in which the marking is to be placed shall be one inch wider than the marking to be placed and 10 mils deeper than the thickness of the marking.

When using this method, use enhanced reflective media. The following retroreflectivity values shall be met.

MINIMUM INITIAL REFLECTOMETER READINGS		
Item	**Color**	**Reflectivity**
Enhanced Reflectivity Media	White	450 mcd/lux/m^2
	Yellow	350 mcd/lux/m^2

Using polyurea, extruded 90 mil thermoplastic or cold applied plastic construct pavement markings in accordance with Section 1205.

Maintenance

Maintain all installed snowplowable delineation before acceptance by the Engineer.

Measurement and Payment

Polycarbonate H-shaped Markers will be measured and paid as the actual number of polycarbonate H-shaped markers satisfactorily placed and accepted by the Engineer.

Inlaid Raised Pavement Markers will be measured and paid as the actual number of inlaid raised pavement markers satisfactorily placed and accepted by the Engineer.

10' Rumble Skips will be measured and paid as the actual number of rumble skips satisfactorily placed and accepted by the Engineer.

Inlaid Cradle Markers will be measured and paid as the actual number of pavement markers satisfactorily placed and accepted by the Engineer.

10' Inlaid Pavement Markings will be measured and paid as the actual number of 10' inlaid pavement markings satisfactorily placed and accepted by the Engineer.

Replace Snowplowable Pavement Marker Reflector will be measured and paid in accordance with Article 1253-5.

Payment will be made under:

Pay Item	Pay Unit
Polycarbonate H-shaped Markers	Each
Inlaid Raised Pavement Markers	Each
10' Rumble Skips	Each
Inlaid Cradle Markers	Each
10' Inlaid Pavement Markings	Each

PERMANENT SEEDING AND MULCHING:

(7-1-95)(Rev. 1-16-24) 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 *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.

COIR FIBER MAT:

(9-16-25) 1629 SP16 R05

Revise the *Standard Specifications* as follows:

Page 16-9, Article 1629-2 MATERIALS, lines 22-24, delete and replace the last paragraph with the following:

Provide #3 or #4 uncoated reinforcing steel anchors, 24 inches in length, bent into a U-shape with a 4-inch diameter bend and a 4-inch straight leg extending from the bend to catch and secure the coir fiber mat.

WATTLE DEVICES:

(1-1-24)(Rev. 9-16-25) 1642 SP16 R10

Revise the *Standard Specifications* as follows:

Page 16-23, Subarticle 1642-2(B) Wattle, lines 10-12, delete and replace with the following:

(B) Wattle and Wattle Barrier

Wattles shall meet Table 1642-1.

TABLE 1642-1 100% CURLED WOOD (EXCELSIOR) FIBERS - WATTLE	
Property	**Property Value**
Minimum Diameter	12 inches
Minimum Density	2.5 pcf +/- 10%
Net Material	Synthetic
Net Openings	1 inch x 1 inch
Net Configuration	Totally Encased
Minimum Weight	20 lb +/- 10% per 10 foot length

Coir Fiber Wattles shall meet Table 1642-2.

TABLE 1642-2 100% COIR (COCONUT) FIBERS WATTLE	
Property	**Property Value**
Minimum Diameter	12 inches
Minimum Density	3.5 pcf +/- 10%
Net Material	Coir Fiber
Net Openings	2 inch x 2 inch
Net Strength	90 lb
Minimum Weight	2.6 pcf +/- 10%

Wattle Barriers shall meet Table 1642-3.

TABLE 1642-3 100% CURLED WOOD (EXCELSIOR) FIBERS – WATTLE BARRIER	
Property	**Property Value**
Minimum Diameter	18 inches
Minimum Density	2.9 pcf +/- 10%
Net Material	Synthetic
Net Openings	1 inch x 1 inch
Net Configuration	Totally Encased
Minimum Weight	5 pcf +/- 10%

Coir Fiber Wattle Barriers shall meet Table 1642-4.

TABLE 1642-4 100% COIR (COCONUT) FIBERS WATTLE BARRIER	
Property	**Property Value**
Minimum Diameter	18 inches
Minimum Density	5 pcf +/- 10%
Net Material	Coir Fiber
Net Openings	2 inch x 2 inch
Net Strength	90 lb
Minimum Weight	10 pcf +/- 10%

Pages 16-24 & 16-25, Article 1642-5 MEASUREMENT AND PAYMENT, lines 42-47 & lines 1-2, delete and replace with the following:

Wattle 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 *Wattle*.

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of coir fiber 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*.

Wattle Barrier will be measured and paid as the actual number of linear feet of 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 *Wattle Barrier*.

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*.

Page 16-25, Article 1642-5 MEASUREMENT AND PAYMENT, after line 9, delete and replace "___ Wattle Check" with "Wattle".

Page 16-25, Article 1642-5 MEASUREMENT AND PAYMENT, after line 9, delete and replace "___ Wattle Barrier" with "Wattle Barrier".

Page 16-25, Article 1642-5 MEASUREMENT AND PAYMENT, after line 9, add the following:

Pay Item	**Pay Unit**
Coir Fiber Wattle	Linear Foot
Coir Fiber Wattle Barrier	Linear Foot

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08)(Rev. 1-16-24) 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 *Standard Specifications*.

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

Restricted Noxious **Weed**	Limitations per Lb. Of Seed	Restricted Noxious **Weed**	Limitations per Lb. of Seed
Blessed Thistle	4 seeds	Cornflower (Ragged Robin)	27 seeds
Cocklebur	4 seeds	Texas Panicum	27 seeds
Spurred Anoda	4 seeds	Bracted Plantain	54 seeds
Velvetleaf	4 seeds	Buckhorn Plantain	54 seeds
Morning-glory	8 seeds	Broadleaf Dock	54 seeds
Corn Cockle	10 seeds	Curly Dock	54 seeds
Wild Radish	12 seeds	Dodder	54 seeds
Purple Nutsedge	27 seeds	Giant Foxtail	54 seeds
Yellow Nutsedge	27 seeds	Horsenettle	54 seeds
Canada Thistle	27 seeds	Quackgrass	54 seeds
Field Bindweed	27 seeds	Wild Mustard	54 seeds
Hedge Bindweed	27 seeds		

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed

shall not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet – Strain R
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass
Crownvetch
Pensacola Bahiagrass
Creeping Red Fescue
Japanese Millet
Reed Canary Grass
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

STANDARD SPECIAL PROVISION
ERRATA

(1-16-24)(Rev. 6-16-26) Z-4

Revise the *2024 Standard Specifications* as follows:

Division 1

Page 1-1, Article 101-2 ABBREVIATIONS, line 25, replace "American Wood-Preservers' Association" with "American Wood Protection Association".

Page 1-18, Article 102-10 BID BOND OR BID DEPOSIT, line 26, replace " Subarticle 102-8(A)(8)(b)" with "Subarticle 102-8(A)(12)(b)".

Page 1-20, Subarticle 102-14(A) State Funded Projects, line 3, replace "$30,000" with "$40,000".

Page 1-20, Subarticle 102-14(B) Federal Aid Projects, line 7, replace "$30,000" with "$40,000".

Page 1-36, Subarticle 104-12(B) Evaluation of Proposals, line 21, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-36, Subarticle 104-12(D) Preliminary Review, line 37, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-37, Subarticle 104-12(E) Final Proposal, line 3, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-37, Subarticle 104-12(F) Design-Build VEPs, line 36, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-38, Subarticle 104-12(G) Modifications, line 1, replace "Design-Build Unit" with "Alternative Delivery Unit".

Division 3

Page 3-5, Article 305-2 MATERIALS, after line 16, replace " 1032-3(A)(7)" with "1032-3" and add the item "Galvanized Corrugated Steel Pipe" with Section "1032-3".

Page 3-6, Article 310-2 MATERIALS, after line 9, add the item "Galvanized Corrugated Steel Pipe" with Section "1032-3".

Division 6

Page 6-15, Article 610-1 DESCRIPTION, line 20, replace "The work includes" with "The work includes, but is not limited to,".

Page 6-15, Article 610-1 DESCRIPTION, line 22, replace “applying the tack coat as specified.” with “applying the tack coat in accordance with Section 605.”.

Page 6-30, Article 610-14 DENSITY ACCEPTANCE, line 39, replace “QC process.” with “QC process in accordance with Section 609.”.

Page 6-31, Article 610-16 MEASUREMENT AND PAYMENT, line 13, replace "*Hot Mix Asphalt Pavement*” with “*Asphalt Concrete _____ Course, Type _____*”.

Page 6-50, Subarticle 661-4(A) Equipment, lines 4-7, replace the first two sentences of the seventh paragraph with the following:

When an erected fixed stringline is utilized for longitudinal profile and cross slope control furnish and erect the necessary guide line for the equipment.

Division 7

Page 7-18, Subarticle 710-10(A) General, lines 7-8, delete “for *Surface Testing Concrete Pavement*” from the last paragraph.

Division 8

Page 8-27, Article 846-1 DESCRIPTION, line 8, delete “4 inch” from the first paragraph.

Division 9

Page 9-17, Article 904-4 MEASUREMENT AND PAYMENT, prior to line 1, replace " Sign Erection, Relocate Type (Ground Mounted)” with “Sign Erection, Relocate Type ___ (Ground Mounted)”.

Division 10

Page 10-51, Article 1024-4 WATER, prior to line 1, delete the “unpopulated blank row” in Table 1024-2 between “Time of set, deviation from control” and “Chloride Ion Content, Max.”.

Page 10-170, Subarticle 1081-1(C) Requirements, line 4, replace "maximum” with “minimum”.

Division 11

Page 11-15, Article 1160-4 MEASUREMENT AND PAYMENT, line 24, replace “Where barrier units are moved more than one” with “Where barrier units are moved more than once”.

Division 15

Page 15-10, Article 1515-4 MEASUREMENT AND PAYMENT, lines 11, replace " All piping” with “All labor, the manhole, other materials, excavation, backfilling, piping”.

Division 16

Page 16-14, Article 1633-5 MEASUREMENT AND PAYMENT, line 20-24 and prior to line 25, delete and replace with the following " *Flocculant* will be measured and paid in accordance with Article 1642-5 applied to the temporary rock silt checks."

Page 16-3, Article 1609-2 MATERIALS, after line 26, replace "Type 4" with "Type 4a".

Page 16-25, Article 1644-2 MATERIALS, after line 22, replace "Type 4" with "Type 4a".

Page 16-27, Article 1644-5 MEASUREMENT AND PAYMENT, line 31, replace "Article 1630-4" with "Article 1630-3".

Division 17

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, line 23, delete and replace "1.25" with "1-1/4".

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, line 24, delete and replace ")(1.25" with ", 1-1/4".

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES

(Imported Fire Ant, Guava Root Knot Nematode, Spongy Moth (formerly known as gypsy moth), Witchweed, Cogon Grass, And Any Other Regulated Noxious Weed or Plant Pest)

(3-18-03)(Rev. 3-18-25) 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/divisions/plant-industry/plant-protection/plant-industry-plant-pest-quarantines* 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 present a hazard of spreading imported fire ant, guava root knot nematode, spongy moth (formerly known as gypsy moth), witchweed, cogon grass, or other regulated noxious weed or plant pest.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

TITLE VI AND NONDISCRIMINATION:

(6-28-77)(Rev 1/16/2024) Z-6

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 US.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. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* 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) *(Religion/ Creed in all aspects of any aviation or transit-related construction)*	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. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(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

ON-THE-JOB TRAINING

(10-16-07) (Rev. 6-16-26) Z-10

Description

The North Carolina Department of Transportation administers a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternative OJT Program. All Contractors will be automatically placed in the Alternative OJT Program.

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.

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

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special 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 Unit, will assign annual training goals based on the Contractor's activity over the past three years' on federal projects with the Department. At the beginning of each year, all eligible Contractors 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 implement a self-imposed on-the-job training program for the calendar year. This agreement will specify the annual training goals agreed upon by both parties. The number of training assignments may range from 1 to 15 per Contractor per calendar year, unless a higher number is agreed to by the Contractor. The Contractor shall sign an agreement committing 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.

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 special 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 trainees in each occupation shall be in their first year of 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 at minimum 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 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.

MECHANICALLY STABILIZED EARTH RETAINING WALLS (1-16-24)

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.

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	≥ 5,000 Ω · cm	≤ 100 ppm	≤ 200 ppm
Fine	≥ 3,000 Ω · 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	**Requirement[1]**	**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 (Xj_{ave}) / Ultimate Tensile Strength in the MD from ASTM D6637, Method A) × 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 ± 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 ≤ 30 sf	1/2"
30 sf < A ≤ 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 Slope[1] (H:V)	**Minimum Embedment Depth[2] (whichever is greater)**	
6:1 or flatter (except abutment walls)	H/20	1 ft for H ≤ 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 ≤ 30 sf	25 ft	2
	35 ft[1]	3
30 sf < A ≤ 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", ±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. 1, 2, 4, and 5 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. 1, 2, 4, and 5* 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. 1, 2, 4, and 5* 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.

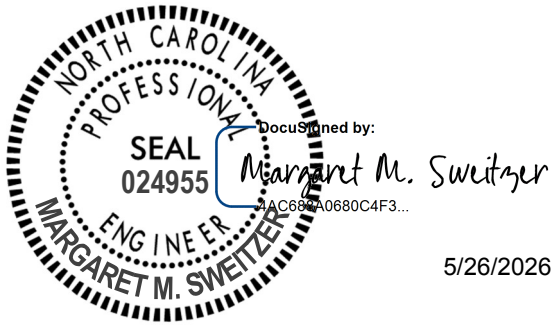
No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for *MSE Retaining Wall No. 1, 2, 4, and 5*.

The contract unit price for *MSE Retaining Wall No. 1, 2, 4, and 5* 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. 1, 2, 4, and 5* 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 2 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	**Pay Unit**
MSE Retaining Wall No. 1	Square Foot
MSE Retaining Wall No. 2	Square Foot
MSE Retaining Wall No. 4	Square Foot
MSE Retaining Wall No. 5	Square Foot



ARCHITECTURAL CONCRETE SURFACE TREATMENT (SPECIAL)

1.0 GENERAL

The work covered by this special provision consists of constructing textured surfaces on formed reinforced concrete surfaces as indicated on the Plans and in this Special Provision. The Contractor shall furnish all materials, labor, equipment, and incidentals necessary for the construction of architectural concrete surface treatment using simulated stone masonry form liners (molds) and a compatible concrete coloring system.

The architectural concrete surface treatment should match the appearance (stone size and shape, stone color, and stone texture, pattern, and relief) of natural stone and rock as directed by the Engineer. Grout pattern joints (mortar joints) and bed thickness should re-create the appearance and color of precast concrete surfaces as indicated in the Plans, this Special Provision, or as directed by the Engineer.

2.0 SUBMITTALS

Shop Drawings - Submit for review and acceptance, a PDF file for plan and elevation views and details showing overall simulated stone pattern, joint locations and end, edge or other special conditions. The drawings should include typical cross sections of applicable surfaces, joints, corners, stone relief, stone size, pitch/working line, mortar joint and bed depths. If necessary, revise the shop drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. The PDF file of shop drawings should be 22-inch x 34-inch in size and have enough resolution to show the details of all stone and joints patterns as well as overall appearance.

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 minimize construction joint lines. The top of wall must have untreated, non-textured, and uncolored areas within the distance from the top of wall to the bottom of the coping.

Shop drawings shall be reviewed and accepted prior to fabrication of form liners.

Sample Panels – After the shop drawings have been reviewed and accepted by the Engineer, submit a precast sample panel to the project site. The sample panel shall be transportable and minimum 4 foot x 4 foot in size. The materials used in construction of the sample panel shall comply with section 420 of the Standard Specifications. The sample panel shall be constructed using approved form liners and color system/stains. The sample panel can be colored on the project site in accordance with this provision. Any sample panel that is not accepted by the Engineer is to be removed from the project site and a new sample panel produced at no additional expense to the Department.

After the color, texture, and uniformity of the furnished samples are approved, produce a full scale unit meeting the design requirements. This mock-up and the furnished samples establish the standard quality for determining the acceptance of the panels.

Architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the accepted sample panels. Upon acceptance by the Engineer, the sample panels shall be used as the quality standard for the project. After the acceptance of the completed structure, dispose of the sample panels as directed by the Engineer.

3.0 MATERIALS REQUIREMENTS

Form Liner – 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 architectural concrete surface treatment shall match the appearance (stone size and shape, stone texture, pattern, relief and joint) of natural stone to resemble an ashlar stone pattern or approved equal. All texture shall be in addition to the nominal thickness of the wall panels of four inches ±¼ inch. The maximum relief of the textured surface shall be 1.5 inch or less. The top 1'-0" of the top panel within each sound barrier wall segment shall have a smooth, non-textured and non-stained finish to resemble faux coping. For information purposes only, sources of form liners in the ashlar stone pattern include, but are not limited to:

Custom Rock Formliner
2020 West 7th Street
St. Paul, MN 55116
http://www.customrock.com
Pattern: Ashlar Stone # 12021

Architectural Polymers, Inc.
1220 Little Gap Road
Palmerton, PA 18071
http://www.apformliner.com/
Pattern: Ashlar Stone #904

Fitzgerald Form Liners
1500 East Chestnut Avenue
Santa Ana, CA 92701
http://formliners.com/
Pattern: Georgia Ashlar # 16999

The contractor has the option of supplying an alternative pattern of simulated stone form liner, as long as the pattern selected is approved, in writing, as an equal or approved alternative by the Engineer.

Form Release Agent – Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product. Form release agents shall be compatible with the color system applied and any special surface finish.

Concrete color system/stain – The final coloration of the wall is to match the Grey Palette Color # FS 36270 found in the *Federal Standard 595B - Colors Used in Government Procurement*. Stain the sample panel using the proposed colors and the approved sample panel shall be the basis for determining the appropriate color/stain application.

The concrete color stains shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight, or weathering. Stain mix shall meet the requirements for mildew resistance of Federal Test Method Standard 144, Method 6271, and requirements for weathering resistance of 1,000 hours accelerated exposure measures by Weatherometer in accordance with ASTM G 26. Color samples must be submitted for approval.

Anti-Graffiti Coating Application – Apply the anti-graffiti coating that is compatible with the concrete color system/stain. After application, the anti-graffiti coating shall be dry to touch within one hour and shall achieve a final cure within three hours. The color of the anti-graffiti shall be clear after full cure. The contractor shall provide one gallon of graffiti remover, thinners, dryers and all necessary components recommended by the manufacturer to the North Carolina Department of Transportation Materials and Test Unit, Chemical Testing Engineer.

Quality Standards - Manufacturer of simulated stone masonry form liners and custom coloring system shall have at least five years of experience making stone masonry molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors.

After the Engineer has reviewed and approved the shop drawings, schedule a preconstruction conference with manufacturer representative and the Engineer to assure understanding of simulated stone masonry form liner use, color application, requirements for construction of sample panels, and to coordinate the work. Disclose the source of simulated stone masonry manufacturer and final coloration contractor at the Preconstruction Conference.

4.0 CONSTRUCTION METHODS

Form Liner Preparation – Before 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. Use a technical representative from the form liner manufacturer for technical supervision during the installation and removal of form liners.

Form Release Agent – Form release agent shall be applied in accordance with the manufacturer's recommendations. The material shall be compatible with the form liner material and the concrete coloring system and in accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

Patching – All form tie holes and other 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.

Surface Finish – 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. Pressure washing with water is the preferred method of removing laitances. Sandblasting will not be permitted.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption.

Reinforced 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.

Grout Pattern Joints – Grout pattern joints shall be constructed 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.

Color/Stain Application – 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. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Anti-Graffiti Coating Application – The anti-graffiti coating shall be applied by brush, roller or airless spray when the ambient temperature is between 40°F and 90°F, and the surface temperature is between 50° F and 100° F. Ensure the surface is clean and dry before applying the anti-graffiti coating. The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

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.

Experience and Qualifications - The Contractor shall have a minimum of three consecutive years of experience in architectural concrete surface treatment construction on similar types of projects. A minimum of 10 days prior to the submission of shop drawings, furnish to the Engineer 5 references who were responsible for supervision of similar projects and will testify to the successful completion of these projects. Include name, address, telephone number, and specific type of application.

5.0 MEASUREMENT AND PAYMENT

The quantity of architectural concrete surface treatment to be paid for will be the actual number of square feet of architectural concrete surface treatment that has been incorporated into the completed and accepted work.

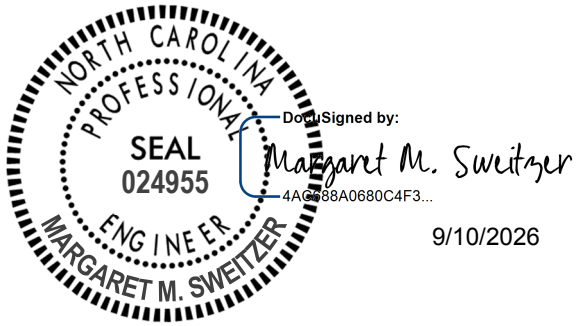
The area of architectural concrete surface treatment will be measured by the area of front facing in-place treated concrete. Do not include the top surfaces and the end wall surfaces in the measurement. Area of sample panels shall not be included in the measurement of architectural concrete surface treatment.

6.0 BASIS OF PAYMENT

Architectural concrete surface treatment as described on the plans and in this Special Provision will be paid for at the contract unit price bid for "Architectural Concrete Surface Treatment". The above 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 shall include, but not be limited to, furnishing all labor, materials, equipment, and other incidentals, including sample panels, necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Architectural Concrete Surface Treatment	Square Foot



SHORED MECHANICALLY STABILIZED EARTH RETAINING WALLS (SPECIAL)

1.0 GENERAL

Construct shored mechanically stabilized earth (SMSE) retaining walls consisting of a combination of mechanically stabilized earth (MSE) with steel or geosynthetic reinforcement in the reinforced zone connected to vertical facing elements and shoring walls in the form of soil nail walls consisting of soil nail spaced at a regular pattern and connected to a reinforced shotcrete face supporting the excavation. 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 SMSE retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. The MSE component of the system should consider the long-term retaining benefits provided by the Soil Nail Wall. Contributions of the Soil Nail Wall include a reduction in lateral loads on the MSE mass and significant contributions to global stability. Provide working drawing submittals for the MSE retaining wall and the soil nail wall at the same time to allow for concurrent review.

Define SMSE 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,
SMSE Wall – Shored mechanically stabilized earth wall referring to the entire wall system,
Soil Nail Wall – Soil nail retaining wall portion of the SMSE system,
Soil Nail Wall Contractor – Anchored wall contractor installing soil nails and applying shotcrete,
Nail – soil nail,
MSE Wall – Mechanically stabilized earth retaining wall portion of SMSE system,
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 – SMSE wall with bridge foundations in any portion of the reinforced zone or an SMSE wall connected to an abutment wall (even if bridge foundations only penetrate a small part of the reinforced zone, the entire SMSE wall is considered an abutment wall).

At the Contractor's option, use coarse or fine aggregate in the reinforced zone of MSE portion of SMSE retaining walls except do not use fine aggregate for walls subject to scour, walls that support or are adjacent to railroads or walls with design heights greater than 35 ft or internal acute corners less than 45°. Provide reinforced concrete coping as required.

2.0 MATERIALS

MSE Wall System

Refer to the *Standard Specifications*.

Item	Section
Aggregate	1014
Asphalt Concrete Base Course, Type B25.0C	620
Corrugated Steel Pipe	1032-3
Curing Agents	1026
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
Wire Staples	1060-8(D)
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.

1) 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 electrochemical 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	≥ 5,000 Ω · cm	≤ 100 ppm	≤ 200 ppm
Fine	≥ 3,000 Ω · 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*.

2) 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.

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.

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	**Requirement[1]**	**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 (Xj_{ave}) / Ultimate Tensile Strength in the MD from ASTM D6637, Method A) × 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)

3) 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 ± 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 ≤ 30 sf	1/2"
30 sf < A ≤ 75 sf	3/4"

4) 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.

Soil Nail Wall System

Refer to the *Standard Specifications*.

Item	Section
Curing Agents	1026
Geosynthetics	1056
Portland Cement	1024.1
Reinforcing Steel	1070
Select Material, Class VI	1016
Shotcrete	1002
Shoulder Drain Materials	816-2
Steel Plates	1072-2

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. 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

MSE Wall System

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 production facility on the 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 shored MSE walls with a minimum reduced reinforcement length of 6 feet or 0.4 times the SMSE wall design height, whichever is greater; except for the top two layers of reinforcement, which must have a minimum length of 0.7 times the SMSE wall design height or extend 5 feet beyond the face of the soil nail wall, whichever is longer. Where the height of the soil nail wall is less than 2/3 times the SMSE wall design height, design the MSE wall in accordance with the plans, AASHTO LRFD Bridge Design Specifications and any NCDOT restrictions for the chosen MSE wall system unless otherwise required, using a minimum reinforcement length of 0.7 times the SMSE wall design height. Where the soil nail wall extends to near the top of the SMSE wall disallowing extension of the upper two layers of reinforcement, either connect the reinforcement to the soil nail wall, use a minimum reinforcement length of 0.7 times the SMSE wall design height, or submit an alternate detail to the Engineer for review and acceptance. Use a maximum vertical reinforcement spacing of 2.5 feet. Extend the reinforcement to the soil nail wall, where applicable. Otherwise 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)	**Corrosion Loss Rate (after zinc depletion)**
Coarse	0.47 mil/year
Fine (except abutment walls)	0.58 mil/year
Fine (abutment walls)	0.70 mil/year

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

WALL EMBEDMENT REQUIREMENTS		
Front Slope[1] (H:V)	**Minimum Embedment Depth[2] (whichever is greater)**	
6:1 or flatter (except abutment walls)	H/20	1 ft for H ≤ 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[3]	H/7	2 ft

1. Front slope is as shown in the plans.

2. H is the maximum design height per wall.

3. Minimum embedment for front slopes of 3:1 to 2:1 must be 4 feet to achieve minimum external stability requirements.

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 Wall Height Above Horizontal Panel Joint**	**Minimum Number of Pads per Horizontal Panel Joint**
A ≤ 30 sf	25 ft	2
	35 ft[1]	3
30 sf < A ≤ 75 sf	25 ft	3
	35 ft[1]	4

(a) 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:

A. Set dowels in core spaces of SRW units filled with grout instead of coarse aggregate or
B. 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.

Soil Nail Wall System

A. 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 as a critical wall and 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.

Design soil nail walls considering both wall and groundline geometry at time of construction. When noted in the plans, design soil nail walls for a live load (traffic) surcharge of 250 psf. Perform a global stability analysis for the entire SMSE system at the critical section.

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 a continuous aggregate shoulder drain along the base of shotcrete facing. Provide aggregate shoulder drains and outlet components in accordance with Roadway Standard Drawing No. 816.02.

Design shotcrete facing in accordance with the plans and Article 11.12.6.2 of the *AASHTO LRFD Bridge Design Specifications*. Use shotcrete facing with the dimensions shown in the plans. Extend shotcrete facing to the bottom of the soil nail wall elevation. Cover ends of nails, nuts, and plates with at least 2” of shotcrete for corrosion protection. The shotcrete thickness shown on the plans is the thickness between nail heads. Shotcrete thickness at the nail head will be slightly thicker.

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, and shotcrete. If

necessary, include details on working drawings for obstructions extending through walls or interfering with nails. 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_{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.

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:

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_{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.

B. 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.

C. 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 CORROSION MONITORING

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

5.0 MSE WALL VENDOR SITE ASSISTANCE

Unless otherwise approved, provide an MSE Wall Vendor representative to assist and guide the MSE Wall Installer on-site for at least 8 hours when the first panels 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 SMSE walls. Direct run off away from SMSE walls, select material and backfill. Contain and maintain select material and backfill and protect material from erosion.

Construct to the tolerances found in Table 4 of FHWA-CFL/TD-06-001.

Perform necessary clearing and grubbing in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary for SMSE walls in accordance with the accepted submittals.

A. MSE Wall Installation

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

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

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

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

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

Erect and support panels and stack SRW units so the final wall position is as shown in the accepted submittals. Stagger SRW units to create a running bond by centering SRW units over joints in the row below as shown in the accepted submittals. Space bearing pads in horizontal panel joints as shown in the accepted submittals and cover all panel joints with filtration geotextiles as shown in the accepted submittals. Attach filtration geotextiles to back of panels with adhesives, tapes or other approved methods.

Construct MSE walls with the following tolerances:

1) SRW units are level from front to back and between units when checked with a 4 ft long level,
2) Vertical joint widths are 1/4" maximum for SRW units and 3/4", ±1/4" for panels,
3) 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
4) 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*.

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

separation geotextiles in place with wire staples or anchor pins as needed. Seal joints above and behind MSE walls between coping and concrete slope protection with silicone sealant.

B. Soil Nail Wall Installation

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 over excavation occurs, repair walls with an approved method and a revised soil nail wall design or construction plan may be required.

Excavation

Excavate for soil nail walls from the top down on a 1(H):14(V) batter and 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:

a) Heights not to exceed vertical nail spacing,

b) Bottom of lifts no more than 3 ft below nail locations for current lift and

c) Horizontal and vertical alignment within 2" of location shown in the accepted submittals.

Maintain the minimum shotcrete thickness over cobbles, boulders, rubble or debris that 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.

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.

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.

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.

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. Maintain tremies below the top of 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.

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.

Wall Drainage Systems

Install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. Before installing shotcrete reinforcement, place geocomposite drain strips with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, drain strips may be placed after shotcreting over weep holes through the shotcrete. Hold drain strips in place with anchor pins so strips are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous drain strips are not allowed. If splices are needed, overlap drain strips at least 12" so flow is not impeded. Connect drain strips to continuous aggregate shoulder drain by embedding strip ends at least 4" into No. 57 stone.

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.

Construction Records

Provide 2 copies of soil nail wall construction records within 24 hours of completing each lift. Include the following in construction records:

a) Names of Soil Nail Wall Contractor, Superintendent, Nozzleman, Drill Rig Operator, Project Manager and Design Engineer;

b) Wall description, county, Department's contract, TIP and WBS element number;

c) Wall station and number and lift location, dimensions, elevations and description;

d) Nail locations, dimensions and inclinations, bar types, sizes and grades, corrosion protection and temporary casing information;

e) 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;

f) Grout volume, temperature, flow and density records;

g) Ground and surface water conditions and elevations if applicable;

h) Weather conditions including air temperature at time of grout placement and shotcrete application; and

i) All other pertinent details related to soil nail wall construction.

After completing each soil nail wall or stage of a wall, provide a PDF copy of all corresponding construction records.

Soil 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 required for at least one nail per soil type per soil nail wall or 2 nails per wall, whichever is greater. Proof tests are 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.

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.

7.0 MEASUREMENT AND PAYMENT

SMSE Retaining Wall will be measured and paid in square feet. SMSE walls will be measured as the square feet of MSE 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 for MSE walls without coping.

The contract unit price for SMSE Retaining Wall will be full compensation for providing designs, submittals, labor, tools, equipment and SMSE wall materials, excavating, backfilling, hauling and removing excavated materials and supplying site assistance, leveling pads, panels, reinforcement, aggregate, wall drainage systems, geotextiles, bearing pads, coping, miscellaneous components and any incidentals necessary to construct SMSE walls. The contract unit price for SMSE Retaining Wall will also be full compensation for reinforcement connected to and aggregate behind end bent caps in the reinforced zone, 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 the design or construction of the Soil Nail Wall portion of the SMSE wall. Design and construction of the soil nail wall portion of the SMSE wall will be incidental to the contract unit price for SMSE Retaining Wall.

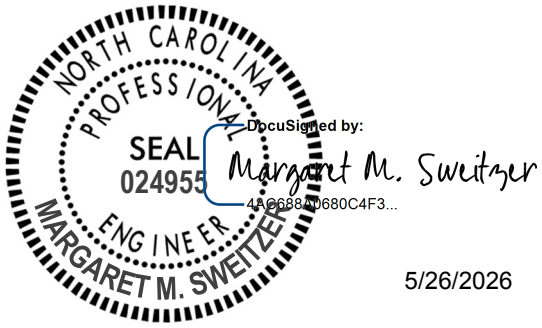
No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for SMSE Retaining Wall.

The contract unit price for SMSE Retaining Wall does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract.

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

Payment will be made under:

Pay Item	**Pay Unit**
SMSE Retaining Wall No. 3	Square Foot



TEMPORARY SHORING:

(2-20-07)(Rev. 1-16-24) 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 *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 *Roadway Standard Drawing* No. 862.02.

Materials

Refer to the *Standard Specifications*.

Item	**Section**
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-7
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
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 *Standard Specifications*. Use Class IV select material for temporary guardrail and Class A concrete that meets Article 450-2 of the *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 *Standard Specifications*. Splice bars in accordance with Article 1070-9 of the *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 *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 *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 *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* 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 *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 *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 *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 sheepsfoot, 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 *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.

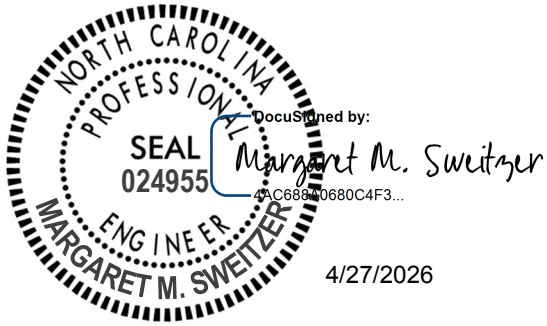
No payment will be made for temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience. No value engineering proposals will be accepted based solely on revising or eliminating shoring locations shown in the plans or estimated 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 Article 1170-4 of the *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 Article 862-6 of the *Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Shoring	Square Foot



STANDARD SHORING: **(1-16-24)**

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	1000-7
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 4a geotextile for geotextile reinforcement except for the ultimate tensile strength. 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.

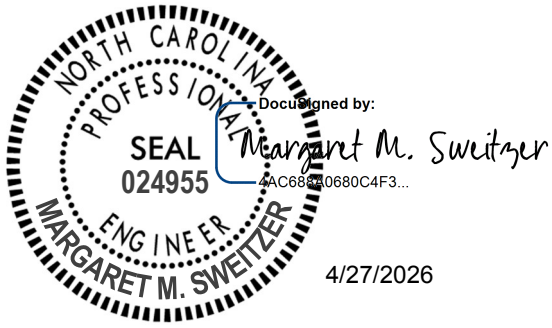
(B) Standard Temporary Walls Installation

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.

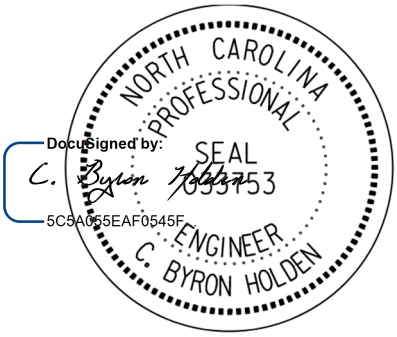


TC-1

P-5707 Wake County

WORK ZONE TRAFFIC CONTROL
Project Special Provisions
Table of Contents

Special Provision	**Page**
ADA Compliant Pedestrian Traffic Control Devices	TC-2



8/20/2026

TC-2

P-5707 Wake County

ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES:
(10/31/2017) (Rev. 6/3/2022)

Description

Furnish, install, and maintain all ADA compliant pedestrian traffic control devices for existing pedestrian facilities that are disrupted, closed, or relocated by planned work activities.

The ADA compliant pedestrian traffic control devices used to either close, redirect, divert or detour pedestrian traffic are Pedestrian Channelizing Devices, Audible Warning Devices and Temporary Curb Ramps.

Construction Methods

The ADA compliant pedestrian traffic control devices involved in the closing or redirecting of pedestrians as designated on the Transportation Management Plan (TMP) shall be manufactured and assembled in accordance with the requirements of the Americans with Disabilities Act (ADA) and be on the NCDOT approved products list.

Pedestrian Channelizing Devices shall be manufactured and assembled to be connected as to eliminate any gaps that allow pedestrians to stray from the channelizing path. Any Pedestrian Channelizing Devices used to close or block a pedestrian facility shall have a "SIDEWALK CLOSED" sign affixed to it and any audible warning devices, if designated on the TMP.

Audible Warning Devices shall be manufactured to include a locator tone activated by a motion sensor and have the ability to program a message for a duration of at least 1 minute. The motion sensor shall have the ability to detect pedestrians a minimum of 10' away. The voice module may be automatic or it may be push button activated. If push button activated, it shall be mounted at a height of approximately 3.5 feet, but no more than 4 feet, above the pedestrian facility.

Temporary Curb Ramps shall be manufactured and assembled to meet all of the requirements for persons with walking disabilities, including wheelchair confinement, according to the ADA regulations. All detectable warning features are to be included with these installations.

Measurement and Payment

Pedestrian Channelizing Devices will be measured and paid as the maximum number of linear feet of *Pedestrian Channelizing Devices* furnished, acceptably placed, and in use at any one time during the life of the project.

No direct payment will be made for any sign affixed to a pedestrian channelizing device. Signs mounted to pedestrian channelizing devices will be considered incidental to the device.

Audible Warning Devices will be measured and paid as the maximum number of *Audible Warning Devices* furnished, acceptably installed, and in use at any one time during the life of the project.

Relocation, replacement, repair, maintenance, or disposal of *Pedestrian Channelizing Devices* and *Audible Warning Devices* will be incidental to the pay item.

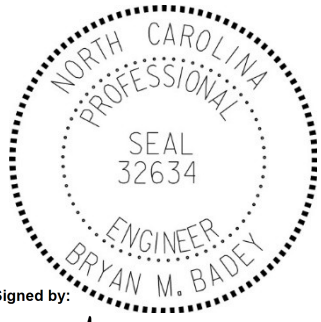
Temporary Curb Ramps will be measured and paid as the actual number of *Temporary Curb Ramps* furnished, acceptably installed, and in use. *Temporary Curb Ramps* will be paid for each time a curb ramp is moved from one location on the project to another location on the project.

Payment will be made under:

Pay Item	**Pay Unit**
Pedestrian Channelizing Devices	Linear Foot
Audible Warning Devices	Each
Temporary Curb Ramps	Each

PROJECT SPECIAL PROVISIONS
Utility Construction

RK&K
8601 Six Forks Road
Forum 1, Suite 700
Raleigh, NC 27615



DocuSigned by:
Bryan Badey
9BA4BFC74F37415...
8/20/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Where brand names and model numbers are specified in these Special Provisions or in the plans, the cited examples are used only to denote the quality standard of product desired and do not restrict bidders to a specific brand, make, or manufacturer. They are provided to set forth the general style, type, character, and quality of the product desired. Equivalent products will be acceptable.

The utility owner is the City of Raleigh. The contact person is Todd Toler and he can be reached by phone at 919-996-3476.

The provisions contained within these Utilities Construction Project Special Provisions modify the *Standard Specifications* only for materials used and work performed constructing water or sewer facilities owned by the City of Raleigh.

RELATION OF WATER MAINS TO NON POTABLE WATER LINES AND OTHER UTILITIES:

(3-18-25)

Revise the 2024 *Standard Specifications* as follows:
Page 15-1 and 15-2, Article 1500-5 RELATION OF WATER MAINS TO NON-POTABLE WATER LINES AND OTHER UTILITIES, lines 39-42 and lines 1-5, replace the article with the following:

Lay water mains at least 10 feet laterally from existing or proposed sanitary sewers or reclaimed water distribution lines. If local conditions or barriers prevent a 10-foot separation, lay the water main with at least 18 inches vertical separation above the top of the sanitary sewer or reclaimed water distribution pipe either in a separate trench or in the same trench on a bench of undisturbed earth.

For storm drain pipe or other utilities, lay the water main with at least 12 inches separation from the outside of the water main and the outside of the other facility.

One full length of water pipe at the point of crossing shall be located so that both joints will be as far from the sanitary sewer or reclaimed water distribution pipe as possible. If practicable, the water main shall be located above the sewer or reclaimed water distribution line.

SUBMITTALS AND RECORDS
(9-5-23)

Revise the 2024 *Standard Specifications* as follows:

Page 15-2, Article 1500-7 SUBMITTALS AND RECORDS, lines 29-30, replace the last sentence of the third paragraph with the following:

Provide as-built plans of the installed wet utilities in accordance with the City of Raleigh's requirements. Final acceptance for service of wet utilities by the City of Raleigh is contingent upon the contractor's submission of satisfactory as-built plans.

As-built plans must include the following data:

1. Horizontal and vertical coordinates (NC State Plane NAD83 northing, easting, and NAVD88 elevation) of the installed location for the following:
    - All fittings – Including but not limited to vertical and horizontal bends, tees, reducers, sleeves. Include size(s) and angle.
    - All utility controls – Including but not limited to valves, meters, fire hydrants, sampling stations, vaults, manholes, line stops installed as part of the project (whether abandoned or remaining active), and blow offs. Include size, type, and other descriptor(s) as applicable to specifically identify the control.
    - All cleanouts. Include size and material.
    - All piping – With survey points taken at intervals no greater than 100-feet along straight sections, and 50-feet along curved sections.
    - Start and end points of restrained joint piping.
    - Start and end points of encasement pipes. Include size and material of encasement.
    - Start and end points trenchless installations, including but not limited to pipe installed by horizontal directional drill.
    - Sanitary sewer manholes and cleanouts. Include rim and each invert.

Note: The elevation coordinate for buried facilities must be the elevation of the buried facility and not the surface elevation.

2. Size, material, and class of all piping, including identification of any special coatings or linings.
3. Identify new and existing facilities and connection point(s) to existing facilities

Verify accuracy and completeness of as-built plans in the field with the City of Raleigh inspections staff prior to submittal. Submit as-built drawings in PDF format as well as DGN or DWG format, sealed by a surveyor licensed in the state of North Carolina, to the City of Raleigh for review and approval.

GENERAL

Owner Coordination and Inspections

The existing potable water, reclaimed water, and sanitary sewer utilities within the project area (hereinafter "wet utilities") belong to the City of Raleigh (hereinafter "Owner"). The Contractor shall provide access for the Owner's representatives to all phases of construction. Testing, inspection, and acceptance shall be in accordance with the Owner's requirements. Contractor shall coordinate with the Owner to ensure all testing, inspection, and documentation requirements are met at 919-996-3476.

Owner Specifications

The proposed utility construction shall meet the applicable requirements of the NC Department of Transportation's "Standard Specifications for Roads and Structures" (hereinafter "NCDOT Standard Specifications") dated January 2024, the Owner's "Raleigh Water – Public Utility Design Manual" (hereinafter "Owner Specifications") current edition, the City of Raleigh's standard utility details, the Utility Construction plans, and the following Special Provisions.

Measurement and payment for proposed Utility Construction shall conform to the applicable requirements of the 2024 NCDOT Standard Specifications, as appended by these Special Provisions. If a discrepancy arises between the NCDOT Standard Specifications and the Owner Specifications that is not related to measurement and payment, the more stringent requirements shall prevail.

Material Requirements

Materials for pipe and appurtenances shall be as specified herein or as shown on the plans.

All metallic components that are subject to exposure to wastewater or wastewater gases shall be stainless steel or lined with Ceramic Epoxy.

Service Outages

Any wet utility service outages shall take place at a time and date acceptable to the Owner, including nights and weekends, shall be limited to no more than 8 hours per service interruption, unless otherwise specified on the plans or by the Owner. The Contractor shall coordinate all shutdowns with the Owner and shall provide notice as required by the Owner to all affected users. The Contractor shall not be entitled to any additional compensation or delay claims associated with these requirements.

WET UTILITY INSTALLATION PLAN

Description

For each wet utility relocation, the Contractor shall submit a plan, detailing the intended wet utility construction to the Owner for approval prior to installing any component of the proposed wet utility or interrupting wet utility service. The Plan shall include at minimum:

1. Schedule and Sequence
    a. Proposed installation schedule and sequence including all connections to active pressure pipes (line stops, tapping sleeves, or cut-in work), connections to manholes, or other connections to the Owner's system, installation phasing, pressure testing, disinfection, flushing, water quality testing, service connection switchovers, and abandonment or removal of lines to be abandoned.
2. Shutdowns
    a. For each phase of wet utility construction requiring a service outage (defined as the closure of one or more valves, resulting in depressurization of any portion of the existing system, including services), the Contractor shall provide the following:
        i. Location of proposed work and justification for shutdown
        ii. Schedule (date and time) and duration
        iii. Affected customers
3. Bypasses
    a. For any work requiring bypass of portions of the existing wet utility system or other temporary piping, the Contractor shall provide the following:
    a. Bypass piping layout, showing at minimum:
        i. Position of all components of the bypass system, including but not limited to pumps (if applicable), piping, valves, connection points to the existing system, aerial crossing(s), and supports.
        ii. Size, type, and material of all piping, control valves, and air release valve(s).
        iii. Details of traffic or stream crossings
    b. If the bypass will require pumps, the Contractor shall submit a bypass plan in accordance with the Owner Specifications, sealed by a Professional Engineer, licensed in North Carolina.
    c. Any plan which requires the use of elevated structures or other special supports, e.g. aerial crossings and other bridges, shall require certification by a Professional Engineer licensed in North Carolina. The Contractor shall provide the certification(s) at no additional cost to the Owner.

Implementation of foregoing installation plans shall not commence until approval of the submittals required under this Section. The Owner's may, at its sole discretion, require an on-site preconstruction meeting prior to certain utility construction activities.

The Contractor shall allow sufficient time for review and approval of each submitted installation plan, including any test shutdowns required by Owner, and shall not be entitled to any delay claims related to review, rejection, resubmittal, modifications, or any other actions necessary to obtain approved installation plans.

Measurement and Payment
Wet Utility Installation Plan is considered incidental to the utility line to which each plan applied. No measurement nor payment will be made.

CONNECTIONS TO EXISTING PIPE

Materials

Materials for connections to existing piping shall be in accordance with NCDOT Standard Specifications and Owner Specifications.

(A) Mechanical Joint (MJ) Sleeves

MJ sleeves shall be long body, ductile iron, conforming to the requirements of ANSI A21.10 (AWWA C110).

(B) MJ Restraints

MJ Restraints consist of follower glands, meeting the applicable requirements of ANSI/AWWA C110/A21.10, incorporating multiple gripping wedges, actuated by torque-limiting bolts. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

(C) Transition Couplings

Transition Couplings shall be steel or ductile iron body with fusion bonded epoxy coating, EPDM rubber gaskets, and bolt-actuated metallic seal rings with stainless steel hardware and shall be suitable for a wide range of host pipe outside diameters and material types. Transition couplings shall be NSF 61 rated for use in potable or reclaimed water systems or rated for wastewater exposure for use in wastewater systems.

Construction Methods

(A) Mechanical Joint (MJ) Sleeves

Use MJ Sleeve fittings to connect proposed ductile iron piping to existing ductile iron piping where indicated on the plans.

Restrain MJ Sleeves with MJ Restraints whose working pressure rating is equal to or greater than the host pope.

(B) Transition Couplings

Use Transition Couplings to connect proposed ductile iron piping to existing piping that is not ductile iron.

Restrain connections made with Transition Couplings using thrust collars on the proposed piping, or with threaded rods connecting to the nearest MJ fitting on the proposed piping.

Measurement and Payment

Connections to Existing Piping are incidental to the project and no specific measurement nor payment shall be made.

CERAMIC EPOXY LINING

Materials
All ferrous materials that are subject to exposure to wastewater and are not stainless steel shall be factory lined with ceramic epoxy.

Ceramic epoxy shall be an amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment, shall have a permeability rating of 0.00 when tested in accordance with Procedure A Method A of ASTM E-96, and shall have an abrasion resistance of no more than 3 mils loss after one million cycles using European Standard EN 598: Section 7.8 Abrasion Resistance.

Construction Methods
Repair any damage to lining including coating the exposed ends of field cuts with ceramic epoxy joint/repair compound of the same manufacturer as the lining to be repaired and in accordance with manufacturer recommendations.

Measurement and Payment
Ceramic Epoxy Lining is considered incidental to the applicable sewer pipeline pay item(s) and no specific measurement nor payment will be made.

THRUST RESTRAINT

Materials
Materials for connections to existing piping shall be in accordance with NCDOT Standard Specifications and Owner Specifications.

(A) MJ Restraints
MJ Restraints consist of follower glands, meeting the applicable requirements of ANSI/AWWA C110/A21.10, incorporating multiple gripping wedges, actuated by torque-limiting bolts. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN. MJ Restraints shall be rated for a working pressure equal to or greater than that of the host pipe.

(B) Concrete Thrust Collars
All reinforcing steel for thrust collars shall be Grade 60 in accordance with Article 1070-2. All concrete shall be Class B in accordance with Article 1000-4.

(C) Thrust Blocking
Concrete for reaction blocking shall be Class B in accordance with Article 1000-4.

(D) Rodding
Rodding for thrust restraint shall be ¾-inch diameter threaded rods, hot dipped galvanized steel or stainless steel.

Construction Methods
Restrain all bend fittings, valves, caps, reducers, and other components of pressurized pipeline systems that are subject to hydrostatic thrust. Use both MJ Restraints and Reaction Blocking or Concrete Thrust Collars. Use Rodding in addition to other methods of restraint as shown on the detail drawings.

Concrete used for thrust restraint shall cure a minimum of 72-hours prior to operating valves being restrained or pressurizing pipelines being restrained.

(E) MJ Restraints
Install MJ Restraints on all MJ connections. Do not use MJ Restraints on existing piping, unless that piping is ductile iron.

(F) Concrete Thrust Collars
Install concrete thrust collars as indicated on the plans and detail drawings, as necessary to restrain existing piping or appurtenances, and as necessary to facilitate phased construction.

Excavation for Concrete Thrust Collars shall be made in a manner which minimizes disturbance to adjacent soils.

Dual opposing MJ Restraints may be used in lieu of welded-on rings as directed by the Owner. Do not use MJ Restraints on existing piping, unless that piping is ductile iron.

Where Concrete Thrust Collars cannot be connected to the host pipe with welded-on rings or MJ Restraints, use cast-in rodding to connect Concrete Thrust Collars to the fitting or valve being restrained.

(G) Thrust Blocking
Install Thrust Blocking in accordance with the detail drawings. Use polyethylene sheeting to prevent contact between fittings and concrete. Concrete must not obstruct access to nor operation of connecting or MJ Restraint hardware.

(H) Rodding
Use the number of ¾-inch rods specified in the table below. For sizes not listed, use the next larger size to determine number of rods.

Pipe/Fitting Size	Number of ¾-inch Rods Required
4-inch	2
6-inch	2
8-inch	4
12-inch	4
16-inch	6

Measurement and Payment
Thrust Restraint is incidental to the project and no specific measurement nor payment shall be made.

FIRE HYDRANT

Materials
The hydrant valve opening shall be five and one-quarter inches with no exceptions. Bronze to bronze threads shall be provided between the hydrant seat or seat ring and the seating attaching assembly. All hydrants must include cast or ductile epoxy lined shoe, rubber drain seals and positive, protective valve stop device.

Restraining rods and accessories shall be "hot dipped" galvanized

Hydrants shall be open-left type and shall have a six-inch hub-end or mechanical joint elbow. The hydrant barrel shall be of sufficient length to provide a minimum of three and one-half feet of bury and be of the break-away impact type

Construction Methods
Hydrant installation shall be as shown in Detail W-4 and shall be restrained from the main to the hydrant with a mechanical joint pipe restraining system. If the distance is greater than 20 feet the hydrant branch shall be restrained for the entire length with a mechanical joint pipe restraining system.

When hydrants are used as blow -off assemblies, the valves shall be rodded to a thrust block. Detail W-4A is another available option.

When the relocation of an existing fire hydrant is approved by the Public Utilities Department, the existing hydrant branch will be plugged at the tee or tapping valve with a mechanical plug with no bends. If the existing main/tee is lead joint, the tap or tee will need to be cut out and a new section of pipe (nipple) installed with a ductile iron repair joint.

Hydrants shall be bagged to indicate "out of service" until all testing is complete and the mains are placed in service. Bags shall be large enough to cover the entire hydrant and shall be black in color. Bags shall be secured with duct tape at the base of the hydrant and shall be removed immediately after the hydrants are placed in service.

Measurement and Payment
Fire Hydrant will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

INSERTION VALVES

Materials
Insertion Valves 12" size and smaller shall be Housing-Seated Insertion Valves in accordance with Article 1036-7, except that the working pressure rating shall be 250 psi, and the valve shall be designed to allow removal of the host pipe from the valve body after installation.

Construction Methods
Install split MJ Restraints on both sides of insertion valves where the host pipe is ductile iron.

Install one Concrete Thrust Collar on the "live" side of the insertion valve, between five (5) and ten (10) linear feet from the valve and rodded to the insertion valve. Pour a concrete valve support beneath the insertion valve.

Measurement and Payment
Insertion Valve will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

AIR RELEASE VALVES

Construction Methods
The valve shall be housed in a City of Raleigh approved eccentric manhole. Air release valve locations shall be approved by the Public Utilities Department, or as shown on the plans. The contractor must field stake the air release location.

Measurement and Payment
Air Release Valves will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

VALVES

Materials
Adjustable valve boxes shall be class 35 gray cast iron and manufactured in accordance with ASTM A48 and be of the dimensions specified in Detail W-17 of these specifications.

Lids shall have the word "Water" cast into the lid. See Detail W-18. All castings must be domestically cast and so indicated by the manufacturers name and "USA" cast into all sections of the valve box.

All castings must meet or exceed AASHTO H-20 load rating.

Total valve box weight shall be a minimum of 85 lbs and have a minimum lid weight of 25 lbs. Mueller Model AJBV 5 adjustable are permissible.

Construction Methods
Valves over 10’ in depth must have a valve stem extension to bring operating nut to a depth of no more than 5’. Valve stem extensions in these situation must be a minimum of 1” square stock for water mains 12” and larger.

Where pavement exist, the box shall be adjusted to finished street grade and a concrete pad two-feet square and six inches thick shall be poured around the box two inches from the top of finished grade as shown in Detail W-17.

Measurement and Payment
Valves will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

Fittings are incidental to the project and no specific measurement nor payment shall be made.

SERVICE LINE VALVES AND FITTINGS

Materials
1½ inch and 2 inch taps may only be made with use of a double strap bronze saddle.

Service saddles shall be all bronze with double bronze straps and with a neoprene "O" ring gasket attached to the body. The clamp shall have corporation cock threads.

Coppersetters or copper meter yokes shall be 5/8 inch and 12 inches in height. All coppersetters shall have locking wings on the angle valve and be of the angle check type.
Owner Preference: Ford, or approved equal

Construction Methods
For buried services, no joints or couplings are to be installed in the right of way.

Measurement and Payment
Valves will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

WATER METERS

Materials
Meter boxes and vaults shall be constructed of cast iron, precast concrete, concrete block, high-density polyethylene, or cast-in-place concrete.

Meter vault access doors shall be aluminum slam lock type.
Owner Preference: Halliday, U.S.F. Fabrication, or approved equal.

Construction Methods
All water meters shall be provided and installed by the City of Raleigh Public Utilities

Department Meters Division.

Meters will be the same size in diameter as the service. The only exceptions are a 10-inch Fire Service Meter with a by-pass on a 12-inch water service line and a 5/8" residential meter on a 3/4" water service line.

Meter boxes and vaults shall not be placed within sidewalks or driveways unless no other alternatives are available and approval is obtained by the Public Utilities Director. Traffic rated lids and vaults shall be installed for all meters 1 ½" and larger. The meter box must be set to grade. If for some reason, the grade is altered, then the meter box must be adjusted to match the new grade. This includes the addition of topsoil by a landscape contractor or homeowner, flower gardens, etc.

Measurement and Payment
Water Meter will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

ENCASEMENT AND CARRIER PIPES:

Materials
Steel encasement pipes shall be Grade 2 high strength steel with a minimum yield strength of 35,000 psi, welded or smooth-wall seamless construction, manufactured in accordance with ASTM A252.

Steel encasement pipes shall be of the size and minimum wall thickness as specified in the table below. For carrier pipe sizes not listed, use the next larger size shown in the table.

Carrier Pipe Nominal Diameter (inches)	Encasement Pipe Minimum Inside Diameter (inches)	Encasement Pipe Minimum Wall Thickness (inches)
6	14	0.375
8	16	0.375
10	18	0.375
12	20	0.375
14	24	0.375
16	26	0.500

All materials must be approved by the authority having jurisdiction over the location of installation (i.e. NCDOT, railroad, etc.). Thicker wall pipe may be required by the authority having jurisdiction over the location of installation.

Carrier pipe shall be restrained joint ductile iron through encasements, extending a minimum of 10-feet beyond the ends of the encasement pipe. Carrier pipes conveying wastewater shall be lined with ceramic epoxy interior lining.

Steel pipe supports shall be of the dimensions and materials shown in the Owner's standard detail drawings.

Construction Methods
Install encasement pipes using the method specified on the Drawings (trenchless or open cut). Encasement pipe segments shall have "v-groove" type ends, joined by cleaning and welding continuously along the joint in accordance with applicable requirements of American Welding Society D1.1.

Install a minimum of two (2) steel pipe supports per carrier pipe joint within the encasement. Install supports at one fourth the carrier pipe joint length away from both the bell and spigot ends of the carrier pipe, and one support a maximum of 1-foot from each end of the encasement pipe.

Install the carrier pipe into the encasement pipe in accordance with carrier pipe manufacturer's instructions. After installation, pull carrier pipe back to lock all joint restraints.

Isolate carrier pipe from encasement pipe end seals by wrapping carrier pipe with polyethylene sheeting or roofing felt. Seal ends of encasement pipes between carrier and encasement with brick and mortar and parge coat exterior surface with mortar or hydraulic cement.

Do not grout fill annular space between encasement pipe and carrier pipe.

Measurement and Payment
Encasement and carrier pipes will be measured and paid in accordance with Articles 1510, 1520, and 1540. No separate payment will be made for the work specified under this special provision.

LINE STOP WITH BYPASS

Description
Install Line Stops for Abandonment, of the size specified, where shown on the Utility Construction plans and as directed by the Engineer or Owner.

Materials
Materials shall be in accordance with the Owner Specifications.

Construction Methods
Construction methods shall be in accordance with Article 1515-3 and manufacturer's instructions.

Install a line stop at the abandonment location(s) shown on the Drawings. Install cast-in-place concrete to support and restrain the line stop in accordance with line stop manufacturer requirements and as necessary to restrain the line stop against hydrostatic thrust from the pressurized line. Where line stops are used adjacent to a proposed relocation which connects to the existing water main via tapping sleeve and valve, the line stop shall be installed on the same joint of pipe as the tapping sleeve at a distance no greater than 5-feet from the tapping sleeve.

Install a restrained ductile iron cap on the "live side" of the line to be abandoned, on the same pipe joint and as close as practical to the line stop.

Cast-in-place concrete used for thrust restraint shall cure a minimum of 3 days prior to operating valves or line stops being restrained by the concrete or pressurizing any pipe segments being restrained by the concrete.

Measurement and Payment
Line Stop with Bypass will be measured and paid in accordance with Articles 1515-4. No separate payment will be made for the work specified under this special provision.

REMOVE BACKFLOW PREVENTION ASSEMBLY

Description
Remove Backflow Prevention Assembly, where shown on the Utility Construction plans and as directed by the Engineer or Owner.

Materials
Materials shall be in accordance with the Owner Specifications.

Construction Methods
Remove backflow prevention assembly per the Owner Specifications.

Measurement and Payment
Payment for removal of backflow preventors shall be per each and paid for under the contract price for "Remove Backflow Prevention Assembly". Such price and payments will be full compensation for all labor, materials, excavation, shoring, backfilling, and any incidentals necessary to complete the work. The removal of backflow preventors will be measured and paid for under the contract item "Remove Backflow Prevention Assembly".

Pay Item:	**Pay Unit**
Remove Backflow Prevention Assembly	Each

End of UC Special Provisions

PROJECT SPECIAL PROVISIONS
Utilities by Others

RK&K
8601 Six Forks Rd., Forum 1 Suite 700 | Raleigh, NC 27615 | P 919.878.9560 | T 888.521.4455 | www.rkk.com

General:

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

- **Gas**
  - Enbridge Gas
- **Power**
  - Town of Wake Forest Power (Distribution)
  - Wake EMC (Distribution)
- **Telecommunications**
  - Brightspeed Communications
  - Crown Castle
  - MCI/Verizon
  - Windstream
- **CATV**
  - Charter
- **Other**
  - Ting Fiber
  - Town of Wake Forest- IT

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, unless otherwise indicated, 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 2024 Standard Specifications.

PROJECT SPECIAL PROVISIONS
Utilities by Others

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans.

Gas

(Enbridge Gas)

- Enbridge's relocation work will be completed by the date of availability.
- Adam Dimattia (919) 538-5481 / adam.dimattia@enbridge.com
- Brandon Peebles (919) 737-4784 / brandon.peebles@enbridge.com

Power

(Town of Wake Forest Power)

- Town of Wake Forest Power has completed their relocation work.
- Hugo Mier (919) 761-3261 / hmier@wakeforestnc.gov

(Wake EMC)

- Wake EMC's relocation work will be completed by the date of availability.
- Jack Sapp (919) 314-7595 / Jack.Sapp@wemc.com
- Charles Flaxcomb (919) 614-9708 / charles.flaxcomb@wemc.com

Telecommunications

(Brightspeed)

- CenturyLink has completed their relocation work.
- Kevin Godwin (919) 336-2142 / kevin.godwin@centurylink.com
- Eric Williams (704) 363-5036 / eric.williams@lambertcable.com
- Phil Robertson (919) 208-0700 / phil.b.robertson@brightspeed.com
- David Lilienthal / David.Lilienthal@brightspeed.com

(Crown Castle)

- Crown Castle has completed their relocation work.
- Rick Stransky (801) 669-4175 / Rick.Stransky@crowncastle.com
- Austin Gregory (919) 791-6544 / austin.gregory@ariumnetworks.com
- Joe Baluha (585) 255-0008 / Joe.Baluha@zayo.com

PROJECT SPECIAL PROVISIONS
Utilities by Others

(MCI/Verizon)

- MCI/Verizon's has completed their relocation work.
- Mark Stacy (910) 409-3083 / mark.stacy@verizon.com
- Tim Bigler (919) 624-5504 / TBigler@its-nc.com

(Windstream)

- Windstream has completed their relocation work.
- Don Fradel (919) 795-7693 / donald.fradel@uniti.com
- Scott Temple (919) 291-0813 / swtemple@templar-inc.com

CATV –

(Spectrum)

- Spectrum has completed their relocation work.
- Robert Dabrowski (919) 288-4867 / Robert.Dabrowski@charter.com
- Frankie Bonett (919) 388-1992 / Frankieb.pni@gmail.com
- Lee Foltz (919) 427-6173 / leef.pni@gmail.com

Other –

(Ting)

- Ting had empty conduits and handholes along the south side from Main Street to Grandmark Street. The conduits are abandoned in place and the handholes have been removed per Brian Deffenbaugh.
- Brian Deffenbaugh (814) 574-1159 / bdeffenbaugh@ting.com

(Town of Wake Forest- IT)

- Town of Wake Forest IT had empty conduits and handholes along the south side from Main Street to Grandmark Street. The conduits are abandoned in place and the handholes have been removed per Adam Oates.
- Adam Oates (919) 435-9501/ aoates@wakeforestnc.gov

Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:

(4-30-2019)(Rev. 1-21-25)

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit issued by the North Carolina Department of Environmental Quality Division of Energy, Mineral and Land Resources. Temporary or permanent ground cover stabilization shall occur within the following time frames from the last land-disturbing activity:

- Stabilize perimeter dikes, swales, ditches, and perimeter slopes within 7 calendar days.
- Stabilize high quality water (HQW) zones within 7 calendar days.
- Stabilize slopes steeper than 3:1 within 7 calendar days.
    - If slopes are 10 feet or less in length and are not steeper than 2:1, 14 calendar days are allowed.
- Stabilize slopes 3:1 to 4:1 within 14 calendar days.
    - 7 calendar days for slopes greater than 50 feet in length and with slopes steeper than 4:1.
    - 7 calendar days for perimeter dikes, swales, ditches, perimeter slopes, and HQW Zones.
- Stabilize areas with slopes flatter than 4:1 within 14 calendar days.
    - 7 calendar days for perimeter dikes, swales, ditches, perimeter slopes, and HQW Zones.

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

SEEDING AND MULCHING: (East)

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

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

06 Dust	Escalade	Kalahari	Serengeti
2nd Millennium	Essential	Kitty Hawk 2000	Shelby
3rd Millennium	Evergreen 2	Legitimate	Shenandoah III
Avenger	Faith	Lexington	Shenandoah Elite
Bar Fa	Falcon IV	LifeGuard	Sheridan
Barlexas	Falson NG	LSD	Sidewinder
Barlexas II	Falcon V	Magellan	Signia
Barrera	Fat Cat	Masterpiece	Silver Hawk
Barrington	Fesnova	Millennium SRP	Skyline
Barrobusto	Fidelity	Monet	Solara
Barvado	Finelawn Elite	Mustang 4	Southern Choice II
Biltmore	Finelawn Xpress	Naturally Green	Speedway
Bingo	Finesse II	Ninja 2	Spyder LS
Bizem	Firebird	Ol' Glory	Sunset Gold
Black Tail	Firecracker LS	Padre	Taccoa
Blackwatch	Firenza	Patagonia	Tahoe II
Blade Runner II	Five Point	Pedigree	Talladega
Bonsai	Focus	Picasso	Tanzania
Braveheart	Forte	Piedmont	Temple
Bravo	Garrison	Plantation	Terrano
Bullseye	Gazelle II	Proseeds 5301	Thor
Cannavaro	GLX Aced	Prospect	Thunderstruck
Catalyst	Gold Medallion	Quest	Titanium LS
Cayenne	Grande 3	RainDance	Titan LTD
Cezanne RZ	Greenbrooks	Raptor II	Tracer
Chipper	Greenkeeper	Rebel IV	Traverse SRP
Cochise IV	Gremlin	Rebel Exeda	Trio
Constitution	Greystone	Rebel Sentry	Tulsa Time
Corgi	Guardian 21	Regenerate	Turbo
Corona	Guardian 41	Regiment II	Turbo RZ
Coyote	Hemi	Rembrandt	Tuxedo
Cumberland	Honky Tonk	Rendition	Ultimate
Darlington	Hot Rod	Reunion	Umbrella

DaVinci	Hunter	Rhambler 2 SRP	Van Gogh
Desire	Inferno	Riverside	Venture
Diablo	Integrity	RNP	Watchdog
Dominion	Jaguar 3	Rocket	Wolfpack II
Dynamic	Jamboree	Saltillo	Xtremegreen
Dynasty	Justice	Scorpion	

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

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

NATIVE GRASS SEEDING AND MULCHING (East)

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation 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.

March 1 - August 31		**September 1 - February 28**	
18#	Creeping Red Fescue	18#	Creeping Red Fescue
6#	Indiangrass	6#	Indiangrass
8#	Little Bluestem	8#	Little Bluestem
4#	Switchgrass	4#	Switchgrass
25#	Browntop Millet	35#	Rye Grain
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Creeping Red Fescue Cultivars:

Aberdeen	Boreal	Epic	Cindy Lou

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

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

Measurement and Payment

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

TEMPORARY SEEDING:

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

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis and as directed.

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

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be 4 inches.

LAWN TYPE APPEARANCE:

All areas adjacent to lawns must be hand finished as directed to give a lawn type appearance. Remove all trash, debris, and stones ¾" and larger in diameter or other obstructions that could interfere with providing a smooth lawn type appearance. These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

REFORESTATION:

Description

Reforestation will be planted within interchanges and along the outside borders of the road, and in other areas as directed. *Reforestation* is not shown on the plan sheets. See the Reforestation Detail Sheet.

All non-maintained riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated with native woody species.

The entire *Reforestation* operation shall comply with the requirements of Section 1670 of the *Standard Specifications*.

Materials

Reforestation shall be bare root seedlings 12"-18" tall.

Construction Methods

Reforestation shall be shall be planted as soon as practical following permanent S*eeding and Mulching*. The seedlings shall be planted in a 16-foot wide swath adjacent to mowing pattern line, or as directed.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay (kaolin) or a superabsorbent that is designated as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval.

With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Seasonal Limitations: *Reforestation* shall be planted from November 15 through March 15.

Measurement and Payment

Reforestation will be measured and paid for in accordance with Article 1670-17 of the *Standard Specifications*.

ENVIRONMENTALLY SENSITIVE AREAS:

Description

This project is located in an *Environmentally Sensitive Area*. This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading operations within the Environmentally Sensitive Areas identified on the plans and as designated by the Engineer. This also requires special procedures to be used for seeding and mulching and staged seeding within the project.

The Environmentally Sensitive Area shall be defined as a 50-foot buffer zone on both sides of the stream or depression measured from top of streambank or center of depression.

Construction Methods

(A) Clearing and Grubbing

In areas identified as Environmentally Sensitive Areas, the Contractor may perform clearing operations, but not grubbing operations until immediately prior to beginning grading operations as described in Article 200-1 of the *Standard Specifications*. Only clearing operations (not grubbing) shall be allowed in this buffer zone until immediately prior to beginning grading operations. Erosion control devices shall be installed immediately following the clearing operation.

(B) Grading

Once grading operations begin in identified Environmentally Sensitive Areas, work shall progress in a continuous manner until complete. All construction within these areas shall progress in a continuous manner such that each phase is complete and areas are permanently stabilized prior to beginning of next phase. Failure on the part of the Contractor to complete any phase of construction in a continuous manner in Environmentally Sensitive Areas will be just cause for the Engineer to direct the suspension of work in accordance with Article 108-7 of the *Standard Specifications*.

(C) Temporary Stream Crossings

Any crossing of streams within the limits of this project shall be accomplished in accordance with the requirements of Subarticle 107-12 of the *Standard Specifications*.

(D) Seeding and Mulching

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

Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment. No appreciable time shall lapse into the contract time without stabilization of slopes, ditches and other areas within the Environmentally Sensitive Areas.

(E) Stage Seeding

The work covered by this section shall consist of the establishment of a vegetative cover on cut and fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 feet in height measured along the slope, or greater than 2 acres in area. Each stage shall not exceed the limits stated above.

Additional payments will not be made for the requirements of this section, as the cost for this work shall be included in the contract unit prices for the work involved.

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

CONSTRUCTION MATERIALS MANAGEMENT

(3-19-19) (rev. 04-27-20)

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+Quality/Environmental+Sciences/ATU/PAM8_30_18.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 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 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.

WASTE AND BORROW SOURCES:

(2-16-11) (Rev. 3-17-22)

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

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

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

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/Contract%20Reclamation%20Procedures.pdf

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

SAFETY FENCE AND JURISDICTIONAL FLAGGING:

Description

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

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

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

Materials

(A) Safety Fencing

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

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

(B) Boundary Flagging

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

Construction Methods

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

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. Posts shall be installed a minimum of 2 ft. into the ground. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

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

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

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

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel

to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

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

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(5) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

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

Measurement and Payment

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

Payment will be made under:

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

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 4a	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 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

IMPERVIOUS DIKE:
(9-9-11)(Rev. 11-15-22)

Description

This work consists of furnishing, installing, maintaining, pumping 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 by the Engineer.

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.

Construction Methods

Where impervious dikes are shown on the plans and used to dewater or lower the water elevation, construct in accordance with Article 410-4 and 410-5.

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 by the Engineer. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, pumping and removal of the impervious dike.

Payment will be made under:

Pay Item	**Pay Unit**
Impervious Dike	Linear Foot

TEMPORARY PIPE FOR CULVERT CONSTRUCTION:

Description

This work consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction.

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passageway for the stream through the work-site. The minimum size requirements will be as stated on the erosion control plans.

Measurement and Payment

__" *Temporary Pipe* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Payment will be made under:

Pay Item	Pay Unit
__" Temporary Pipe	Linear Foot

CONCRETE WASHOUT:

(10-22-15)(Rev. 4-15-25)

Description

Concrete washouts are impermeable enclosures, above or below grade, to contain concrete wastewater and associated concrete mix from cleaning of ready-mix trucks, drums, pumps, tools 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 washout operations.

Acceptable concrete washouts may include constructed earthen structures, above or below ground, or commercially available devices designed specifically to capture concrete wash water.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall consist of a minimum 10 mil thick polypropylene or polyethylene geomembrane.

Construction Methods

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed by the Engineer near the project entrance(s) or at location(s) of concrete operations. Structures shall be constructed a minimum of 50 feet from drainage conveyances or jurisdictional streams or wetlands. Alternate structure designs or plans for management of concrete washout may be submitted for review and approval by the Engineer. Include in the alternate plan the

method used to retain, treat and dispose of the concrete washout wastewater generated within the project limits and in accordance with the minimum setback requirements.

Install temporary silt fence around the perimeter of the structure enclosure in accordance with the details and as directed by the Engineer if the structure is not located in an area where existing erosion and sedimentation control devices are capable of containing stormwater runoff.

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 by the Engineer for visibility to construction traffic.

Install prefabricated concrete washouts, designed specifically to capture concrete wash water, at locations of additional concrete pouring operations. Acceptable systems may include geotextile lined containers, vinyl or plastic containers or roll-off containers, with or without filter bags with a minimum functional holding capacity of 36 cubic feet (1.33 cubic yards). Submit prefabricated concrete washout system for approval by the Engineer prior to installation. Place prefabricated concrete washout devices to a minimum 50 foot setback from drainage conveyances and jurisdictional streams and wetlands. If the minimum setback cannot be achieved, provide secondary containment to prevent accidental release of wastewater from reaching drainage conveyances or streams.

Prefabricated concrete washouts must be clearly and visibly labeled as such, either by the manufacturer on the product itself, or by a sign with the words "Concrete Washout" in close proximity of the concrete washout area so it is clearly visible to site personnel.

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 to liner or structure to maintain functionality.

Maintain prefabricated concrete washout systems per manufacturer's recommendations. Inspect concrete washout structures for damage to linings or structure and repair or replace as necessary.

Remove the concrete washout structures and sign upon project completion. Grade the area to match the existing topography and permanently seed and mulch area. Dispose of prefabricated concrete washout structures according to state or local waste regulations.

Measurement and Payment

Concrete Washout Structure will be measured and paid per each enclosure installed in accordance with the details in the plans. If alternate plans or details are approved, those structures will also be paid for per each approved and installed structure. Such price and payment will be full compensation for all work including, but not limited to, furnishing all materials, labor, equipment,

signage, slurry solidification and incidentals necessary to construct, maintain and remove *Concrete Washout Structure* and dispose of residual concrete washout wastewater and concrete solids.

Prefabricated Concrete Washout will be measured and paid per each system installed in accordance with the manufacturer's recommendations. Such price and payment will be full compensation for all work including, but not limited to, furnishing all materials, labor, equipment, signage, slurry solidification and incidentals necessary to install, maintain and remove *Prefabricated Concrete Washout*, and dispose of residual concrete washout wastewater and concrete solids.

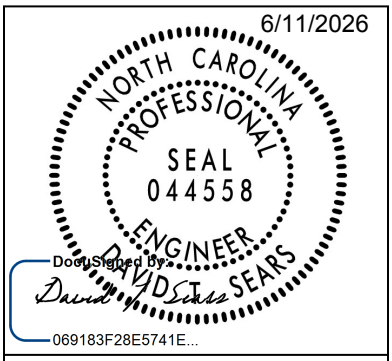
Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

Safety Fence shall be measured and paid for as provided elsewhere in this contract.

No measurement will be made for over excavation or stockpiling or other items necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Washout Structure	Each
Prefabricated Concrete Washout	Each



Document not considered final unless all signatures completed.

Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 24.3)

Prepared By: JTS
11-Jun-26

Contents

1. 2024 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES 3
1.1. ELECTRICAL JUNCTION BOXES (1091-5) 3
1.2. TRAFFIC SIGNAL ACTIVATION (1700-4) 3
1.3. PEDESTALS (1098-15) 3
2. SIGNAL HEADS 7
2.1. MATERIALS 7
A. General: 7
B. Vehicle Signal Heads: 9
C. Pedestrian Signal Heads: 11
3. CONTROLLERS WITH CABINETS 13
3.1. MATERIALS – TYPE 2070LX CONTROLLERS 13
3.2. MATERIALS – GENERAL CABINETS 13
3.3. MATERIALS – TYPE 170E CABINETS 14
A. Type 170 E Cabinets General: 14
B. Type 170 E Cabinet Electrical Requirements: 15
C. Type 170 E Cabinet Physical Requirements: 21
D. Model 2018 Enhanced Conflict Monitor: 22
3.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS 32
4. VIDEO IMAGING LOOP EMULATOR DETECTOR SYSTEMS FOR TEMPORARY INSTALLATION 32
4.1. DESCRIPTION 32
4.2. MATERIALS 33
A. General: 33
B. Loop Emulator System: 34
C. Video Imaging Loop Emulator System Support: 35
4.3. CONSTRUCTION METHODS 35
4.4. MEASUREMENT AND PAYMENT 36
5. METAL POLE SUPPORTS 37
5.1. METAL POLES 37
A. General: 37
B. Materials: 38
C. Design: 40
D. Strain Poles: 42
5.2. DRILLED PIER FOUNDATIONS FOR METAL POLES 42
A. Description: 43
B. Soil Test and Foundation Determination: 43
C. Drilled Pier Construction: 46
5.3. POLE NUMBERING SYSTEM 46
5.4. MEASUREMENT AND PAYMENT 46

6. ETHERNET EDGE SWITCH 46
6.1. DESCRIPTION 46
A. Ethernet Edge Switch: 46
B. Network Management: 47
6.2. MATERIALS 47
A. General: 47
B. Compatibility Acceptance 47
C. Standards: 47
D. Functional: 48
E. Physical Features: 48
F. Management Capabilities: 49
G. Electrical Specifications: 50
H. Environmental Specifications: 50
I. Ethernet Patch Cable: 51
6.3. CONSTRUCTION METHODS 51
A. General: 51
B. Edge Switch: 51
6.4. MEASURMENT AND PAYMENT 51

1. 2024 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2024 Standard Specifications are revised as follows:

1.1. ELECTRICAL JUNCTION BOXES (1091-5)

Page 10-209, revise paragraphs beginning on line 26 to read "Provide electrical junction boxes with covers of the type and size indicated by the contract or plans for the termination of conduits. Boxes and covers shall meet all requirements and specifications of ANSI/SCTE 77. Structural load tests shall meet the Tier 15 application type.

Page 10-209, line 28, revise title of section 1091-5(B) from “Polymer Concrete (PC) Junction Boxes” to “Polymer Concrete (PC), Composite, and Thermoplastic Junction Boxes”.

Page 10-209, revise paragraphs beginning on line 29 through line 41 to read “For PC junction boxes, 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.

Provide junction boxes which have bolted covers and open bottoms. Provide vertical extensions of 6 inches to 12 inches as required by project provisions.

Provide the required logo on the cover. Provide at least two size 3/8 inch diameter hex head stainless steel cover bolts to match inserts in the box. Provide pull slot(s) with stainless steel pin(s). Bodies of junction boxes shall be a single piece.

Polymer concrete, composite, and thermoplastic junction boxes are not required to be listed electrical devices.”

1.2. TRAFFIC SIGNAL ACTIVATION (1700-4)

Page 17-4, revise paragraph beginning on line 42 through line 46 to read “Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in yellow-red flashing mode for up to 7 days or as directed by the Engineer. Yellow-red flashing mode differs from the red-red flashing mode shown in the signal plan. Yellow-red flash mode includes flashing the yellow signal indications on all main street through movements while flashing the red signal indications on all side street signal heads and any left turn heads on the main street. 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 prior approval of the Engineer.”

1.3. PEDESTALS (1098-15)

Pages 10-226 through 10-230, revise section 1098-15 beginning on page 10-226 line 17 through page 10-230 line 10 to read “Furnish pedestal assemblies and their components that are pre-approved on the ITS & Signals QPL with foundations that conform to the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, and the Interim Specifications as shown on the plans. Refer to *Roadway Standard Drawings* No. 1743 for structural design specifications for each type of pedestal.

(A) Pedestal Shaft

Furnish one piece pedestal shafts fabricated from either aluminum or galvanized steel pipe with a uniform pipe outer diameter of 4.5 inches and of the lengths specified for the type of pedestal shown on *Roadway Standard Drawing No.* 1743. Refer to Article 1743-2 for pedestal type descriptions.

For Type I (pedestrian pushbutton pedestals) and Type II (normal-duty pedestals), furnish shafts constructed from schedule 40 extruded aluminum pipe that conforms to Aluminum Association Alloy 6061-T6 with a tensile strength of 30 ksi and a minimum wall thickness of 0.237 inch. Aluminum conduit will not develop the necessary strength required and is not allowed. Thread and deburr in accordance with American National Standard Pipe Threads, NPT (ANSI B2.1). Finish the exterior with a rough surface texture consisting of a uniform grain pattern that is perpendicular to the axis of the pipe along the full pipe length. Unless otherwise specified, do not use galvanized steel pipe for Type I and Type II pedestal shafts.

For Type III (heavy-duty pedestals), furnish schedule 120 galvanized steel pipe that conforms to ASTM A53. Provide an 11 inch square by 1 inch thick steel base plate with minimum yield strength of 36 ksi that conforms to ASTM A36. Fabricate the base plate with four equally spaced bolt holes on an 11 inch bolt circle. Orient the bolt holes in the corners of the plate. Size the holes to accommodate 1 inch diameter machine bolts. Weld the pedestal shaft to the center of the base plate using a socket connection. Provide circumferential fillet welds at the top and bottom of the base plate. Perform all welding in accordance with AWS Code on the plans. Hot-dip galvanize the pedestal shaft and base plate assembly after fabrication in accordance with ASTM A123. Unless otherwise specified, do not use aluminum pipe for Type III pedestal shafts.

(B) Transformer Bases

Furnish transformer bases for each type of pedestal shown on *Roadway Standard Drawings* No. 1743 fabricated from aluminum that meets Aluminum Association Alloy 356 or equivalent, and that are designed to break upon impact in accordance with AASHTO requirements. Pre-approved transformer base shape, size, and bolt circle dimensions may vary by product supplier, but are structurally qualified for use by each pedestal type. Compliance with manufacturer's installation instructions is crucial to ensure optimal performance when impacted.

Provide a 0.5 inch minimum diameter, coarse thread hole cast into transformer base located inside of base and oriented for easy access for use in grounding and bonding.
Provide an access opening for all transformer bases with an access door that is attached with a 1/4 inch x 3/4 inch long stainless steel vandal proof screw to secure access door.

For Type I (pedestrian pushbutton pedestals) and Type II (normal-duty pedestals), provide a threaded opening at the top of the base to receive a 4 inch NPT pipe shaft. Include a set screw prep and 3/8 inch-16 x 1 inch stainless steel set screw to secure the pedestal post to the pedestal base. Fabricate the bottom of the transformer base with four equally spaced holes or slots to secure the entire assembly to the concrete foundation.

For Type III (heavy-duty pedestals), provide square bases designed for bolt-on mounting of a Type III pedestal shaft. Fabricate the top of the transformer base with four equally spaced holes or slots for an 11 inch bolt circle to attach the pedestal shaft. Size the holes or slots to accommodate 1 inch diameter machine bolts. Fabricate the bottom of the transformer base with four equally spaced holes or slots for a 12 inch bolt circle to secure the entire assembly to the concrete foundation. Size the holes or slots to accommodate 1 inch diameter anchor bolts. Provide the following mounting hardware for heavy-duty pedestals:

(1) Four 1 inch diameter by 3 1/2 inch long machine bolts (ASTM F593), with heavy hex nuts (ASTM A563 Grade DH, or A 194 Grade 2H), and thick flat washers, and lock washers (ASTM F436) per pedestal assembly. Galvanize in accordance with ASTM A153.

(2) Three heavy hex nuts (ASTM A563 Grade DH, or A194 Grade 2H), 2 thick flat washers, and one lock washer (ASTM F436) for each anchor bolt. Galvanize in accordance with ASTM A153.

(3) Six minimum slotted stainless steel shims of necessary thickness for leveling per pedestal assembly.

(C) Anchor Bolts

For each pedestal mounted on a concrete foundation, provide four anchor bolts in accordance with ASTM F1554, Grade 55, of the size and length specified in *Roadway Standard Drawings* No. 1743. Provide anchor bolts with coarse threads meeting the bolt/thread criteria specified by AISC. Provide threads for a minimum length of 4 inches on each end of the bolt. All thread anchor rods may be used. Ensure anchor bolts are hot-dipped galvanized in accordance with ASTM A153.

For each anchor bolt:

(1) Provide three heavy hex nuts; one at the top, and two at the bottom (embedded end) of the anchor bolt. Provide hex nuts with coarse threads that match the anchor bolt thread requirements above. Provide hex nuts that meet the requirements of ASTM A563 Grade DH, ASTM A194, Grade 2H or equivalent. Galvanize all heavy hex nuts in accordance with ASTM A153.

(2) Provide one standard size washer that meets the requirements of ASTM F436 for use between the two heavy hex nuts on the embedded end of the anchor bolt. Galvanize in accordance with ASTM A153.

(3) Provide one extra thick, oversized washer for use over the slotted opening of the pedestal base. Fabricate washer to meet the chemical, physical, and heat treating requirements of ASTM F436. Fabricate the washer to the diameter and thickness needed. Galvanize fabricated washer in accordance with ASTM A153. Heat treat to the same requirements as F436 (i.e. 26 to 45 HRC).

For a 3/4 inch diameter anchor bolt mounted in a 1 1/2 inch slotted opening, the dimensional requirements for an extra thick, oversized washer are as follows:

(a) The minimum Outside Diameter (OD) required is 2 3/4 inch.
(b) The hole Inside Diameter (ID) = Nominal Bolt Diameter + 1/16 inch = 0.812 inch.
(c) The minimum washer thickness required is 3/8 inch.

If anchor bolts less than 3/4 inch in diameter are proposed for use to anchor pedestal bases, provide a washer calculation to ensure the washer thickness is adequate. To account for any pedestal manufacturing differences, verify the actual slotted opening width of the pedestal base anchoring points, and include it in the calculation. Anchor bolts that are less than 1/2 inch in diameter may not be used as they are not structurally adequate to support the pedestal and may inhibit the performance of the breakaway base.

The fabrication process for thick washers makes the washer slightly tapered (i.e. the top OD and the bottom OD are not the same). Install thick washers with the larger diameter face down against the pedestal base casting.

Do not use standard washers over the slotted opening of the pedestal base. Do not substitute or stack thin washers to achieve the required thickness specified or required.

In addition to the submittal requirements of Section 1098-1(B), provide Mill Certifications, Galvanization Certifications, and Heat Treating Certifications for all anchor bolts, fabricated washers, and structural hardware.

(D) Pedestal Cap

Furnish a 4 1/2 inch outside diameter slip fit domed pedestal top cap for each pedestal assembly designed to fit over the outside of the pedestal shaft. Fabricate the cap from aluminum that meets Aluminum Association Alloy 356. Ensure the cap provides 3 equally spaced stainless steel set screw fasteners to secure the cap to the pedestal shaft.

(E) Pole Flange Base for 4 1/2 Inch Pipe

As an alternative to using a frangible transformer base, furnish a flange base with cover for use with Type I pedestrian pushbutton pedestals only. Flange bases are non-breakaway supports that are to be used with a breakaway bolt system for AASHTO compliance for breakaway structures. Provide aluminum or steel flange bases with a minimum 7.5 inch diameter bolt circle. Ensure bases are either continuously welded to shafts or threaded to receive shafts. Each base should be designed to accommodate either three or four 1/2 inch bolts equally spaced on the bolt circle to receive breakaway anchors. Provide NPT threads on the internal opening of the flange base through the full length of the flange base with locking set screws at the top of the base to receive a 4 inch NPT pipe shaft.

Fabricate aluminum flange bases that meet Aluminum Association Alloy 356 requirements for architectural bases. Fabricate steel flange bases that meet ASTM A36.

Do not use flange bases for Type II or Type III pedestals.

(F) Breakaway Anchors

Use breakaway anchors installed in concrete pedestal foundations as an alternative to transformer bases. Furnish single or double neck omni-directional breakaway anchor bolt coupling systems for use with Type I (pedestrian pushbutton pedestals) only. Use with non-breakaway pole flange bases. Use 1/2 inch diameter bolts for pushbutton posts. Fabricate from steel with a minimum yield strength of 55 ksi. Galvanize in accordance with ASTM A153. Do not use breakaway anchors with Type II or III pedestals, or in conjunction with breakaway transformer bases.

(G) Foundation

Install concrete pedestal foundations of the type and size shown on *Roadway Standard Drawings* No. 1743.04 Furnish Class A minimum concrete that conforms to Article 1000-4.

Provide reinforcing steel that conforms to the applicable parts of Section 1070.

(H) Screw-In Helical Foundation Anchor Assembly

Furnish and install screw-in helical foundation as an alternative to the standard reinforced concrete foundation specified in Section 1743, for supporting Type I and Type II Pedestals. Do not use for Type III Pedestals.

(1) Type I – Pedestrian Pushbutton Post:

Fabricate pipe assembly consisting of a 4 inch diameter x 56 inch long pipe, single helical blade and square fixed attachment plate. Furnish pipe in accordance with ASTM A53 ERW Grade B and include a 2 inch x 3 inch cable opening in the pipe at 18 inches below the attachment plate. Furnish steel attachment plate and helical blade in accordance with ASTM A36. Include four slotted mounting holes in the attachment plate to fit bolt circles ranging from 7 3/4 inches to 14 3/4 inches in diameter. Furnish additional 3/4 inch keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish four 3/4 inch 10NC x 3 inch square head anchor bolts to meet the requirements of ASTM F3125. Provide four 3/4 inch plain flat galvanized washers, four 3/16 inch thick galvanized plate washers and four 3/4 inch galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

(2) Type II – Normal-Duty Pedestal:

Fabricate pipe assembly consisting of a 6 inch diameter x 60 inch long, single helical blade, 1 1/4 inch diameter stinger rod and square fixed attachment plate. Furnish pipe in accordance with ASTM A53 ERW Grade B using schedule 40 wall thickness and include a 2 inch x 3 inch cable opening in the pipe at 18 inches below the attachment plate. Furnish steel attachment plate, helical blade and stinger rod in accordance with ASTM A36. Include four slotted mounting holes in the attachment plate to fit bolt circles ranging from 10 inches to 15 inches in diameter. Furnish additional 1 1/4 inch keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish four 1 inch 8NC x 4 inch galvanized Grade 5 square head anchor bolts. Provide four 1 inch plain flat galvanized washers and four 1 inch galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent."

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, wire outlet bodies, wire entrance fitting brackets and end caps when supplied as components of messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538) a minimum of 2.5 to 3.5 mils thick. Do not apply paint to the latching hardware, rigid vehicle signal head mounting brackets for mast-arm attachments, messenger cable hanger components or balance adjuster components.

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

Where required, provide polycarbonate signal heads and visors that comply with the provisions pertaining to the aluminum signal heads listed on the QPL with the following exceptions:

Fabricate signal head housings, end caps, and visors from virgin polycarbonate material. Provide UV stabilized polycarbonate plastic with a minimum thickness of 0.1 ± 0.01 inches that is highway yellow (Federal Standard 595C, Color Chip 13538). Ensure the color is incorporated into the plastic material before molding the signal head housings and end caps. Ensure the plastic formulation provides the following physical properties in the assembly (tests may be performed on separately molded specimens):

Test	**Required**	**Method**
Specific Gravity	1.17 minimum	ASTM D 792
Flammability	Self-extinguishing	ASTM D 635
Tensile Strength, yield, PSI	8500 minimum	ASTM D 638
Izod impact strength, ft-lb/in [notched, 1/8 inch]	12 minimum	ASTM D 256

For pole mounting, provide side of pole mounting assemblies with framework and all other hardware necessary to make complete, watertight connections of the signal heads to the poles and pedestals. Fabricate the mounting assemblies and frames from aluminum with all necessary hardware, screws, washers, etc. to be stainless steel. Provide mounting fittings that match the positive locking device on the signal head with the serrations integrally cast into the brackets. Provide upper and lower pole plates that have a 1 ¼-inch vertical conduit entrance hubs with the hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions, and can accommodate a minimum of ten Number 14 AWG conductors.

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,

2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
   - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

   (Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,
3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

Ensure LED traffic signal modules meet the performance requirements for the minimum period of 15 years, provide a written warranty against defects in materials and workmanship for the modules for a period of 15 years after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make

complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

For mast-arm mounting, provide rigid vehicle signal head mounting brackets and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the mast arms and to provide a means for vertically adjusting the vehicle signal heads to proper alignment. Fabricate the mounting assemblies from aluminum, and provide serrated rings made of aluminum. Provide stainless steel cable attachment assemblies to secure the brackets to the mast arms. Ensure all fastening hardware and fasteners are fabricated from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 15 years and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red circular	17	11

12-inch green circular	15	15

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red arrow	12	9
12-inch green arrow	11	11

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for "Pedestrian Traffic Control Signal Indications" and the following sections of the ITE standard for "Vehicle Traffic Control Signal Heads" in effect on the date of advertisement:

- Section 3.00 - "Physical and Mechanical Requirements"
- Section 4.01 - "Housing, Door, and Visor: General"
- Section 4.04 - "Housing, Door, and Visor: Materials and Fabrication"
- Section 7.00 - "Exterior Finish"

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

Provide standard R10-3 signs with mounting hardware that comply with the MUTCD in effect on the date of advertisement. Provide R10-3E signs for countdown pedestrian heads and R10-3B for non-countdown pedestrian heads.

Design the LED pedestrian traffic signal modules (hereafter referred to as modules) for installation into standard pedestrian traffic signal sections that do not contain the incandescent signal section reflector, lens, eggcrate visor, gasket, or socket. Provide modules that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp. Use LEDs that are of the latest aluminum indium gallium phosphorus (AlInGaP) technology for the Portland Orange hand and countdown displays. Use LEDs that are of the latest indium gallium nitride (InGaN) technology for the Lunar White walking man displays. Install the ultra-bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

Design all modules to operate using a standard 3 - wire field installation. Provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard pedestrian signal housing. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Provide modules in the following configuration: 16-inch displays which have the solid hand/walking man overlay on the left and the countdown on the right. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9

Countdown Indication	16	13

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

3. CONTROLLERS WITH CABINETS

3.1. MATERIALS – TYPE 2070LX CONTROLLERS

Furnish model 2070LX controller units that conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010 and Errata 2 dated December 5, 2014) except as required herein.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide model 2070LX controllers with Linux kernel 2.6.18 or higher and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1C, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2E+, Field I/O Module (FI/O)
  - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is “off”)
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4A, Power Supply Module, 10 AMP

The 2070-1C module’s CPU shall be capable of executing all single and double precision floating point instructions directly within the CPU hardware.

Provide all board support package (BSP), toolchain, libraries, and documentation to the state and to any specified applications software manufacturer when requested by the state to facilitate the porting, building, testing, and support the Department’s application software.

3.2.MATERIALS – GENERAL CABINETS

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

3.3. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 332 base mounted cabinets with auxiliary output files installed and configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1)

DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40º F to +185º F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A
Occurrences (8x20µs waveform)……..10 minimum @ 20,000A
Maximum Clamp Voltage…….395VAC
Operating Current……..15 amps
Response Time……..< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (6 times, 8x20µs)
(Differential Mode)…….400A
(Common Mode)……1,000A
Occurrences (8x20µs waveform)……..500 min @ 200A
Maximum Clamp Voltage
(Differential Mode @400A)……35V
(Common Mode @1,000A)…….35V
Response Time……..< 5 nanoseconds
Maximum Capacitance……..35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A

Occurrences (8x20µs waveform)……..100 min @ 2,000A
Maximum Clamp Voltage…….Rated for equipment protected
Response Time……..< 1 nanosecond
Maximum Capacitance…….1,500 pF
Maximum Series Resistance…….15Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A
Occurrences (8x20µs waveform)……..100 @ 2,000A
Maximum Clamp Voltage…….30V
Response Time……..< 1 nanosecond

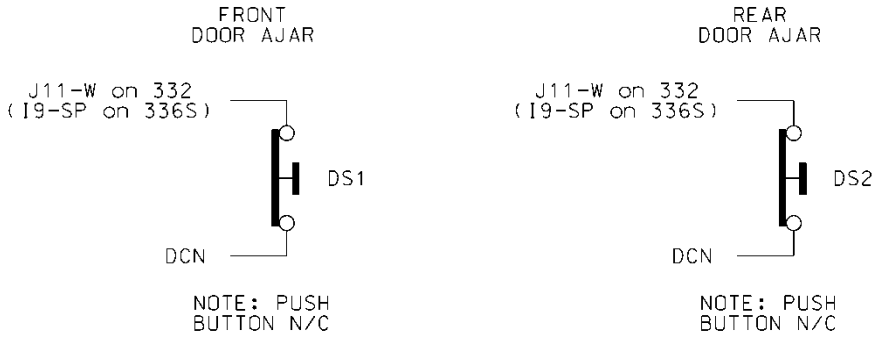
Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A
Maximum Clamp Voltage……350VAC
Response Time……..< 200 nanoseconds
Discharge Voltage……<200 Volts @ 1,000A
Insulation Resistance……≥100 MΩ

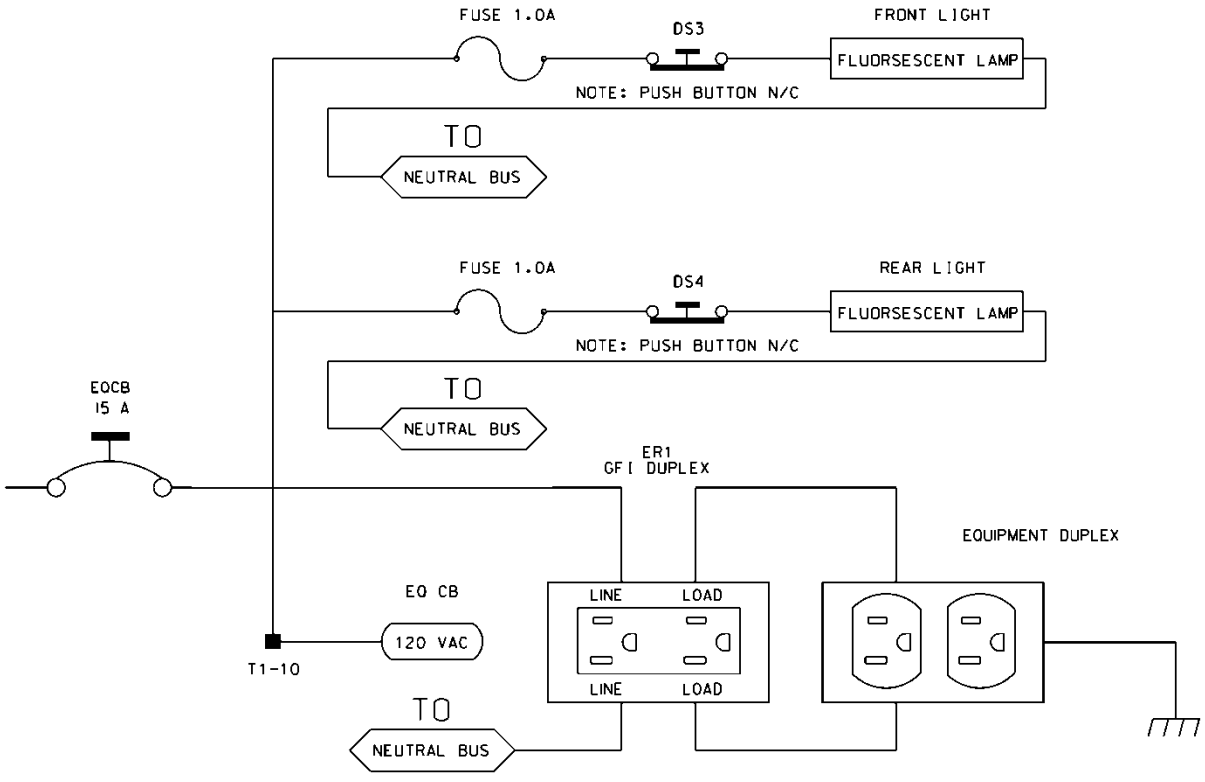
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. Ensure that the police panel door permits access to the police panel when the main door is closed. Ensure that no rainwater can enter the cabinet even with the police panel door open. Provide a police panel door hinged on the right side as viewed from the front. Provide a police panel door lock that is keyed to a standard police/fire call box key. In

addition to the requirements of LA Specification No. 54-053-08, provide the police panel with a toggle switch connected to switch the intersection operation between normal stop-and-go operation (AUTO) and manual operation (MANUAL). Ensure that manual control can be implemented using inputs and software such that the controller provides full programmed clearance times for the yellow clearance and red clearance for each phase while under manual control.

Provide a 1/4-inch locking phone jack in the police panel for a hand control to manually control the intersection. Provide sufficient room in the police panel for storage of a hand control and cord.

For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

Connect detector test switches for cabinets as follows:

332 Cabinet	
Detector Call Switches	**Terminals**
Phase 1	I1-W
Phase 2	I4-W
Phase 3	I5-W
Phase 4	I8-W
Phase 5	J1-W
Phase 6	J4-W
Phase 7	J5-W
Phase 8	J8-W

Provide the PCB 28/56 connector for the conflict monitor unit (CMU) with 28 independent contacts per side, dual-sided with 0.156 inch contact centers. Provide the PCB 28/56 connector contacts with solder eyelet terminations. Ensure all connections to the PCB 28/56 connector are soldered to the solder eyelet terminations.

Ensure that all cabinets have the CMU connector wired according to the 332 cabinet connector pin assignments (include all wires for auxiliary output file connection). Wire pins 13, 16, R, and U of the CMU connector to a separate 4 pin plug, P1, as shown below. Provide a second plug, P2, which will mate with P1 and is wired to the auxiliary output file as shown below. Provide an additional plug, P3, which will mate with P1 and is wired to the pedestrian yellow circuits as shown below. When no auxiliary output file is installed in the cabinet, provide wires for the green and yellow inputs for channels 11, 12, 17, and 18, the red inputs for channels 17 and 18, and the wires for the P2 plug. Terminate the two-foot wires with ring type lugs, insulated, and bundled for optional use.

	P1		P2		P3	
PIN	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

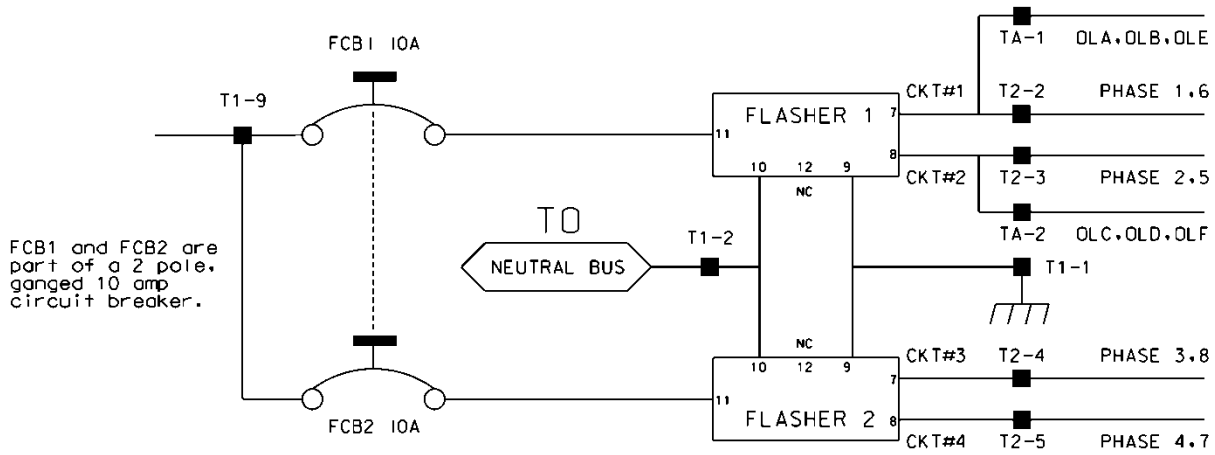
	P20 Connector				
PIN	**FUNCTION**	**CONN TO**	**PIN**	**FUNCTION**	**CONN TO**
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	**FUNCTION**
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	**WATTAGE**
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' "*Transportation Electrical Equipment Specifications*" dated March 12, 2009 with Erratum 1.

C. Type 170 E Cabinet Physical Requirements:

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Furnish unpainted, natural, aluminum cabinet shells. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125 inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070 controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070 controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)
- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150 ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150 ms (210 mode).

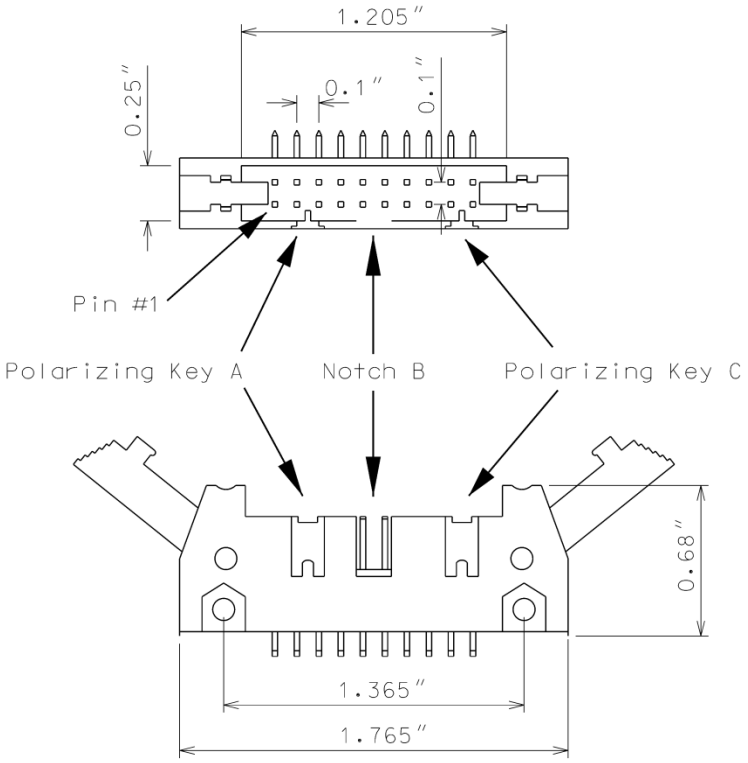
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17 ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered ‘Active’ at a voltage greater than 70 Vrms and ‘Not Active’ at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered ‘Active’ at a voltage less than 50 Vrms and ‘Not Active’ at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS’ 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right angle solder tails are designed for a 0.062” thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10” and pitch is 0.10”. Ensure the mating length of the connector pins is 0.24”. Ensure the pins are finished with gold plating 30µ” thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less

than 250 ms. A Special Function input is undefined by these specifications and may or may not be sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an "off" condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an "off" condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS' 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no "on" voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070 controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less than 700 ms when used with a 170 controller and 1200 ms when used with a 2070 controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:

   a) Red Enable input to monitor is active (Red Enable voltages are "on" at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and

   b) Neither Special Function 1 nor Special Function 2 inputs are active.

   c) Pin #EE (output relay common) is not active

2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1-second accuracy). If a channel fails to detect an "on" signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an "on" signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing

yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.

3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as "on" at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 Hz ± 20% with a 50% duty cycle when the AC Line voltage falls below the "drop-out" level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the "restore" level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the "restore" level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 16 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 Hz ± 20% with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the "restore" level. If the watchdog input has not made 5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel pair for the following fault conditions: Conflict, Flash Rate Detection, Red Fail, Dual Indication, and

Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 9 Red	Channel 10 Red	Channel 11 Red	Channel 12 Red
Yellow Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Flashing Yellow Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

If a FYA channel pair is enabled for FYA operation, the conflict monitor will monitor the FYA logical channel pair for the additional following conditions:

1. **Conflict:** Channel conflicts are detected based on the permissive programming jumpers on the program card. This operation remains unchanged from normal operation except for the solid Yellow arrow (FYA clearance) signal.
2. **Yellow Change Interval Conflict:** During the Yellow change interval of the Permissive Turn channel (flashing Yellow arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active. These conflicting channels shall be determined by the program card compatibility programming of the Permissive Turn channel (flashing Yellow arrow). During the Yellow change interval of the Protected Turn channel (solid Green arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active as determined by the program card compatibility programming of the Protected Turn channel (solid Green arrow).
3. **Flash Rate Detection:** The conflict monitor unit shall monitor for the absence of a valid flash rate for the Permissive turn channel (flashing Yellow arrow). If the Permissive turn channel (flashing Yellow arrow) is active for a period greater than 1600 milliseconds, ensure the conflict monitor triggers and puts the intersection into flash. If the Permissive turn channel (flashing Yellow arrow) is active for a period less than 1400 milliseconds, ensure the conflict monitor does not trigger. Ensure the conflict monitor will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input. Provide a jumper or switch that will enable and disable the Flash Rate Detection function. Ensure that when the jumper is not present or the switch is in the OFF position the Flash Rate Detection function is enabled. Ensure that when the jumper is present or the switch is in the ON position the Flash Rate Detection function is disabled.
4. **Red Monitoring or Absence of Any Indication (Red Failure):** The conflict monitor unit shall detect a red failure if there is an absence of voltage on all four of the inputs of a FYA channel pair (RA, YA, FYA, GA).

5. **Dual Indications on the Same Channel:** The conflict monitor unit shall detect a dual indication if two or more inputs of a FYA channel pair (RA, YA, FYA, GA) are "on" at the same time.
6. **Short/Missing Yellow Indication Fault (Clearance Error):** The conflict monitor unit shall monitor the solid Yellow arrow for a clearance fault when terminating both the Protected Turn channel (solid Green arrow) interval and the Permissive Turn channel (flashing Yellow arrow) interval.

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

For conflict monitors used within an Ethernet communications system, provide a conflict monitor with an Ethernet 10/100 Mbps, RJ-45 port for data communication access to the monitor by a local notebook computer and remotely via a workstation or notebook computer device connected to the signal system local area network. The Ethernet port shall be electrically isolated from the conflict monitor's electronics and shall provide a minimum of 1500 Vrms isolation. Integrate monitor with Ethernet network in cabinet. Provide software to retrieve the time and date from a network server in order to synchronize the on-board times between the conflict monitor and the controller. Furnish and install the following Windows based, graphic user interface software on workstations and notebook computers where the signal system client software is installed: 1) software to view and retrieve all event log information, 2) software that will search and display a list of conflict monitor IP addresses and IDs on the network, and 3) software to change the conflict monitor's network parameters such as IP address and subnet mask.

For non-Ethernet connected monitors, provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070 controller or to a Department-furnished laptop computer. Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070). Furnish and connect a serial cable from the conflict monitor's DB-9 connector to Comm Port 1 of the 2070 controller. Ensure conflict monitor communicates with the controller. Provide a Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	**Function**	**I/O**
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

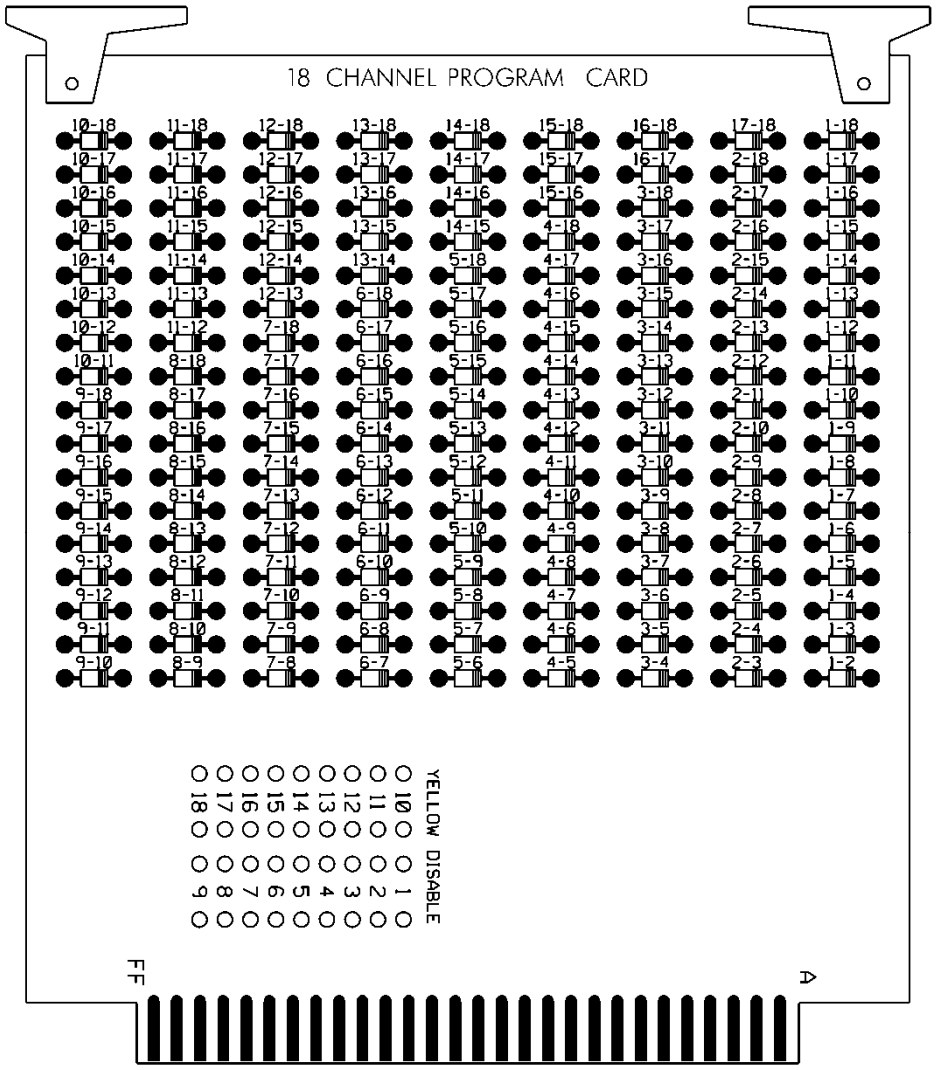
MONITOR BOARD EDGE CONNECTOR			
Pin #	**Function (Back Side)**	**Pin #**	**Function (Component Side)**
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output,Side #2,Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



3.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS

Furnish detector sensor units that comply with Chapter 5 Section 1, "General Requirements," and Chapter 5 Section 2, "Model 222 & 224 Loop Detector Sensor Unit Requirements," of the CALTRANS "Transportation Electrical Equipment Specifications" dated March 12, 2009 with Erratum 1.

4. VIDEO IMAGING LOOP EMULATOR DETECTOR SYSTEMS FOR TEMPORARY INSTALLATION

4.1. DESCRIPTION

Design, furnish, provide training, and install video imaging loop emulator detection systems with all necessary hardware for temporary traffic signals in accordance with the plans and specifications.

Unless otherwise specified in the contract, all loop emulator detection equipment will remain the property of the contractor.

4.2. MATERIALS

A. General:

Material and equipment furnished under this section must be pre-approved on the Department's QPL by the date of installation except miscellaneous hardware such as cables and mounting hardware do not need to be pre-approved.

Used equipment will be acceptable provided the following conditions have been met:

- Equipment is listed on the current QPL.
- Equipment is in good working condition.
- Equipment is to remain the property of the contractor.

Ensure that software is licensed for use by the Department and by any other agency responsible for maintaining or operating the loop emulation system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

Design and furnish video imaging loop emulator detection systems that detect vehicles at signalized intersections by processing video images and providing detection outputs to the signal controller in real time (within 112 milliseconds of vehicle arrival).

Furnish all required camera sensor units, loop emulator processor units, hardware and software packages, cabling, poles, mast arms, harnesses, camera mounting assemblies, surge protection panels, grounding systems, messenger cable and all necessary hardware. Furnish systems that allow the display of detection zones superimposed on an image of the roadway on a Department-furnished monitor or laptop computer screen. Ensure detection zones can be defined and data entered using a simple keyboard or mouse and monitor, or using a laptop PC with software.

Provide design drawings showing design details and camera sensor unit locations for review and acceptance before installation. Provide mounting height and location requirements for camera sensor units on the design based on site survey. Design video imaging loop emulator detection systems with all necessary hardware. Indicate all necessary poles, spans, mast arms, luminaire arms, cables, camera mounting assemblies and hardware to achieve the required detection zones where Department owned poles are not adequate to locate the camera sensor units. Do not design for the installation of poles in medians.

Obtain the Engineer's approval before furnishing video imaging loop emulator detection systems. The contractor is responsible for the final design of video imaging loop emulator detection systems. Review and acceptance of the designs by the Department does not relieve the contractor from the responsibility to provide fully functional systems and to ensure that the required detection zones can be provided.

Provide the ability to program each detection call (input to the controller) with the following functions:

- Full Time Delay – Delay timer is active continuously,
- Normal Delay – Delay timer is inhibited when assigned phase is green (except when used with TS 2 and 170/2070L controllers),
- Extend – Call is extended for this amount of time after vehicle leaves detection area,
- Delay Call/Extend Call – This feature uses a combination of full time delay and extend time on the same detection call. Ensure operation is as follows: Vehicle calls are received after the delay timer times out. When a call is detected, it is held until the detection area is empty and the programmed extend time expires. If another vehicle enters the detection area before the

extend timer times out, the call is held and the extend time is reset. When the extend timer times out, the delay timer has to expire before another vehicle call can be received.

Provide the ability to program each detection zone as one of the following functions:

- Presence detector,
- Directional presence detector,
- Pulse detector,
- Directional pulse detector.

Ensure previously defined detector zones and configurations can be edited.

Provide each individual system with all the necessary equipment to focus and zoom the camera lenses without the need to enter the camera enclosure.

Provide systems that allow for the placement of at least 8 detection zones within the combined field of view of a single camera sensor unit. Provide a minimum of 8 detection outputs per camera.

Provide detection zones that can be overlapped. Ensure systems reliably detect vehicles when the horizontal distance from the camera sensor unit to the detection zone area is less than ten times the mounting height of the sensor. Ensure systems detect vehicles in multiple travel lanes.

Ensure systems can detect vehicle presence within a 98 to 102 percent accuracy (up to 2 percent of the vehicles missed and up to 2 percent of false detection) for clear, dry, daylight conditions, a 96 to 105 percent accuracy (up to 4 percent of the vehicles missed and up to 5 percent false detection) for dawn and dusk conditions, and a 96 percent accuracy (up to 4 percent of the vehicles missed) for night and adverse conditions (fog, snow, rain, etc.) using standard sensor optics and in the absence of occlusion.

Repair and replace all failed components within 72 hours.

The Department may conduct field-testing to ensure the accuracy of completed video imaging loop emulator detection systems.

B. Loop Emulator System:

Furnish loop emulator systems that receive and simultaneously process information from camera sensor units, and provides detector outputs to signal controllers.

Ensure systems provide the following:

- Operate in a typical roadside environment and meet the environmental specifications and are fully compatible with NEMA TS 1, NEMA TS 2, or Type 170/2070L controllers and cabinets,
- provide a “fail-safe” mode whereby failure of one or more of the camera sensor units or power failure of the loop emulator system will cause constant calls to be placed on the affected vehicle detection outputs to the signal controller,
- provide compensation for minor camera movement of up to 2 percent of the field of view at 400 feet without falsely detecting vehicles,
- process the video at a minimum rate of 30 times per second,
- provide separate wired connectors inside the controller cabinet for video recording each camera,
- provide remote video monitoring with a minimum refresh rate at 1 frame per second over a standard dial-up telephone line,
- provide remote video detection monitoring.

Furnish camera sensor units that comply with the following:

- have an output signal conforming to EIA RS-170 standard,
- have a nominal output impedance of 75 ohms,
- be immune to bright light sources, or have built in circuitry or protective devices to prevent damage to the sensor when pointed directly at strong light sources,
- be housed in a light colored environmental enclosure that is water proof and dust tight, and that conforms to NEMA-4 specifications or better,
- simultaneously monitor at least five travel lanes when placed at the proper mounting location with a zoom lens,
- have a sunshield attached to the environmental enclosure to minimize solar heating,
- meet FCC class B requirements for electromagnetic interference emissions,
- have a heater attached to the viewing window of the environmental enclosure to prevent ice and condensation in cold weather.

Where coaxial video cables and other cables are required between the camera sensor and other components located in the controller cabinet, furnish surge protection in the controller cabinet.

If furnishing coaxial communications cable comply with the following, as recommended by the approved loop emulator manufacturer:

- Number 20 AWG, solid bare copper conductor terminated with crimped-on BNC connectors (do not use BNC adapters) from the camera sensor to the signal controller cabinet.
- Number 22 AWG, stranded bare copper conductor terminated with crimped-on BNC connectors (do not use BNC adapters) from the camera sensor unit to the junction box, and within the signal controller cabinet.

Furnish power cable appropriately sized to meet the power requirements of the sensors. At a minimum, provide three conductor 120 VAC field power cable.

As determined during the site survey, furnish sensor junction boxes with nominal 6 x 10 x 6 inches dimensions at each sensor location. Provide terminal blocks and tie points for coaxial cable.

C. Video Imaging Loop Emulator System Support:

Furnish video imaging loop emulator systems with either a simple keyboard or a mouse with monitor and appropriate software, or with system software for use on department-owned laptop PCs. Ensure the system is Windows 2000 and Windows XP compatible.

Provide Windows 2000 and Windows XP compatible personal computer software, if needed, to provide remote video and video detection monitoring.

Ensure systems allow the user to edit previously defined detector configurations. When a vehicle is within a detection zone, provide for a change in color or intensity of the detection zone perimeter or other appropriate display changes on the Department-furnished monitor or laptop computer screen.

Provide cabling and interconnection hardware with 6-foot minimum length interconnection cable to interface with the system.

Provide all associated equipment manuals and documentation.

4.3. CONSTRUCTION METHODS

Arrange and conduct site surveys with the system manufacturer's representative and Department personnel to determine proper camera sensor unit selection and placement. Provide the Department

at least 3 working days notice before conducting site surveys. Upon completion of the site surveys the Department will provide revised plans reflecting the findings of the site survey.

Before beginning work at locations requiring video imaging loop emulator detection systems, furnish system software. Upon activation of detection zones, provide detector configuration files. Ensure that up-to-date detection configuration files are furnished for various detection zone configurations that may be required for construction phasing.

Place into operation loop emulator detection systems. Configure loop emulator detection systems to achieve required detection in designated zones. Have a certified manufacturer's representative on site to supervise and assist with installation, set up, and testing of the system.

Install the necessary processing and communications equipment in the signal controller cabinet. Make all necessary modifications to install equipment, cabling harnesses, and camera sensor interface panels with surge suppression.

Perform modifications to camera sensor unit gain, sensitivity, and iris limits necessary to complete the installation.

Do not install camera sensor units on signal poles unless approved by the Engineer.

Install the necessary cables from each sensor to the signal controller cabinet along signal cabling routes. Install surge protection and terminate all cable conductors.

Reconfigure detection zones as necessary according to the plans for construction phases.

Provide at least 8 hours of training on the set up, operation, troubleshooting, and maintenance of the loop emulator detection system to a maximum of ten Department personnel. Arrange for training to be conducted by the manufacturer's representative at an approved site within the Division responsible for administration of the project. Thirty days before conducting training submit a detailed course curriculum, draft manuals and materials, and resumes. Obtain approval of the submittal before conducting the training. At least one week before beginning training, provide three sets of complete documentation necessary to maintain and operate the system. Do not perform training until installation of loop emulator detection systems is complete.

4.4. MEASUREMENT AND PAYMENT

Actual number of site surveys, arranged, conducted, and accepted.

Actual number of luminaire arms for video systems furnished, installed, and accepted.

Actual number of cameras without internal loop emulator processing units furnished, installed, and accepted.

Actual number of external loop emulator processing units furnished, installed, and accepted.

No measurement will be made of video imaging loop emulator system support or training, power and video cables, and trenching as these items will be considered incidental to furnishing and installing video imaging loop emulator detection systems.

Payment will be made under:

Site Survey ..... Each

Luminaire Arm for Video System ..... Each

Camera without Internal Loop Emulator Processing Unit ..... Each

External Loop Emulator Processing Unit ..... Each

5. METAL POLE SUPPORTS

5.1. 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 *2024 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications*. Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 1st Edition, 2015 (hereinafter called 1st 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/TSMO-Design-Resources.aspx

Comply with article 1098-1(B) 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 1098-1(A) 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 unique drawing number 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 unique drawing number 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 unique drawing number 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.

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 572 Gr 55 or 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 1st 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. In accordance with the National Electrical Code (NEC) Article 230.2(E), provide identification of the electrical source provider for the luminaire feeder circuit with contact information on a permanent label located in the pole hand hole near the feeder circuit raceway.

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 1st Edition AASHTO specifications:

- Use 700-Year MRI and 10-Year MRI wind pressure maps developed from 3-second gust speeds, as provided in Section 3.8.
- 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 forces using applicable equations from Section 5. The Maximum allowable force ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements.
- 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 ft^2
- 4-section, 12-inch, Surface area: 32.0 ft^2
- 5-section, 12-inch, Surface area: 42.0 ft^2

Design a base plate for each pole. The minimum base plate thickness for all poles is determined by the following criteria:

<u>*Case 1*</u> 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

D_1 = horizontal distance between the anchor bolt center and the outer face of the upright, or the difference between the bolt circle radius and the outside radius of the upright

Locate the critical section at the face of the anchor bolt and perpendicular to the bolt circle radius. The overlapped part of two (2) adjacent critical sections is considered ineffective.

<u>*Case 2*</u> 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

D_2 = horizontal distance between the face of the upright and the face of the anchor bolt nut

Locate the critical section at the face of the anchor bolt top nut and perpendicular to the radius of the bolt circle. The overlapped part of two (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. Strain Poles:

Refer to Metal Pole Standard Drawing Sheets M2 and M3 for fabrication details.

Provide two (2) messenger cable (span wire) clamps and associated hardware for attachment of messenger cable. Ensure diameter of the clamp is appropriate to its location on the pole and is appropriately designed for adjustment from 1'-6" below the top, down to 6'-6" below the top of the pole. Do not attach more than one (1) support cable to a messenger cable clamp.

Provide a minimum of three (3) 2-inch holes equipped with an associated coupling and weatherhead on the messenger cable load side of the pole to accommodate passage of signal cables from inside the pole. Provide galvanized threaded plugs for all unused couplings at pole entrance points. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Provide designs with a 6" x 12" hand hole with reinforcing frame for each pole.

Provide a terminal compartment with cover and screws in each pole encompassing the hand hole and containing a 12-terminal barrier type terminal block. Provide two (2) terminal screws with a removable shorting bar between them for each termination. Furnish terminal compartment covers attached to the pole by a sturdy chain or cable approved by the Engineer. Ensure 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 base.

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 grounding lug(s) in the approximate vicinity of the messenger cable clamp for bonding and grounding messenger cable. Lugs must accept #4 AWG wire to bond messenger cables to the pole in order to provide an effective ground fault circuit path. Refer to Metal Pole Standard Drawing Sheet M6 for construction details.

Install metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Ensure the installed pole, when fully loaded, is within 1 degree 40 minutes (1°40') of vertical. Install poles with the manufacturer's recommended "rake." Where required, use threaded leveling nuts to establish rake.

5.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 1st 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.

Ensure deflection at top of foundation does not exceed 1 inch for worst-case (Service Limit State) 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:

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest\ Boring\ Depth}}{Total\ Number\ of\ N\ values}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest\ Boring\ Depth})^2$$

$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deeepest\ Boring\ Depth}$$

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

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

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

OR

$$Average\ of\ First\ Four\ (4) N\ values = \frac{N_{@1'} + N_{@2.5'} + N_{@5'} + N_{@7.5'}}{4}$$

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/TSMO-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 10.8 of the *2014 AASHTO LRFD Bridge Design Specifications, 7th 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/2024-Specifications-and-Special-Provisions.aspx

5.3. POLE NUMBERING SYSTEM

Attach an identification tag to each pole shaft section as shown on Metal Pole Standard Sheet M2 "Typical Fabrication Details for All Metal Poles."

5.4. MEASUREMENT AND PAYMENT

Actual number of metal strain signal poles (without regard to height or load capacity) furnished, installed and accepted.

Actual number of soil tests with SPT borings drilled furnished and accepted.

Actual volume of concrete poured in cubic yards of drilled pier foundation furnished, installed and accepted.

No measurement will be made for foundation designs prepared with metal pole designs, as these will be considered incidental to designing Traffic Signal, CCTV or MVD support structures.

Payment will be made under:

Metal Strain Signal Pole ..... Each

Soil Test ..... Each

Drilled Pier Foundation..... Cubic Yard

6. 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, Division, or Statewide traffic signal system communications network.

6.1. DESCRIPTION

A. Ethernet Edge Switch:

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for the traffic signal controller or ITS device as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 1000 megabits per second from each remote traffic signal controller or ITS device location to the routing switches.

Contact the City or NCDIT to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum ten (10) working days notice to allow the City or NCDIT to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the existing City, Division, or Statewide Network Management Software.

6.2. 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 SFP 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, Division, or Statewide 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 SNTP. 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. Provide small form-factor pluggable modules (SFPs) with a maximum range that meets or exceeds the distance requirement as indicated on the Plans.

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 6 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 6 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 6 or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors
- Copper-clad aluminum is **NOT** allowed.

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 6 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

6.3. 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 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the City, Division, or NCDIT a minimum of 10 working days prior to installation to allow for the programming of the edge switch.

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.

6.4. MEASURMENT 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, small form factor pluggable modules (SFPs), 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

ST-1

Project No. P-5707 Wake County

Project Special Provisions
BRIDGE #911492 ON ROGERS ROAD

Table of Contents

	PAGE #
FALSEWORK AND FORMWORK (11-30-23)	ST-2
SUBMITTAL OF WORKING DRAWINGS (1-31-25)	ST-8
CRANE SAFETY (12-05-25)	ST-14
GROUT FOR STRUCTURES (12-1-17)	ST-15
THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)	ST-16
ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)	ST-18
BRIDGE MOUNTED CHAIN LINK FENCE (SPECIAL)	ST-21

9/15/2026

Project Special Provisions

P-5707 BRIDGE 911492 ON ROGERS ROAD

FALSEWORK AND FORMWORK (11-30-23)

GENERAL

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.

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.

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 link slabs, the top 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 ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the current edition of 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 surface damage.

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.

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.

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.

MEASUREMENT AND PAYMENT

Unless otherwise specified, *Falsework and Formwork* will not be directly measured.

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 (1-31-25)

GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this Special Provision. For this Special Provision, "submittals" refers to only those listed in this Special 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.

ST-9

Project No. P-5707 Wake County

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.

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. D. N. Snoke, 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. D. N. Snoke, 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 (Eastern Regional Office):

Via Email: EastGeotechnicalSubmittal@ncdot.gov

Via US mail:

Mr. Neil Roberson, P. E.
Assistant State Geotechnical
Engineer – Eastern Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office

Via other delivery service:

Mr. Neil Roberson, 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

3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14 (Western Regional Office):

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:	Madonna Rorie (919) 707 – 6508 mlrorie@ncdot.gov
Eastern Regional Geotechnical Contact (Divisions 1-7):	Neil Roberson (984) 920-8901 EastGeotechnicalSubmittal@ncdot.gov
Western Regional Geotechnical Contact (Divisions 8-14):	Eric Williams (980)258-6400 WestGeotechnicalSubmittal@ncdot.gov

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
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

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

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.

2. Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email), US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.

3. The Pile Driving Equipment Data Form is available from:
   https://connect.ncdot.gov/projects/construction/ConstManRefDocs/PILE%20DRIVING%20EQUIPMENT%20DATA%20FORM.pdf
   See second page of form for submittal instructions.

4. Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY (12-5-25)

GENERAL

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.

MEASUREMENT AND PAYMENT

No direct payment will be made for providing information, certifications and documentation required for *Crane Safety*.

GROUT FOR STRUCTURES (12-1-17)

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.

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.

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.

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.

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

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.

QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

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.

INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

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.

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.

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.

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, 4 inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers with a middle section

consisting of a rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway, and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow 8 inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 "Rigid Nonmetallic Conduit." Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states "Install Print Line Up" to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 "Rigid Nonmetallic Conduit."

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the Standard Specifications.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the Standard Specifications.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others, and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for "Electrical Conduit System for Signals at station 29+90.36 -L-".

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Electrical Conduit System for Signals at station 29+90.36 -L- Lump Sum

BRIDGE MOUNTED CHAIN LINK FENCE (SPECIAL)

DESCRIPTION

Provide 72" chain link fencing in accordance with plans, Section 866 of the 2024 Standard Specifications, and the provisions herein.

CONSTRUCTION METHODS

Contractors will provide all materials including incidentals necessary to install the fence as detailed on the plans. Work will include labor, materials, and equipment required to satisfactorily complete installation of the fencing as shown on the plans.

MEASUREMENT AND PAYMENT

72" Chain Link Fence will be measured and paid for in linear feet that has been installed and accepted. Such price includes, but is not limited to providing all necessary labor, tools. Equipment, and materials necessary to acceptably install the fence.

Pay Item	Pay Unit
72" Chain Link Fence:	Linear Feet

CSX OP No. NC0867

SPECIAL PROVISIONS FOR PROTECTION OF RAILROAD INTEREST

Under the terms of these provisions, the North Carolina Department of Transportation shall hereinafter be called "Department", and the CSX Transportation, Inc. shall hereinafter be called "Railroad".

The CSXT Special Provisions, CSXT Criteria for Undergrade Railroad Bridges, CSXT Construction Submission Criteria, CSXT Soil and Water Management Policy, and CSXT Insurance Requirements, as found in the CSX Transportation Public Projects Manual, which can be found at, https://www.csx.com/index.cfm/library/files/about-us/property/public-project-manual/, as well as the current version of the CSXT Design and Construction Standard Specifications available at the time of execution of the agreement, which shall be obtained from CSXT or its authorized representative upon request from the Department or its Contractor, all of the aforementioned shall be considered to be included by reference only, and the attached project-specific CSXT Temporary Right of Entry Agreement shall serve as the basis for the railroad provisions of this contract. CSXT further reserves the right to revise, update and enforce any and all safety related Design and Construction Standards and Specifications as may be necessary throughout the course of the project. The following additional statements are to be included as addendums to the referenced provisions:

- Requirements throughout these provisions placed on "Agency or its Contractor" shall be the sole responsibility of the Contractor unless specifically stated otherwise elsewhere within these provisions. All contractor costs for railroad coordination shall be considered incidental to the other pay items.

- Unless noted elsewhere in these provisions, all contact with Railroad should be addressed to the below individual who shall be considered the CSXT Representative.

  Mr. G. Douglas Barber
  CE&I Lead
  AECOM
  (704) 295-2431 (Direct)
  (919) 791-9777 (Mobile)
  Doug.barber@aecom.com

- The Engineer shall be considered the Department Representative.

- All required work plan submittals shall be forwarded to and approved in writing by the Railroad prior to proceeding with the work of each applicable phase. Up to thirty (30) days will be required to review each submittal. Up to an additional thirty (30) days will be required to review each subsequent submission returned not marked "Conforms As Noted". The Contractor shall be responsible for submitting these to the Railroad and

providing a copy to the Engineer.

- At project completion, a complete set of "As Built" plans for the proposed construction shall be submitted to CSXT Bridge Maintenance and Design Group via AECOM. CSXT will keep these plans on file in Jacksonville for future reference. Please address these plans to:

  Mr. G. Douglas Barber
  CE&I Lead
  AECOM
  (704) 295-2431 (Direct)
  (919) 791-9777 (Mobile)
  Doug.barber@aecom.com

- CSXT Special Provisions Section VI.A - The following paragraph shall be added as the second paragraph

  The Department will bear all railroad costs incidental to such crossings including flagging and services performed by Railroad personnel. Written approval from the Engineer is required prior to use of the crossings. The Contractor shall sequence construction to minimize the duration the crossing(s) remain in-place. The Contractor shall reimburse the Department for any costs of the flagging for the crossing outside of the duration approved by the Engineer. Cost of the installation, maintenance and removal of the temporary crossing(s) incurred by the Contractor will be considered incidental to the other pay items.

- CSXT Special Provisions Section XII.C – Flagging requests should be made to FLAGGING@aecom.com. Termination or cancellation of flagger requires ten (10) days' notice to avoid incurring costs.

- CSXT Special Provisions Section XII.D - The following paragraph shall be added as the second paragraph

  Should violations of Railroad policy or unscheduled, unauthorized work by the Contractor result in additional full time flagging being required by the Railroad, the additional cost of such flagging above normal flagging cost shall be deducted from the final payment to the Contractor as provided in Article 109-9 of the Standard Specifications. Neither Department nor Railroad will be liable for damages resulting from unscheduled or unauthorized work.

- CSXT Special Provisions Section XII.E - Include the following sentence at the end of the paragraph

The Contractor shall reimburse the Department for any costs of the flagging which is required for work for the benefit of the Contractor.

- Insurance Requirements Section I.4.d - The Project Description and Designation on the Declarations shall read:

  Wake Forest, Wake County, North Carolina, Grade Separation Rogers Road (SR 2052) over CSXT at Milepost S 142.53, Carolinas Zone, Norlina Subdivision, DOT No. #633 905Y; CSXT OP# NC0867, State# P-5707

- Insurance Requirements Section II.1 - Insurance documents shall be submitted to the Department at the following address:

  NCDOT Rail Division
  Engineering & Safety Branch
  C/O State Railroad Agent
  1556 Mail Service Center
  Raleigh, NC 27699-1556

- The Contractor shall not commence any work on railroad rights-of-way until a fully executed copy of the attached CSX Transportation Inc. Temporary Right of Entry Agreement has been received and all other requirements of these provisions for commencement of work have been completed. It should be noted that the provisions included in the CSXT Temporary Right of Entry Agreement materially duplicate those included in the CSXT Special Provisions and are not intended to be standalone requirements. It shall be noted that obtaining the Temporary Right of Entry Agreement will take between four (4) and six (6) months to obtain barring there are no changes requested to the language shown below.

Wake Forest, Wake County, North Carolina
Grade Separation CSXT over Rogers Road (SR 2052) at Milepost S-142.53
Carolinas Zone, Norlina Subdivision
DOT# 633 905Y; OP# NC0867; State# P-5707

CSX Transportation, Inc.
Temporary Right of Entry Agreement

THIS AGREEMENT, made as of _____, 20___, by and between CSX TRANSPORTATION, INC., a Virginia corporation, whose mailing address is 500 Water Street, Jacksonville, Florida 32202, (hereinafter "**CSXT**") and named Contractor, (**********), whose mailing address is (**********), (**********), (hereinafter "**Licensee**").

W I T N E S S E T H:

WHEREAS, Licensee has submitted a written application to CSXT requesting permission to enter CSXT's property located within the Carolinas Zone, Norlina Subdivision, at DOT#: 633 905Y, MP S-142.53, Rogers Road in Wake Forest, Wake County, North Carolina (hereinafter the "**Property**"), for the Grade Separation CSXT over Rogers Road (SR 2502) on behalf of the North Carolina Department of Transportation ("**Department**"), located at MP S-142.53 from approximately Sta. 14+30 to Sta. 52+45 on the right of way owned by the Department (hereinafter the "**Project**").

WHEREAS, CSXT is willing to grant to Licensee the limited right and permission to enter upon the Property for the limited purpose of performing the Project.

NOW THEREFORE, CSXT hereby grants to Licensee the right and permission to enter upon the Property for the purpose of performing said Project, subject to the terms and conditions set forth below:

1. **PROJECT**: The Project shall be performed at the entire cost and expense of the Department per the fully executed Construction Agreement between the Department and CSXT for this project, dated _____, 20___in accordance with good and sound engineering practices, to the satisfaction of CSXT's Division Engineer or his or her duly authorized representative (hereinafter "Division Engineer") and in a manner to avoid accidents, damages, unnecessary delays to, or interference with train traffic of CSXT. Prior to entry, Licensee shall notify the Division Engineer's representative and arrange for flagging protection in accordance to Sections 5 and 6 of this Agreement. Licensee shall not dig in the ballast line or within the tracks loading influence area, or otherwise disturb the track structure. Licensee and Licensee's employees, agents, contractors (hereinafter "Contractors") and other representatives (hereinafter collectively, "Agents") shall maintain in their possession a copy of this Agreement at all times during their occupation of the Property. Licensee and Agents also further agree to abide by the Special Provisions included as Attachment B to this Agreement.

2. **INDEMNITY:**

2.1 Licensee and its Contractors hereby assume risk of and shall indemnify, defend, protect, and save CSXT and CSXT's Affiliates harmless with respect to any and all attorneys' fees, liability, claims, demands, payments, suits, actions, recoveries, penalties, costs, legal expenses, judgments, settlements, and damages of every nature, degree, and kind (including direct, indirect, consequential, incidental, and punitive damages) for:

2.1.1 Personal injury, including, but not limited to bodily injury to or death of any person or persons whomsoever, including the agents, servants, Affiliates or employees of the parties, or the Contractors;

2.1.2 The loss or damage to any property whatsoever, including property owned or in the care, custody, or control of the parties hereto or their respective Affiliates;

2.1.3 Any environmental damage and any related remediation brought or recovered against CSXT or any of its Affiliates; and

2.1.4 Any and all other losses or damages; arising directly or indirectly from the presence of Licensee or its Agents on or about the Property, whether or not attributable in whole or part to the negligence, gross negligence, or intentional misconduct of CSXT or its Affiliates.

2.2 The parties waive any and all right or opportunity to contest the enforceability of this Section and agree that, in the event this Section, or any part of this Section, is found unenforceable by the final, unappealable judgment of a court of competent jurisdiction, this Section shall be construed so as to be enforceable to the maximum extent permitted by applicable law. In the event that such court of competent jurisdiction finds that Florida statutory construction contract indemnity monetary limits apply to this Agreement with respect to Licensee's/Contractors' indemnification of CSXT and its Affiliates for liability caused in whole or in part by any act, omission, or default by CSXT or its Affiliates, the parties hereto agree that such limit shall be equal to the limits (exclusive of deductibles) of the applicable insurance required by Sections 3 and 4 of this Agreement. The parties acknowledge and agree that this monetary limit, if required, bears a commercially reasonable relationship to this Agreement, in so far as, among other factors, the parties have taken into account the availability and cost of insurance and other risk transference devices, the scope of the Project, the risks associated with the Project, and the compensation and any other benefits exchanged between the parties in connection with this Agreement.

2.2.1 Licensee shall comply, and shall require its Contractors to comply, with any federal, State, or local laws, statutes, codes, ordinances, rules, and regulations applicable to its presence or performance of any activity on the Property. Licensee and its Contractors shall indemnify, defend, and hold CSXT and its Affiliates harmless with respect to any fines, penalties, liabilities, or other consequences for its failure to so comply.

2.2.2 For the purpose of this Agreement, the term "Affiliates" includes all entities, directly or indirectly owned or controlled by or under common control of a party or its respective officers, directors, employees, and agents, and in the case of CSXT, includes CSX Corporation, CSXT, and their Affiliates and their respective officers, directors, employees, and agents.

2.2.3 The provisions of this Section shall survive the termination or expiration of this Agreement.

3. GENERAL LIABILITY INSURANCE: Licensee shall or shall require its Contractor to procure and maintain insurance in compliance with CSXT's insurance requirements attached to this Agreement as Attachment A. Neither the Department nor its Contractor shall commence work on the Project until such policy or policies have been submitted to and approved by CSXT's Risk Management Department.

4. **RAILROAD PROTECTIVE LIABILITY INSURANCE:** Licensee shall or shall require its Contractor to procure and maintain Railroad Protective Liability insurance in compliance with CSXT's requirements attached to this Agreement as Attachment A.

5. **PRIOR NOTIFICATION: Licensee or Licensee's Agents shall notify CSXT's General Engineering Consultant (GEC) Representative** at least ten (10) days prior to requiring entry on the Property and shall abide by the instructions of the Division Engineer, or his or her authorized representative. CSXT's GEC Representative, AECOM, can be contacted at FLAGGING@aecom.com to schedule flagging services.

6. **CLEARANCES**: Neither Licensee nor Agents shall perform any Project or place or operate any equipment of Licensee or Agents at a distance closer than fifty (50) feet from the center of any track, without the prior approval of the Division Engineer. The Division Engineer may require protective services or such other services as deemed necessary or appropriate. Equipment shall be moved across CSXT's track(s) only at a public crossing unless prior arrangements have been made with the Division Engineer and a Private Crossing Agreement is fully executed and in place. Licensee and Agents shall take all precautions necessary to avoid interference with or damage to CSXT's property and signal and communication facilities during their performance of the Project.

7. **PROTECTIVE SERVICES**: If protective services, such as flagging protection, are required by CSXT, Licensee shall make arrangements with CSXT's GEC Representative to furnish such personnel, flagman, or watchman, that in CSXT's opinion may be necessary to protect the facilities and traffic of CSXT during the performance of the Project.

8. **PAYMENT FOR PROTECTIVE SERVICES**: Payment shall be made by the Department in accordance with the fully executed Construction Agreement between the Department and CSXT for this project.

9. **ENVIRONMENTAL**: **This Agreement does not include and expressly excludes the performance of any site investigation activities designed to determine environmental conditions on, about, or beneath the Property**. Precluded activities include performing soil borings for purposes other than geotechnical investigation; obtaining soil, sediment, groundwater, and surface water samples; and conducting field or laboratory analyses of any soil, sediment, groundwater, or surface water samples obtained from CSXT property to identify chemical composition or environmental condition. *If any type of environmental investigation is desired, a separate right of entry agreement issued through CSXT's Environmental Department must be secured.*

10. **CLAIMS:** Licensee shall, or shall require Agents, to promptly notify the Division Engineer of any loss, damage, injury, or death arising out of or in connection with the Project.

11. **REMEDIATION**: It is understood and agreed that, upon completion of the Project, the Property shall be left in a condition satisfactory to the Division Engineer or his or her duly authorized representative.

12. **SAFETY:**

12.1 All personnel entering the Property must comply with CSXT safety rules and requirements to include, without exception, the wearing of hard hats and approved safety

shoes and safety glasses with side shields. Anyone not in compliance with these rules and regulations will be asked to leave the Property.

12.2 Before performing any work authorized by this Agreement, Licensee, at its sole cost and expense, shall obtain all necessary permit(s) (including but not limited to zoning, building, construction, health, safety, or environmental matters), letter(s), or certificate(s) of approval. Licensee expressly agrees and warrants that it shall conform and limit its activities to the terms of such permit(s), approval(s), and authorization(s) and shall comply with all applicable ordinances, rules, regulations, requirements, and laws of any governmental authority (State, federal or local) having jurisdiction over Licensee's activities, including the location, contact, excavation, and protection regulations of the Occupational Safety and Health Act (OSHA) (29 C.F.R. § 1926.651(b), et al.), and State "One Call"-"Call Before You Dig" requirements.

13. **TERM:** This Right-of-Entry Agreement and the permission conferred and the license granted by it does not constitute a grant of permanent easement and shall terminate upon completion of the Project or at midnight, _____**,** whichever occurs first, unless extended in writing by CSXT. In the event Licensee fails to comply with the terms and provisions of this Agreement, Licensee agrees to pay and agrees that CSXT shall be entitled to recover the costs and expenses incurred by CSXT, including legal fees and expenses, to enforce the terms of this Agreement.

14. **SEVERABILITY**: The parties agree that if any part, term, or provision of this Agreement is held to be illegal, unenforceable, or in conflict with any applicable federal, State, or local law or regulation, such part, term, or provision shall be severable, with the remainder of this Agreement remaining valid and enforceable. If any provision or any part of a provision of this Agreement shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable law, ordinance, rule, or regulation, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of this Agreement, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

15. **ENTIRE AGREEMENT:** This Agreement embodies the entire understanding of the parties, may not be waived or modified except in a writing signed by authorized representatives of both parties, and supersedes all prior or contemporaneous written or oral understandings, agreements, or negotiations regarding its subject matter.

16. **NOTICES:** All notices, consents, and approvals required or permitted by this Agreement shall be in writing and shall be deemed delivered; upon personal delivery, upon the expiration of three (3) business days following mailing by U.S. first class mail, or upon the next business day following mailing by a nationally recognized overnight carrier, to the Licensee at the address above, and to CSXT at the address shown on Page 1, or at such other addresses as either party may designate by delivery of prior notice to the other party.

17. **TERMINATION:** CSXT shall have the right at any time and at its sole discretion to terminate this Agreement upon notice to Licensee.

18. **WAIVER:** If either party fails to enforce its respective rights under this Agreement or fails to insist upon the performance of the other party’s obligations hereunder, such failure shall not be construed as a permanent waiver of any rights or obligations in this Agreement.

19. **GOVERNING LAW; VENUE:** This Agreement shall be governed by and construed under the laws of the State of North Carolina, without regard to the choice of law provisions thereof. Venue for any action arising from, or brought to enforce, this Agreement, shall vest exclusively in the state or federal courts located in Duval County, Florida, and the parties agree to submit to the personal jurisdiction of any state or federal court located in Duval County, Florida.

20. **NO ASSIGNMENT:** Notwithstanding anything to the contrary contained in this Agreement, Licensee shall not permit the Agents to enter the Property without first requiring the Agents to agree in writing to comply with all of the terms of this Agreement. Notwithstanding the foregoing, Licensee shall continue to be responsible for ensuring that the Agents comply with all of the terms and conditions of this Agreement and shall indemnify and hold CSXT harmless for any damages described in Section 2 above caused in whole or in part by such subcontractor. Assignment of this Agreement to any party other than the Agents in accordance with this Section shall not be permitted except upon the prior written consent of CSXT, which consent may be granted or withheld at CSXT's sole discretion. This Agreement shall be binding upon the parties and their respective successors and assigns.

[*Signatures appear on following page*]

Wake Forest, Wake County, North Carolina
Grade Separation CSXT over Rogers Road (SR 2052) at Milepost S-142.53
Carolinas Zone, Norlina Subdivision
DOT# 633 905Y; OP# NC0867; State# P-5707

BY SIGNING THIS AGREEMENT, I certify that there have been no changes made to the content of this Agreement since its approval by the CSXT Legal Department on _____, 20___.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the day and year first above written.

CSX TRANSPORTATION, INC.

BY: _____

NAME: Michael Liebelt

TITLE: Project Manager II

DATE: _____

(**********)**:**

BY: _____

NAME: _____

TITLE: _____

Who, by the execution hereof, affirms that he/she has the authority to do so and to bind (**********) to the terms and conditions of this Agreement.

Wake Forest, Wake County, North Carolina
Grade Separation CSXT over Rogers Road (SR 2052) at Milepost S-142.53
Carolinas Zone, Norlina Subdivision
DOT# 633 905Y; OP# NC0867; State# P-5707

Attachment A

INSURANCE REQUIREMENTS

I. Insurance Policies:

The Department and its Contractor, if and to the extent that either is performing work on or about CSXT's property, shall procure and maintain the following insurance policies:

1. Commercial General Liability coverage at their sole cost and expense with limits of not less than Five Million Dollars ($5,000,000) in combined single limits for bodily injury and/or property damage per occurrence, and such policies shall name CSXT as an additional named insured. The policy shall include endorsement ISO CG 24 17 evidencing that coverage is provided for work within fifty (50) feet of a railroad. If such endorsement is not included, railroad protective liability insurance must be provided as described in Item 4 below.

2. Statutory Worker's Compensation and Employers Liability Insurance with limits of not less than One Million Dollars ($1,000,000), which insurance must contain a waiver of subrogation against CSXT and its affiliates (if permitted by state law).

3. Commercial automobile liability insurance with limits of not less than One Million Dollars ($1,000,000) combined single limit for bodily injury and/or property damage per occurrence, and such policies shall name CSXT as an additional named insured. The policy shall include endorsement ISO CA 20 70 evidencing that coverage is provided for work within fifty (50) feet of a railroad. If such endorsement is not included, railroad protective liability insurance must be provided as described in Item 4 below.

4. Railroad protective liability insurance with limits of not less than Five Million Dollars ($5,000,000) combined single limit for bodily injury and/or property damage per occurrence and an aggregate annual limit of Ten Million Dollars ($10,000,000), which insurance shall satisfy the following additional requirements:

   a. The Railroad Protective Insurance Policy must be on the ISO/RIMA Form of Railroad Protective Insurance - Insurance Services Office (ISO) Form CG 00 35.

   b. CSX Transportation must be the named insured on the Railroad Protective Insurance Policy.

   c. Name and Address of Contractor and the Department must appear on the Declarations page.

   d. Description of operations must appear on the Declarations page and must match the Project description.

   e. Authorized endorsements must include the Pollution Exclusion Amendment - CG 28 31, unless using form CG 00 35 version 96 and later.

   f. Authorized endorsements may include:

(i). Broad Form Nuclear Exclusion - IL 00 21
(ii) 30-day Advance Notice of Non-renewal or cancellation
(iii) Required State Cancellation Endorsement
(iv) Quick Reference or Index - CL/IL 240

g. Authorized endorsements may not include:

(i) A Pollution Exclusion Endorsement except CG 28 31
(ii) A Punitive or Exemplary Damages Exclusion
(iii) A "Common Policy Conditions" Endorsement
(iv) Any endorsement that is not named in Section 4 (e) or (f) above.
(v) Policies that contain any type of deductible

5. All insurance companies must be A.M. Best rated A- and Class VII or better.

6. The CSX OP number or CSX contract number, as applicable, must appear on each Declarations page and/or certificates of insurance.

7. Such additional or different insurance as CSXT may require.

II. Additional Terms

1. Contractor must submit the original Railroad Protective Liability policy, Certificates of Insurance, and all notices and correspondence regarding the insurance policies to:

Insurance Department
CSX Transportation, Inc.
500 Water Street, 14th Floor
Jacksonville, FL 32202

OR

insurancedocuments@csx.com and [CMR email address]

2. Neither the Department nor its Contractor may begin work on the Project until it has received CSXT's written approval of the required insurance.

Wake Forest, Wake County, North Carolina
Grade Separation CSXT over Rogers Road (SR 2052) at Milepost S-142.53
Carolinas Zone, Norlina Subdivision
DOT# 633 905Y; OP# NC0867; State# P-5707

Attachment B

SPECIAL PROVISIONS

DEFINITIONS:

As used in these Special Provisions, all capitalized terms shall have the meanings ascribed to them by the Agreement, and the following terms shall have the meanings ascribed to them below:

"CSXT" shall mean CSX Transportation, Inc., its successors and assigns.

"CSXT Representative" shall mean the authorized representative of CSX Transportation, Inc.

"Agreement" shall mean the Agreement between CSXT and the Department dated as of _____, 20___ amended from time to time.

"Department" shall mean the North Carolina Department of Transportation.

"Department Representative" shall mean the authorized representative of the North Carolina Department of Transportation.

"Contractor" shall mean the Licensee identified in the CSX Transportation, Inc. Temporary Right of Entry Agreement to which these provisions are attached.

"Work" shall mean the Project as described in the Agreement.

I. AUTHORITY OF CSXT ENGINEER

The CSXT Representative shall have final authority in all matters affecting the safe maintenance of CSXT operations and CSXT property, and his or her approval shall be obtained by the Department or its Contractor for methods of construction to avoid interference with CSXT operations and CSXT property and all other matters contemplated by the Agreement and these Special Provisions.

II. INTERFERENCE WITH CSXT OPERATIONS

A. The Department or its Contractor shall arrange and conduct its work so that there will be no interference with CSXT operations, including, but not limited to train, signal, telephone, and telegraphic services, or damage to CSXT's property, or to poles, wires, and other facilities of tenants on CSXT's Property or right-of-way. The Department or its Contractor shall store materials so as to prevent trespassers from causing damage to trains, or CSXT Property. Whenever Work is likely to affect the operations or safety of trains, the method of doing such Work shall first be submitted to the CSXT Representative for approval, but such approval shall not relieve the Department or its Contractor from liability in connection with such Work.

B. If conditions arising from or in connection with the Project require that immediate and unusual provisions be made to protect train operation or CSXT's property, the Department or its Contractor shall make such provision. If the CSXT Representative

determines that such provision is insufficient, CSXT may, at the expense of the Department or its Contractor, require or provide such provision as may be deemed necessary, or cause the Work to cease immediately.

C. Should work activities be required within CSXT property or right-of-way, the Contractor shall request CSXT to locate any buried utilities or facilities (air lines, wells, etc.). A written request shall be delivered to the CSXT Representative at least five (5) days in advance. The traditional "One Call" utility locate services are not responsible for locating any CSXT undergrade utilities or facilities.

III. INSURANCE

The Contractor shall not be permitted to work on, or have potential to foul, CSXT property or right-of-way until CSXT has acknowledged written acceptance of the insurance coverages for the proposed project. See CSXT INSURANCE REQUIREMENTS following these CSXT SPECIAL PROVISIONS.

IV. NOTICE OF STARTING WORK

The Department or its Contractor shall not commence any work on CSXT Property or rights-of-way until it has complied with the following conditions:

A. Notify CSXT in writing of the date that it intends to commence Work on the Project. Such notice must be received by CSXT at least ten (10) business days in advance of the date the Department or its Contractor proposes to begin Work on CSXT property. The notice must refer to this Agreement by date. If flagging service is required, such notice shall be submitted at least thirty (30) business days in advance of the date scheduled to commence the Work.

B. Obtain authorization, through the Notice to Proceed, from the CSXT Representative to begin Work on CSXT property. Once authorization is given, the Department or its Contractor shall provide a detailed schedule to include means and methods for review, comment and/or approval prior to commencement of work. CSXT will in turn provide direction regarding specific conditions with which it must comply.

C. Obtain from CSXT the names, addresses, and telephone numbers of CSXT's personnel who must receive notice under provisions in the Agreement. Where more than one individual is designated, the area of responsibility of each shall be specified.

V. WORK FOR THE BENEFIT OF THE CONTRACTOR

A. No temporary or permanent changes to wire lines or other facilities (other than third party fiber optic cable transmission systems) on CSXT property that are considered necessary to the Work are anticipated or shown on the Plans. If any such changes are, or become, necessary in the opinion of CSXT or Department, such changes will be covered by appropriate revisions to the Plans and by preparation of a force account estimate. Such force account estimate may be initiated by either CSXT or the Department but must be approved by both CSXT and the Department. The Department or its Contractor shall be

responsible for arranging for the relocation of the third-party fiber optic cable transmission systems, at no cost or expense to CSXT.

B. Should the Department or its Contractor desire any changes in addition to the above, then it shall make separate arrangements with CSXT for such changes to be accomplished at the Department or its Contractor's expense.

VI. HAUL ACROSS RAILROAD

A. If the Department or its Contractor desires access across CSXT property or tracks at other than an existing and open public road crossing in or incident to construction of the Project, the Department or its Contractor must first obtain the permission of CSXT and shall execute a license agreement or right of entry satisfactory to CSXT, wherein the Department or its Contractor agrees to bear all costs and liabilities related to such access.

1. Temporary construction haul roads across CSXT tracks will require a separate application and payment to CSXT Property Services. Agreement extensions require additional payment. Actual cost is variable and project specific. Additional information can be found at this URL: https://www.csx.com/index.cfm/customers/value-added-services/property-real-estate/permitting-utility-installations-and-rights-of-entry/.

B. The Department and its Contractor shall not cross CSXT's property and tracks with vehicles or equipment of any kind or character, except at such crossing or crossings as may be permitted pursuant to this section.

VII. COOPERATION AND DELAYS

A. The Department or its Contractor shall arrange a schedule with CSXT for accomplishing stage construction involving work by CSXT. In arranging its schedule, the Department or its Contractor shall ascertain, from CSXT, the lead time required for assembling crews and materials and shall make due allowance therefor.

B. The Department or its Contractor may not charge any costs or submit any claims against CSXT for hindrance or delay caused by railroad traffic; work done by CSXT or other delay incident to or necessary for safe maintenance of railroad traffic; or for any delays due to compliance with these Special Provisions.

C. The Department and its Contractor shall cooperate with others participating in the construction of the Project to the end that all work may be carried on to the best advantage.

D. The Department and its Contractor understand and agree that CSXT does not assume any responsibility for work performed by others in connection with the Project. The Department and its Contractor further understand and agree that they shall have no claim whatsoever against CSXT for any inconvenience, delay or additional cost incurred by the Department or its Contractor on account of operations by others.

VIII. STORAGE OF MATERIALS AND EQUIPMENT

The Department and its Contractor shall not store their materials or equipment on CSXT's property or where they may potentially interfere with CSXT's operations, unless the Department or its Contractor has received CSXT Representative's prior written permission. The Department and its Contractor understand and agree that CSXT will not be liable for any damage to such materials and equipment from any cause and that CSXT may move, or require the Department or its Contractor to move, such material and equipment at the Department's or its Contractor's sole expense. To minimize the possibility of damage to the railroad tracks resulting from the unauthorized use of equipment, all grading or other construction equipment that is left parked near the tracks unattended by watchmen shall be immobilized to the extent feasible so that it cannot be moved by unauthorized persons.

IX. CONSTRUCTION PROCEDURES

A. General

1. Construction work on CSXT property shall be subject to CSXT's inspection and approval.

2. Construction work on CSXT property shall be in accord with CSXT's Construction Submission Criteria, latest edition and CSXT's written outline of specific conditions and with these Special Provisions.

3. Contractor shall observe the terms and rules of the CSXT Safe Way manual, which the Department and its Contractor shall be required to obtain from CSXT, and in accord with any other instructions furnished by CSXT or CSXT's Representative. Failure to comply with the terms of the agreement and CSXT rules can result in mandatory railroad worker protective training for the Department, Contractor, and its subcontractors.

B. Blasting

1. The Department or its Contractor shall obtain CSXT Representative's and the Department Representative's prior written approval for use of explosives on or adjacent to CSXT property. If permission for use of explosives is granted, the Department or its Contractor must comply with the following:

   a. Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Department or its Contractor.

   b. Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.

   c. No blasting shall be done without the presence of an authorized representative of CSXT. At least thirty (30) days' advance written notice to CSXT Representative is required to arrange for the presence of an authorized CSXT representative and any flagging that CSXT may require.

d. The Department or its Contractor must have at the Project site adequate equipment, labor, and materials, and allow sufficient time, to (i) clean up (at the Department's expense) debris resulting from the blasting without any delay to trains; and (ii) correct (at the Department's expense) any track misalignment or other damage to CSXT's property resulting from the blasting, as directed by CSXT Representative, without delay to trains. If the Department's or its Contractor's actions result in delay of any trains, including Amtrak passenger trains, the Department shall bear the entire cost thereof.

e. The Department and its Contractor shall not store explosives on CSXT property.

2. CSXT Representative will:

a. Determine the approximate location of trains and advise the Department or its Contractor of the approximate amount of time available for the blasting operation and clean-up.

b. Have the authority to order discontinuance of blasting if, in his or her opinion, blasting is too hazardous or is not in accord with these Special Provisions.

X. ENVIRONMENTAL

A. Should soil excavation within CSXT property be anticipated and said soils cannot remain on CSXT property during and after construction, then CSXT Environmental must be contacted at least thirty (30) days in advance of the work in order to schedule sampling, classification, and disposition of material. Excavated material is prohibited from being removed from CSXT property, or rights-of-way, without expressed written direction from CSXT. Should final disposition require disposal of excavated material, CSXT shall have sole discretion of means and location of said disposal. The project sponsor or the Department will bear all costs associated with sampling, staging, and subsequent disposal if deemed necessary. Contractor will be required to obtain all disposal tickets / documentation and provide the information to the CSXT Representative. CSXT will not bear any costs associated with this work.

B. Any waste materials generated by the Project, including but not limited to washing with cleaning solvents, blasting, scraping, brushing, and painting operations, shall be the responsibility of the Department or its Contractor and shall be contained, collected, and properly disposed of by the Department or its Contractor. The Department and its Contractor agree to fully comply with all federal, State, and local environmental laws, regulations, statutes, and ordinances at all times.

XI. MAINTENANCE OF DITCHES ADJACENT TO CSXT TRACKS

The Department or its Contractor shall maintain all ditches and drainage structures free of silt or other obstructions that may result from their operations. In addition, the Department or its

Contractor shall maintain all CSXT property or right-of-way impacted by project operations including but not limited to; access or haul roads, staging areas, parking lots in a manner that provides CSXT free and clear access to facilities, and materials while providing acceptable driving surfaces free of drainage impacts or reduced CSXT capacity. The Department or its Contractor shall provide erosion control measures during construction and use methods that accord with applicable state standard specifications for road and bridge construction, including either (1) silt fence; (2) hay or straw barrier; (3) berm or temporary ditches; (4) sediment basin; (5) aggregate checks; and (6) channel lining. All such maintenance and repair of damages due to the Department's or its Contractor's operations shall be performed at the Department's expense.

XII. TRACK PROTECTION / INSPECTION SERVICE

A. CSXT has sole authority to determine the need for track protection required to protect its operations and property. In general, track protection will be required whenever the Department or its Contractor or their equipment are, or are likely to be, working within fifty (50) feet of live track or other track clearances specified by CSXT, or over tracks.

B. The Department shall reimburse CSXT directly for all costs of track protection that is required on account of construction within CSXT property shown in the Plans, or that is covered by an approved plan revision, supplemental agreement, or change order.

C. The Department or its Contractor shall give a minimum of thirty (30) days' advance written notice to CSXT Representative for anticipated need for track protection. No work shall be undertaken until the flag person(s) is/are at the job site. If it is necessary for CSXT to advertise a flagging job for bid, it may take up to ninety (90) days to obtain this service; CSXT shall not be liable for the cost of delays attributable to obtaining such service.

D. CSXT shall have the right to assign an individual to the site of the Project to perform inspection service whenever, in the opinion of CSXT Representative, such inspection may be necessary. The Department shall reimburse CSXT for the costs incurred by CSXT for such inspection service. Inspection service shall not relieve the Department or its Contractor from liability.

E. CSXT shall render invoices for, and the Department shall pay for, the actual pay rate of the flagpersons and inspectors used, plus standard additives, whether that amount is above or below the rate provided in the Estimate. If the rate of pay that is to be used for inspector or flagging service is changed before the work is started or during the progress of the work, whether by law or agreement between CSXT and its employees, or if the tax rates on labor are changed, bills will be rendered by CSXT and paid by the Department using the new rates. The Department and its Contractor shall perform their operations that require track protection or inspection service in such a manner and sequence that the cost of such will be as economical as possible.

XIII. UTILITY FACILITIES ON CSXT PROPERTY

The Department shall arrange, upon approval from CSXT, to have any utility facilities on or over CSXT Property changed as may be necessary to provide clearances for the proposed trackage.

XIV. CLEAN-UP

The Department or its Contractor, upon completion of the Project, shall remove and dispose from CSXT's Property any temporary construction work, any temporary erosion control measures used to control drainage, all machinery, equipment, surplus materials, falsework, rubbish, or temporary buildings belonging to the Department or its Contractor. The Department or its Contractor, upon completion of the Project, shall leave CSXT Property in neat condition, satisfactory to the CSXT Representative.

XV. FAILURE TO COMPLY

If the Department or its Contractor violate or fail to comply with any of the requirements of these Special Provisions, (a) CSXT may require the Department and/or its Contractor to vacate CSXT Property; and (b) CSXT may withhold monies due the Department and/or its Contractor; (c) CSXT may require the Department to withhold monies due its Contractor; and (d) CSXT may cure such failure and the Department shall reimburse CSXT for the cost of curing such failure.

RAILROAD SITE DATA:

The following information is provided as a convenience to the Contractor. This information is subject to change and the Contractor should contact the Railroad to verify the accuracy. Since this information is shown as a convenience to the Contractor but is subject to change, the Contractor shall have no claims whatsoever against either the Railroad or the Department of Transportation for any delays or additional costs incurred based on changes in this information.

Number of tracks	-	1
Number of trains per day	-	4
Maximum speed of trains	-	25 MPH

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-24) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Water Resources, DEQ State of North Carolina
Buffer Certification	Division of Water Resources, DEQ State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project.

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 *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.

P-2

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JOSH STEIN
GOVERNOR

J.R. "JOEY" HOPKINS
SECRETARY

MEMORANDUM TO: File

FROM: Gregory M. Blakeney
Senior Rail Project Development Engineer
Rail Division
North Carolina Department of Transportation

SUBJECT: Environmental Permits for Rogers Road (SR 2052) Grade Separation over CSX Railroad (Crossing No. 633 905 Y), Wake County, NC. TIP No. P-5707

Please find enclosed the following permits and associated general conditions for this project:

Agency	Permit Type	Permit Expiration
US Army Corps of Engineers Section 404 Clean Water Act Permit	Individual Permit Modification (Original June 19, 2020)	December 31, 2029 (Extended from December 31, 2025)
NC Division of Water Resources Section 401 Water Quality Certification	Individual Water Quality Certification No. 4222 Modification	December 31, 2029
NC Division of Water Resources Buffer Certification	Neuse River Riparian Buffer Authorization Modification	June 13, 2030

Work is authorized by the above referenced permits provided it is accomplished in strict accordance with the permitted plans.

The Division Environmental Office must be consulted if any deviation from the permit(s) is required.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
DIVISION 5 OFFICE
2612 NORTH DUKE STREET
DURHAM, NC 27704
CS # 17-27-03

Telephone: (919) 317-4700
Fax: (919) 317-4710
Customer Service: 1-877-368-4968

Website: www.ncdot.gov

Location:
2612 NORTH DUKE STREET
DURHAM, NC 27704

P-3

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, WILMINGTON DISTRICT
RALEIGH FIELD OFFICE
3331 HERITAGE TRADE DRIVE SUITE 105
WAKE FOREST NC 27587

June 26, 2025

Regulatory Program

Sent Via Email: alaad@ncdot.gov

Greg Blakeney
Senior Rail Project Development Engineer
NCDOT Rail Division
1553 Mail Service Center
Raleigh, NC 27699-1553

Dear Mr. Blakeney:

Reference the Department of the Army (DA) permit issued to the North Carolina Department of Transportation (NCDOT), Rail Division, on June 22, 2020. This permit authorized the discharge of fill material into waters of the United States for construction of Project P-5707, rail grade separation at SR 2052 (Roger Road) in Wake Forest, Wake County, NC.

On June 10, 2025, the U.S. Army Corps of Engineers (Corps) received a request from NCDOT to modify the standard permit for the P-5707 project (Mod01), to authorized small changes in construction design to prevent erosion and minimize impact. The enclosed revised permit drawings (REVISED 05/08/2025) reflecting these changes were also submitted on June 10, 2025.

The total waters of the U.S. impacts, including wetland, for the P-5707 project are 0.01 acre of permanent loss impact to riparian wetlands and 992 linear feet (0.17 acre) of streams (724 linear feet (0.25 acre) permanent loss impacts, 214 linear feet (0.06 acre) riprap bank or embedded channel stabilization, and 54 linear feet (0.04 acre) temporary impacts).

The Corps has completed the evaluation of your request and has determined that it is appropriate and reasonable, and that no public notice is required for this modification. Therefore, the permit is modified as requested and as shown on the enclosed revised Permit Drawings, Sheets 1 – 13 of 13 (REVISED 05/08/2025).

The compensatory stream mitigation requirement has been reduced by 448 linear feet, as indicated on the attached revised Compensatory Mitigation Responsibility Transfer form, because of a change to not require compensatory mitigation for permanent impacts due to rip rap bank or embedded channel stabilization.

The permit expiration date is extended to December 31, 2029,

All other conditions of the permit remain in effect as written. Should you have any questions, contact Mr. Eric Alsmeyer, via email at Eric.C.Alsmeyer@usace.army.mil or by telephone at (919) 554-4884, extension 23.

FOR THE COMMANDER

M. Scott Jones, PWS
WRDA / Transportation Branch Chief

Enclosures

cc: Allison Keith, Axiom Environmental, Inc. (via akeith@axiomenvironmental.org)

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

June 19, 2020

Regulatory Division/1200A

Action ID: SAW-2020-00340

Mr. James Bridges
North Carolina Department of Transportation
Rail Division
1553 Mail Service Center
Raleigh, North Carolina 27699

Dear Mr. Bridges:

In accordance with your written request of February 20, 2020, and the ensuing administrative record, enclosed is an electronic copy of a permit to construct the Rogers Road grade separation project, TIP number P-5707. This activity involves the permanent discharge of dredged or fill material into, 0.01 acre of riparian non-riverine wetlands, 987 linear feet of stream channel, and the temporary discharge of fill material into 88 linear feet of stream channel.

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, 2025.

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.

Printed on Recycled Paper

You should address all questions regarding this authorization to Mr. James Lastinger in the Raleigh Regulatory Field Office, telephone number (919) 554-4884, extension 32.

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.

FOR THE COMMANDER

Monte Matthews Date: 2020.06.19 14:28:13 -04'00'

Monte Matthews
Lead Project Manager
Wilmington District

Enclosures

Copies Furnished electronically (without special conditions and plans):

Mr. Gary Jordan
U.S. Fish and Wildlife Service
Raleigh Ecological Service Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Ms. Amanetta Somerville
U.S. Environmental Protection Agency Region 4
61 Forsyth Street SW. Atlanta, Ga 30303
National Environmental Policy Act Section
Strategic Programs Office

Ms. Amy Chapman
Transportation Permitting Branch
Department of Environmental Quality
512 N Salisbury Street, 12th Floor
1617 Mail Service Center
Raleigh, NC 27699-1617

Printed on Recycled Paper

Travis W. Wilson
NC Wildlife Resources Commission
1718 Hwy 56 West
Creedmoor, NC 27522

Printed on Recycled Paper

P-8

DEPARTMENT OF THE ARMY PERMIT

Permittee: **NCDOT, RAIL DIVISION**
ATTN: MR. JAMES BRIDGES
Permit No.: **SAW-2020-00340**

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 the grade separation of Rogers Road over an existing CSX railroad crossing. The project involves the permanent discharge of dredged or fill material into 0.01 acre of riparian non-riverine wetlands, 987 linear feet of stream channel and the temporary discharge of fill material into 88 linear feet of stream channel. NCDOT identifies this project as P-5707.**

Project Location: **The project is approximately 0.73 mile in length and encompasses approximately 40 acres and generally consists of the area within 100 feet of the center of the existing Rogers Road and outward along Heritage Center Drive, Grandmark Street, a new driveway access to businesses on Rogers Road east of the railroad crossing, and a new alignment of Heritage Branch Road south of Rogers Road. (35.9525° N, -78.5238° W)**

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2025.** 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).

(X) 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

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

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.

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

James F. Bridges 19 June 2020

(PERMITTEE) **NCDOT, RAIL DIVISION** **(***DATE)*
MR. JAMES BRIDGES

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

FOR THE COMMANDER

Monte Matthews Date: 2020.06.19 14:40:32 -04'00'

(DISTRICT COMMANDER) **ROBERT J. CLARK, COLONEL** (*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)*

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

P-12

SPECIAL CONDITIONS

ACTION ID: SAW-2020-00340
NC DEPARMENT OF TRANSPORTATION RAIL DIVISION
ROGERS ROAD GRADE SEPARATION, P-5707
WAKE COUNTY

WORK LIMITS / NOTIFICATION

1. **Work Limits:** All work authorized by this permit shall be performed in strict compliance with the attached permit plans entitled “TIP Project: P-5707” dated 05/20/2020. The Permittees shall ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Any modification to the attached permit plans must be approved by the U.S. Army Corps of Engineers (Corps) prior to any active construction in waters or wetlands.

2. **Borrow and Waste:** To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent waters and wetlands, except as authorized by this permit, the Permittee shall require its contractors and/or agents to identify all areas to be used as borrow and/or waste sites associated with this project. The Permittee shall provide the U.S. Army Corps of Engineers with appropriate maps indicating the locations of proposed borrow and/or waste sites as soon as such information is available. The Permittee shall submit to the Corps site-specific information needed to ensure that borrow and/or waste sites comply with all applicable Federal requirements, to include compliance with the Endangered Species Act and the National Historic Preservation Act, such as surveys or correspondence with agencies (e.g., the USFWS, the NC-HPO, etc.). The required information shall also include the location of all aquatic features, if any, out to a distance of 400 feet beyond the nearest boundary of the site. The Permittee shall not approve any borrow and/or waste sites before receiving written confirmation from the Corps that the proposed site meets all Federal requirements, whether or not waters of the U.S., including wetlands, are located in the proposed borrow and/or waste site. All delineations of aquatic sites on borrow and/or waste sites shall be verified by the U.S. Army Corps of Engineers and shown on the approved reclamation plans. The Permittee shall ensure that all borrow and/or waste sites comply with Special Condition three of this permit. Additionally, the Permittee shall produce and maintain documentation of all borrow and waste sites associated with this project. This documentation will include data regarding soils, vegetation, hydrology, any delineation(s) of aquatic sites, and any jurisdictional determinations made by the Corps to clearly demonstrate compliance with Special Condition three. All information will be available to the U.S. Army Corps of Engineers upon request. The Permittee shall require its contractors to complete and execute reclamation plans for each borrow and/or waste site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to

the U.S. Army Corps of Engineers within 30 days of the completion of the reclamation work.

3. **Unauthorized Dredge and/or Fill:** Except as authorized by this permit or any U.S. Army Corps of Engineers 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, or shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and waste activities connected with this project. In addition, 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, into, or out of waters or wetlands or to reduce the reach of waters or wetlands.

4. **Permit Distribution:** The Permittees 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 and drawings shall be available at the project site during construction and maintenance of this project.

5. **Preconstruction Meeting:** The Permittees shall conduct an onsite preconstruction meeting between their representatives, contractor's representatives and the appropriate Corps 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 Permittees shall schedule the preconstruction meeting for a time frame when the Corps and North Carolina Division of Water Resources (NCDWR) Project Managers can attend. The Permittees shall invite the Corps and NCDWR Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedule and participate in the required meeting. The thirty (30) day requirement can be waived with the concurrence of the Corps.

SPECIAL CONDITIONS

ACTION ID: SAW-2020-00340
NC DEPARMENT OF TRANSPORTATION RAIL DIVISION
ROGERS ROAD GRADE SEPARATION, P-5707
WAKE COUNTY

6. **Notification of Construction Commencement and Completion:** The Permittees shall notify the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

7. **Reporting Address:** All reports, documentation, and correspondence required by the conditions of this permit shall be submitted to the following: U.S. Army Corps of Engineers, Wilmington District Raleigh Field Office, Attn: James C. Lastinger at 919-554-4884 Ext. 32 / James.C.Lastinger@usace.army.mil. The Permittees shall reference the following permit number, SAW-2020-00340, on all submittals.

8. **Permit Revocation**: The Permittees, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work would, 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.

9. **Reporting Violations:** Violation of these permit conditions or violation of Section 404 of the Clean Water Act shall be reported to the Corps in writing and by telephone at: 919-554-4884 Ext. 32 / James.C.Lastinger@usace.army.mil within 24 hours of the Permittee's discovery of the violation.

10. **Endangered Species Act:** The Permittees shall implement all necessary measures to ensure the authorized activity does not kill, injure, capture, harass, or otherwise harm any federally-listed threatened or endangered species. While accomplishing the authorized work, if the Permittees discover or observe an injured or dead threatened or endangered species, the U.S. Army Corps of Engineers, Wilmington District Raleigh Field Office, Attn: James C. Lastinger at 919-554-4884 ext 32 / James.C.Lastinger@usace.army.mil would be immediately notified to initiate the required Federal coordination.

11. **Endangered Species Act:** The U.S. Fish and Wildlife Service's (USFWS's) Programmatic Biological Opinion (BO) titled "Northern Long-eared Bat (NLEB) Programmatic Biological Opinion for North Carolina Department of Transportation (NCDOT) Activities in Eastern North Carolina (Divisions 1-8)," dated March 25, 2015, and adopted on April 10, 2015, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that are specified in the BO. Your authorization

under this Department of the Army permit is conditional upon your compliance with all the mandatory terms and conditions associated with incidental take of the BO, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Department of the Army permit. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its BO, and with the ESA.

12. **Historic Properties – Discovery of Previously Unknown Remains and Artifacts**: If the Permittee discovers any previously unknown historic, cultural, or archeological remains and/or artifacts while accomplishing the activity authorized by this permit, the Permittee must immediately notify the U.S. Army Corps of Engineers, Wilmington District Raleigh Regulatory Field Office, Attn: Mr. James Lastinger, 3331 Heritage Trade Drive, Suite 105, Wake Forest, North Carolina 27587 or James.C.Lastinger@usace.army.mil to initiate the required Federal coordination. The Permittee must notify the Corps of what has been found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The Corps would initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places

RELATED LAWS

13. **Maintain Flows and Circulation Patterns 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 and/or wetlands.

14. **Sediment and Erosion Control:**

    a. During the clearing phase of the project, heavy equipment shall not be operated in surface waters or stream channels. Temporary stream crossings would be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings would be constructed of non-erodible materials. Grubbing of riparian vegetation would 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. This includes, but is not limited to, sediment control fences and other barriers intended to catch sediment losses.

c. The Permittees shall remove all sediment and erosion control measures placed in waters and/or wetlands, and shall restore natural grades on those areas, prior to project completion.

d. The Permittees shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to ensure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to ensure compliance with the appropriate turbidity water quality standards. 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 shall remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Adequate sedimentation and erosion control measures shall be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures shall be inspected and maintained regularly, especially following rainfall events. All fill material shall be adequately stabilized at the earliest practicable date to prevent sediment from entering adjacent waters or wetlands.

15. **Clean Fill:** The Permittees shall use only clean fill material for this project. The fill material shall be free of items such as trash, construction debris, metal and plastic products, and concrete block with exposed metal reinforcement bars. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act. Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source.

SPECIAL CONDITIONS

ACTION ID: SAW-2020-00340
NC DEPARMENT OF TRANSPORTATION RAIL DIVISION
ROGERS ROAD GRADE SEPARATION, P-5707
WAKE COUNTY

16. **Water Contamination:** All mechanized equipment shall 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 Permittees shall immediately report it to the N.C. Division of Water Resources at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act shall be followed.

AQUATIC LIFE

17. **Aquatic Life Movement:** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area. All discharges of dredged or fill material within waters of the United States shall be designed and constructed, except as authorized as indirect impacts, to maintain low flows to sustain the movement of aquatic species.

18. **Prohibitions on Concrete:** The Permittees shall take measures necessary to prevent live or fresh concrete, including bags of uncured concrete, from coming into contact with any water in or entering 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 (concrete is set and cured).

CULVERTS

19. **Culverts:** Culverts placed within wetlands must be installed in a manner that does not restrict the flows and circulation patterns of waters of the United States. Culverts placed across wetland fills purely for the purposes of equalizing surface water shall not be buried, but the culverts must be of adequate size and/or number to ensure unrestricted transmission of water.

COMPENSATORY MITIGATION

20. 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 Forms. The requirements of these forms, including any special conditions listed on these forms, are hereby incorporated as special conditions of this permit.

P-18

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

JOSH STEIN
Governor
D. REID WILSON
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

June 13, 2025

Mr. Greg Blakeney, Senior Rail Project Development Engineer
NCDOT Rail Division
1553 Mail Service Center
Raleigh, NC 27699-1553
gmblakeney@ncdot.gov

Subject: MODIFICATION to 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for grade separation of CSX Railroad at SR 2052 in Wake County, State Project No.44643.1.1, TIP No. P-5707.
NCDWR Project No. 20200267 ver. 2.

Dear Mr. Blakeney:

Attached hereto is a copy of Certification No.4222 issued to The North Carolina Department of Transportation (NCDOT) dated March 31, 2020 and modified June 13, 2025.

This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of this Water Quality Certification. If you change your project, you must notify the Division and you may be required to submit a new application package with the appropriate fee. If the property is sold, the new owner must be given a copy of this Certification and is responsible for complying with all conditions. [15A NCAC 02H .0507(d)(2)]. This Certification does not relieve the permittee of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

DocuSigned by:
Robert Ridings
80ECA32C7C38490...

Richard E. Rogers Jr, Director
Division of Water Resources

Attachments
cc:
Eric Alsmeyer, USACE Raleigh Regulatory Field Office (Eric.C.Alsmeyer@usace.army.mil)
Anamika Laad, NCDOT Rail Division (alaad@ncdot.gov)
Heather Montague, NCDOT Division 5 Environmental Officer (hwmontague@ncdot.gov)
Allison Keith, Axiom Environmental (AKeith@axiomenvironmental.org)
Beth Harmon, NC Division of Mitigation Services (beth.harmon@deq.nc.gov)
File Copy

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

MODIFICATION of 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 0.01 acres of jurisdictional wetlands and 992 linear feet of jurisdictional streams in Wake County. The project shall be constructed pursuant to the application dated received June 10, 2025. **This approval replaces the one issued March 31, 2020.** The revised authorized impacts are as described below:

Revised Stream Impacts in the Neuse River Basin

Site	Permanent Fill in Intermittent Stream (linear ft)	Riprap Stabilization to Intermittent Stream (linear ft)	Temporary Impact to Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Riprap Stabilization to Perennial Stream (linear ft)	Temporary Impact to Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1A	0	0	0	13	15	10	38	13
1B	0	12	0	184	185	15	396	184
2A	0	2	12	0	0	0	14	0
2B	0	0	0	0	0	0	0	0
2C	0	0	0	495	0	17	512	495
3	32	0	0	0	0	0	32	0
Total	**32**	**14**	**12**	**692**	**200**	**42**	**992**	**692**

Total Stream Impact for Project: 992 linear feet

Wetland Impacts in the Neuse River Basin

Site	Permanent Fill (ac)	Total Wetland Impact (ac)
2A	0.01	0.01
Total	**0.01**	**0.01**

Total Wetland Impact for Project: 0.01 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Neuse 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 June 10, 2025. 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

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

project (now or in the future) exceed 0.1 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.

This Water Quality Certification neither grants nor affirms any property right, license, or privilege in any lands or waters, or any right of use in any waters. This Water Quality Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and does not create any prescriptive right or any right of priority regarding any usage of water. This Water Quality Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Water Quality Certification to possess any prescriptive or other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded. Upon the presentation of proper credentials, the Division may inspect the property.

Conditions of Certification:

1. Compensatory mitigation for 692 linear feet of impact to perennial streams is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Division of Mitigation Service (DMS), and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in a letter dated June 5, 2025 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. All portions of the proposed project draining to 303(d) listed impaired watersheds shall be designed, constructed, and operated with sediment and erosion control measures that meet ***Design Standards in Sensitive Watersheds*** (15A NCAC 4B.0124). However, due to the size of the project, NC DOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres.

3. All portions of the proposed project draining to 303(d) listed impaired watersheds shall not discharge stormwater directly to surface waters. Stormwater shall be treated using appropriate best management practices (e.g., vegetated conveyances, constructed wetlands, detention ponds, etc.) prior to discharging to surface waters.

4. Channel relocations shall be completed and stabilized, and approved by NCDWR, prior to diverting water into the new channel. Stream banks shall be matted with coir-fiber matting. Vegetation used for bank stabilization shall be limited to native riparian vegetation, and should include establishment of a vegetated buffer on both sides of the relocated channel to the maximum extent practical. Also, rip-rap may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. Once the stream has been turned into the new channel, it may be necessary to relocate stranded fish to the new channel to prevent fish kills. [15A NCAC 02H .0506(b)(3)]

5. DWR approves the stormwater drainage design as shown in the 401 application, under the assumption that it meets the requirements of the NCDOT NPDES permit #NCS000250. These plans are enforceable by DWR. Changes to the approved plans are prohibited without prior approval from DWR. If sediment or other pollutants are found to be discharged from the stormwater outfalls, DWR may take enforcement action. NCDOT and DWR shall assess the damage to water quality standards and implement an appropriate action plan to address the impacts. The action plan shall provide an appropriate timeline for implementation as agreed upon by both DWR and NCDOT. This may require NCDOT to obtain a modification to its current 401 and 404 permits.

6. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams, shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

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 the NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required. [15A NCAC 02H.0506(b)(2)]

7. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage. [15A NCAC 02H.0506(b)(2)]

8. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed. [15A NCAC 02H.0506(b)(2)] {some projects may need riprap in thalweg—change condition to say "must be keyed-into streambed"}

9. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species. [15A NCAC 02H.0506(b)(2)]

10. 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]

11. For all streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species. [15A NCAC 02H.0506(b)(2)]

12. 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)]

13. 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)]

14. 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)]

15. 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)]

16. 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)]

17. 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)]

18. 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)]

19. 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)]

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

20. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]

21. 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]

22. 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)]

23. Wetland areas impacted by temporary clearing shall be stabilized and reseeded with native wetland seed. [15A NCAC 02H.0506(b)]

24. 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)]

25. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization, including all non-commercial borrow and waste sites associated with the project, shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification. [15A NCAC 02H.0501 and .0502]

26. 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.

27. 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)]

28. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the "Certification of Completion Form" to notify the NCDWR when all work included in the 401 Certification has been completed. [15A NCAC 02H.0507]

29. 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)]

30. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within jurisdictional wetlands. [15A NCAC 2H.0506; 15A NCAC 2H.0507]

31. 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.

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

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.

32. Sediment and erosion control measures shall not be placed in wetlands or surface waters, or within 5 feet of the top of bank, without prior approval from DWR. [15A NCAC 02H.0506(b)(3) and (c)(3)]

33. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur. [15A NCAC 02H .0506{b)(3) and (c)(3) and 15A NCAC 02B .0200]

34. Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual,* or for linear transportation projects, the *NCDOT Sediment and Erosion Control Manual.*
All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.
For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.* Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.
If the project occurs in waters or watersheds classified as 303(d) Impaired Waters, then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds*. [15A NCAC 02H.0506(b)(3) and (c)(3)]

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. Please be aware that impacting waters without first applying for and securing the issuance of a 401 Water Quality Certification violates Title 15A of the North Carolina Administrative Code (NCAC) 2H .0500. Title 15A NCAC 2H .0500 requires certifications pursuant to Section 401 of the Clean Water Act whenever construction or operation of facilities will result in a discharge into navigable waters, including wetlands, as described in 33 Code of Federal Regulations (CFR) Part 323. It also states any person desiring issuance of the State certification or coverage under a general certification required by Section 401 of the Federal Water Pollution Control Act shall file with the Director of the North Carolina Division of Water Quality. Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. Pursuant to G.S. 143-215.6A, these violations and any future violations are subject to a civil penalty assessment of up to a maximum of $25,000.00 per day for each violation.

This approval and its conditions are final and binding unless contested [G.S. 143-215.5]. Please be aware that impacting waters without first applying for and securing the issuance of a 401 Water Quality Certification violates Title 15A of the North Carolina Administrative Code (NCAC) 2H .0500. Title 15A NCAC 2H .0500 requires certifications pursuant to Section 401 of the Clean Water Act whenever construction or operation of facilities will result in a discharge into navigable waters, including wetlands, as described in 33 Code of Federal Regulations (CFR) Part 323. It also states any person desiring issuance of the State certification or coverage under a general certification required by Section 401 of the Federal Water Pollution Control Act shall file with the Director of the North Carolina Division of Water Quality. Pursuant to G.S. 143-215.6A, these violations and any future violations are subject to a civil penalty assessment of up to a maximum of $25,000.00 per day for each violation.

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

This Certification can be contested as provided in Chapter 150B of the North Carolina General Statutes by filing a Petition for a Contested Case Hearing (Petition) with the North Carolina Office of Administrative Hearings (OAH) **within sixty (60) calendar days**. Requirements for filing a Petition are set forth in Chapter 150B of the North Carolina General Statutes and Title 26 of the North Carolina Administrative Code. Additional information regarding requirements for filing a Petition and Petition forms may be accessed at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000.

A party filing a Petition must serve a copy of the Petition on:
William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

If the party filing the Petition is not the permittee, then the party must also serve the recipient of the Certification in accordance with N.C.G.S 150B-23(a).

This the 13th day of June 2025

DIVISION OF WATER RESOURCES

DocuSigned by:
Robert Ridings
80ECA32C7C38490...

Richard E. Rogers, Jr, Director

WQC No. 4222

P-25

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

JOSH STEIN
Governor
D. REID WILSON
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

June 13, 2025

DWR #20200267 ver.2
Wake County

Mr. Greg Blakeney, Senior Rail Project Development Engineer
NCDOT Rail Division
1553 Mail Service Center
Raleigh, NC 27699-1553
gmblakeney@ncdot.gov

MODIFICATION of APPROVAL of NEUSE RIPARIAN BUFFER IMPACTS WITH ADDITIONAL CONDITIONS
PROJECT: TIP# P-5707: CSX Railroad Grade Separation at SR 2052

Dear Mr. Blakeney:

You have our approval for the impacts listed below for the purpose described in your application received by the Division of Water Resources (Division) on June 10, 2025. These impacts are covered by the Neuse Buffer Rules and the conditions listed below. Please note that you should get any other federal, state or local permits before proceeding with your project, including those required by (but not limited to) Sediment and Erosion Control, Non-Discharge, and Water Supply Watershed regulations. The following impacts are hereby approved, provided that all of the Conditions listed below and all of the conditions of the Neuse Buffer Rules are met. **This approval replaces the one issued March 31, 2020.** No other impacts are approved, including incidental impacts. [15A NCAC 02B.0267(11)]

Revised Neuse Riparian Buffer Impacts

Site	Zone 1 Impact (sq ft)	Zone 1 Buffer Mitigation Required (using 3:1 ratio)		Zone 2 Impact (sq ft)	Zone 2 Buffer Mitigation Required (using 1.5:1 ratio)
1A	4990	N/A		4809	N/A
1B	11444	34332		4100	6150
1C	0	0		271	407
2	37909	113727		25349	38023
3	2878	N/A		667	N/A
Utility 1A & 1B	1729	N/A		2510	N/A
Totals	**58950**	**148059**		**37706**	**44580**

* n/a = Impact Allowable; No mitigation required
Total Buffer Impact for Project: 96656 square feet.

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of this Authorization Certificate. If you change your project, you must notify the Division and you may be required to submit a new application package. If the property is sold, the new owner must be given a copy of this Authorization Certificate and is responsible for complying with all conditions. [15A NCAC 02B.0267(11)] If you are unable to comply with any of the conditions below, you must notify the DWR Transportation Permitting Branch within 24 hours (or the next business day if a weekend or holiday) from the time the permittee becomes aware of the circumstances.
The permittee shall report to the NC Division of Water Resources any noncompliance with the conditions of this Authorization Certificate and/or any violation of state regulated riparian buffer rules [15A NCAC 02B.0714] . Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the applicant became aware of the circumstances.

Conditions of Approval:

1. Compensatory mitigation for impacts to 49353 square feet of protected riparian buffers in Zone 1 and 29720 square feet of protected riparian buffers in Zone 2 shall be required. We understand that you have chosen to perform compensatory mitigation for impacts to protected buffers through use of the North Carolina Division of Mitigation Services (DMS). Mitigation for unavoidable impacts to Neuse Riparian Buffers shall be provided in the Neuse River Basin and done in accordance with 15A NCAC 2B.0295**.** The DMS has indicated in a letter dated June 5, 2025 that they will assume responsibility for satisfying the compensatory mitigation requirements for the above-referenced project, in accordance with DMS's Mitigation Banking Instrument signed June 14, 2016.

2. All riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated. Maintained buffers shall be permanently revegetated with non-woody species by the end of the growing season following completion of construction. For the purpose of this condition, maintained buffer areas are defined as areas within the transportation corridor that will be subject to regular NCDOT maintenance activities including mowing. The area with non-maintained buffers shall be permanently revegetated with native woody species before the next growing season following completion of construction. [15A NCAC 02B.0714]

3. Pursuant to 15A NCAC 02B.0714, sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by the NCDWR. At this time, the NCDWR has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.

4. All stormwater runoff shall be directed as sheetflow through stream buffers at non-erosive velocities, unless otherwise approved by this certification. [15A NCAC 02B.0714]

5. Native riparian vegetation (i.e., trees and shrubs native to your geographic region) must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction. [[15A NCAC 02B.0714]] & [15A NCAC 02B.0506(b)(2)]

Docusign Envelope ID: 43FC16E9-88F5-4E1F-8AC3-267A0D30BE6D

This approval and its conditions are final and binding unless contested. [G.S. 143-215.5]
This Authorization Certificate can be contested as provided in Chapter 150B of the North Carolina General Statutes by filing a Petition for a Contested Case Hearing (Petition) with the North Carolina Office of Administrative Hearings (OAH) **within sixty (60) calendar days**. Requirements for filing a Petition are set forth in Chapter 150B of the North Carolina General Statutes and Title 26 of the North Carolina Administrative Code. Additional information regarding requirements for filing a Petition and Petition forms may be accessed at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000. One (1) copy of the Petition must also be served to the North Carolina Department of Environmental Quality:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This Authorization shall expire five (5) years from the date of this letter.
This letter completes the review of the Division under the Neuse Riparian Buffer Rules as described in 15A NCAC 02B.0714. Please contact Rob Ridings at rob.ridings@deq.nc.gov or 919-707-8786 if you have any questions or concerns.

Sincerely,

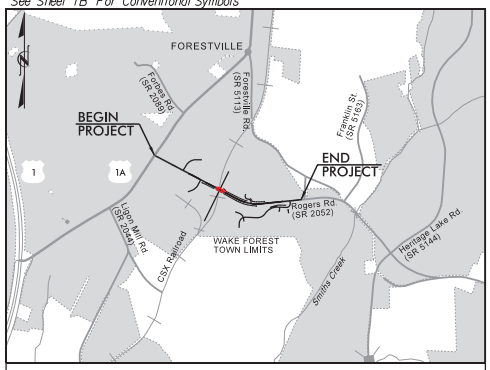
DocuSigned by:
Robert Ridings
80ECA32C7C38490...

Richard E. Rogers, Jr., Director
Division of Water Resources

cc:
Eric Alsmeyer, USACE Raleigh Regulatory Field Office (Eric.C.Alsmeyer@usace.army.mil)
Anamika Laad, NCDOT Rail Division (alaad@ncdot.gov)
Heather Montague, NCDOT Division 5 Environmental Officer (hwmontague@ncdot.gov)
Allison Keith, Axiom Environmental (AKeith@axiomenvironmental.org)
Beth Harmon, NC Division of Mitigation Services (beth.harmon@deq.nc.gov)
File Copy

CONTRACT: C204338 TIP PROJECT: P-5707

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
NCDOT RAIL DIVISION

WAKE COUNTY

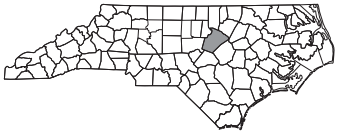
PERMIT DRAWING
SHEET 1 OF 13

REVISED 05/08/2025

ENGLISH

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5707	1	

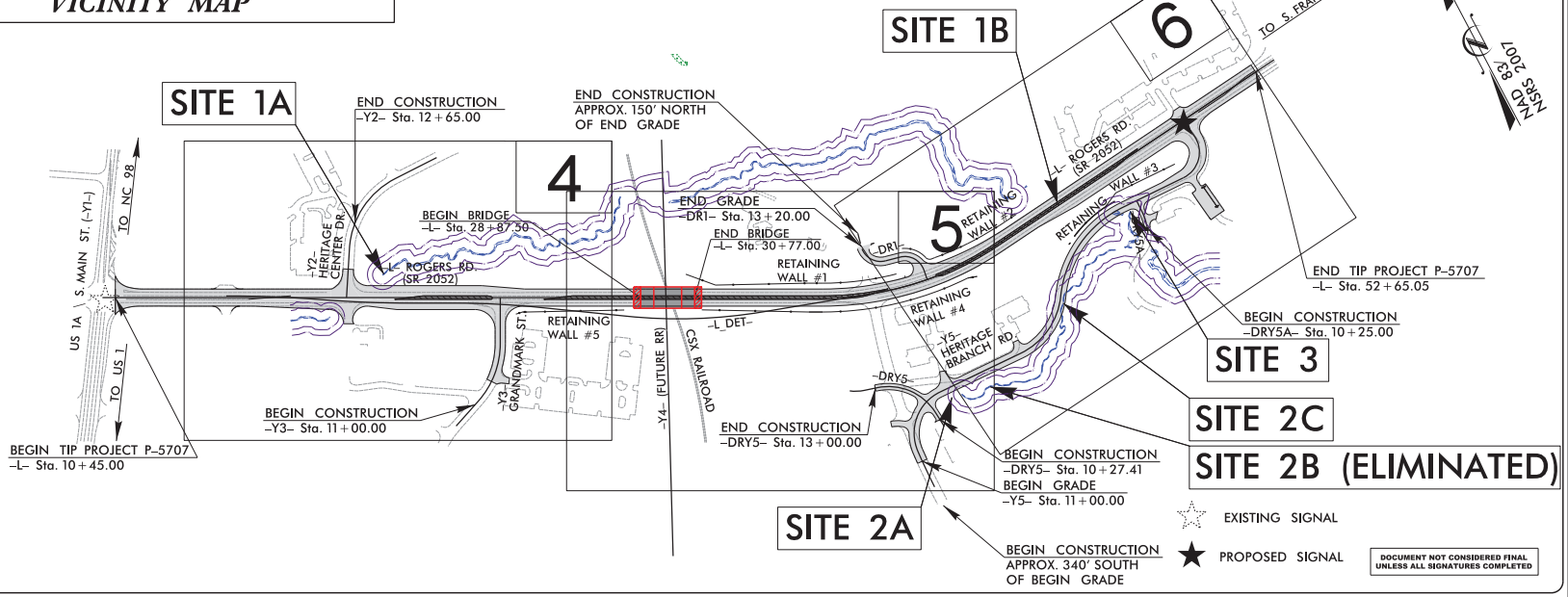
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
44643.1.1		PE
44643.2.1		ROW & UTILITIES
44643.3.1		CONSTRUCTION



LOCATION: *ROGERS ROAD (SR 2052) GRADE SEPARATION OVER CSX RAILROAD (CROSSING NO. 633905Y) AT MILE POST S 142.53*

TYPE OF WORK: *DRAINAGE, GRADING, PAVING, SIGNALS, STRUCTURE, WIDENING & RETAINING WALLS*

WETLAND AND STREAM IMPACTS



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2025 = 27,905
ADT 2045 = 38,166
D = 55%
K = 8%
T = 3% *
V = 50 MPH

*TTST 1.0% / DUAL 2.0%
FUNC CLASS = URBAN MAJOR COLLECTOR

SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT P-5707..... 0.763 miles
LENGTH STRUCTURE TIP PROJECT P-5707..... 0.036 miles
TOTAL LENGTH OF PROJECT P-5707..... 0.799 miles

PLANS PREPARED BY:

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1,Suite 700
Raleigh, North Carolina 27615-5960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

RIGHT OF WAY DATE: June 12, 2018
LETTING DATE: August 19, 2025

Brandon McInnis, P.E.
PROJECT ENGINEER

Jillian Huskey, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

NC DEPARTMENT OF TRANSPORTATION
RAIL DIVISION
ENGINEERING COORDINATION AND SAFETY

2024 STANDARD SPECIFICATIONS

NCDOT RAIL DIVISION
CONTACT: Brian Gackstetter, E.I.

5/8/2025
R:\Hydraulics\PERMITS_Environmental\Drawings\P5707_Hyd_prm_tsh.dgn
cksetter

05/08/25

DRAINAGE DITCH DETAILS

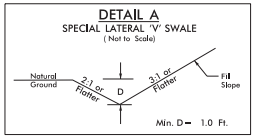
REVISED 05/08/2025

PROJECT REFERENCE NO.	SHEET NO.
P-5707	2D-1
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

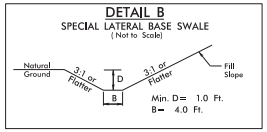
PERMIT DRAWING
SHEET 2 OF 13

DETAIL A
SPECIAL LATERAL 'V' SWALE
(Not to Scale)



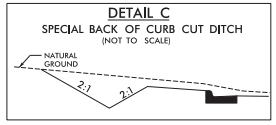
–DRY5– STA. 11+44 TO STA. 12+00 LT
–Y5– STA. 11+50 TO STA. 12+07 LT

DETAIL B
SPECIAL LATERAL BASE SWALE
(Not to Scale)



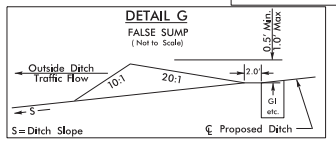
–Y5– STA. 12+50 TO STA. 13+00 LT (DDE = [134] CY)

DETAIL C
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



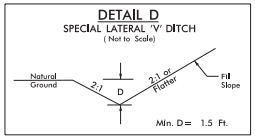
–L– STA. 19+00 TO STA. 21+50 RT

DETAIL G
FALSE SUMP
(Not to Scale)



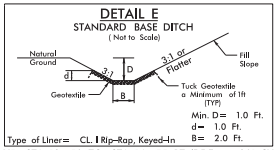
–L– STA. 27+86 RT
–L– STA. 28+14 RT
–Y5– 18+90 RT

DETAIL D
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



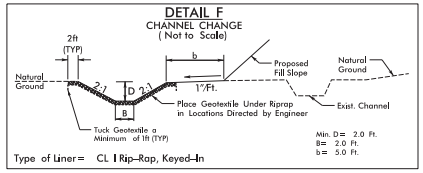
–L– STA. 21+50 TO STA. 23+00 RT

DETAIL E
STANDARD BASE DITCH
(Not to Scale)



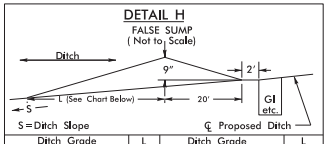
–Y5– STA. 13+50 TO STA. 14+55 RT (DDE = 201 CY;
CL I RIPRAP = 85 TONS; GEOTEXTILE = 163 SY)

DETAIL F
CHANNEL CHANGE
(Not to Scale)



–Y5– STA. 17+36.86 TO STA. 18+75 RT (DDE = 261 CY;
CL I RIPRAP = 144 TONS; GEOTEXTILE = 255 SY)
–Y5– STA. 20+00 TO STA. 21+24 RT (DDE = 298 CY;
CL I RIPRAP = 143 TONS; GEOTEXTILE = 253 SY)

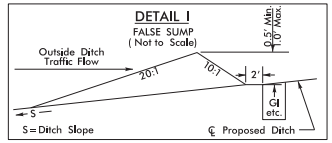
DETAIL H
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

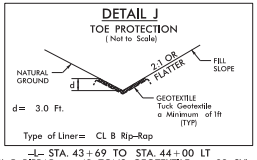
–L_DET– STA. 22+01 LT

DETAIL I
FALSE SUMP
(Not to Scale)



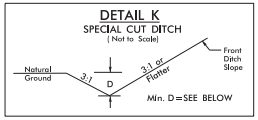
–DRY5– STA. 12+29 RT
–DRY5– STA. 12+63 RT
–L– STA. 19+65 RT
–L– STA. 20+88 RT

DETAIL J
TOE PROTECTION
(Not to Scale)



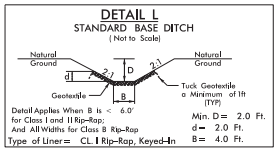
–L– STA. 43+69 TO STA. 44+00 LT
(CL B RIPRAP = 42 TONS; GEOTEXTILE = 92 SY)
–Y5– STA. 14+90 TO STA. 16+60 LT
(CL B RIPRAP = 105 TONS; GEOTEXTILE = 254 SY)
–Y5– STA. 17+50 TO STA. 20+00 LT
(CL B RIPRAP = 185 TONS; GEOTEXTILE = 425 SY)

DETAIL K
SPECIAL CUT DITCH
(Not to Scale)



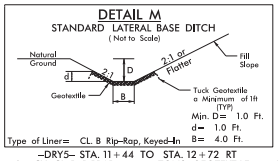
–L_DET– STA. 17+66.44 TO STA. 19+16.47 RT, D/d=1.5'
–L_DET– STA. 20+16.62 TO STA. 20+66.79 RT, D/d=1.0'
–L_DET– STA. 20+66.79 TO STA. 22+67.79 RT, D/d=1.0' *
–L_DET– STA. 21+17.02 TO STA. 23+15.66 LT, D/d=1.0'
–L_DET– STA. 31+23.65 TO STA. 31+74.39 RT, D/d=1.0'

DETAIL L
STANDARD BASE DITCH
(Not to Scale)



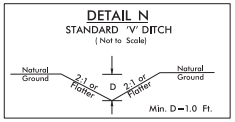
–Y2– STA. 11+11 RT, L=82', S=9.40%,
BEG ELEV=342.5, END ELEV=334.8
CL I RIPRAP = 75 TON
GEOTEXTILE = 163 SY
(DDE = 55 CY)

DETAIL M
STANDARD LATERAL BASE DITCH
(Not to Scale)



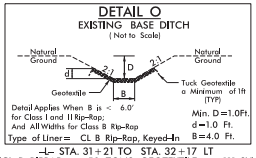
–DRY5– STA. 11+44 TO STA. 12+72 RT
(DDE = 125 CY; CL B RIPRAP = 75 TONS; GEOTEXTILE = 205 SY)

DETAIL N
STANDARD 'V' DITCH
(Not to Scale)



–L_DET– STA. 23+68.31 RT, L=189', S=2.33%, *
BEG ELEV=347.4, END ELEV=342.6
(DDE = 147 CY)
–L_DET– STA. 24+67.66 LT, L=24', S=3.45%,
BEG ELEV=346.8, END ELEV=346.0
(DDE = 44 CY)
–L_DET– STA. 24+91.41 LT, L=66', S=3.05%,
BEG ELEV=346.0, END ELEV=346.2
(DDE = 58 CY)
–L_DET– STA. 26+18.82 RT, L=100', S=6.94%, *
BEG ELEV=343.2, END ELEV=336.3
(DDE = 80 CY)
–L_DET– STA. 30+22.02 RT, L=102, S=3.15%, *
BEG ELEV=332.7, END ELEV=333.5
(DDE = 307 CY)
–L– STA. 35+00 RT, 100, S=0.85%
BEG ELEV=332.7, END ELEV=333.5
(DDE = 161 CY)

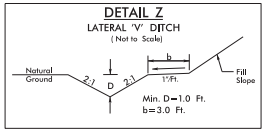
DETAIL O
EXISTING BASE DITCH
(Not to Scale)



–L– STA. 31+21 TO STA. 32+17 LT
(CL B RIPRAP = 50 TONS; GEOTEXTILE = 111 SY)

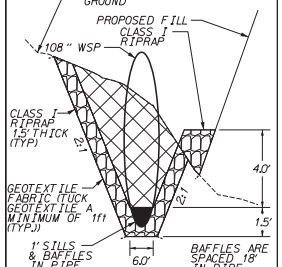
*DITCH TO BE CONSTRUCTED DURING DETOUR PHASE AND RETAINED THROUGH FINAL CONSTRUCTION

DETAIL Z
LATERAL 'V' DITCH
(Not to Scale)



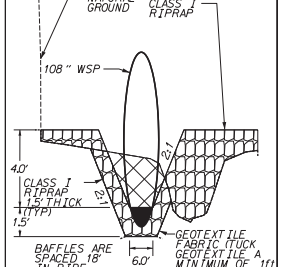
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT

DETAIL R



INLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=76'
–L– STA. 43+36 LT

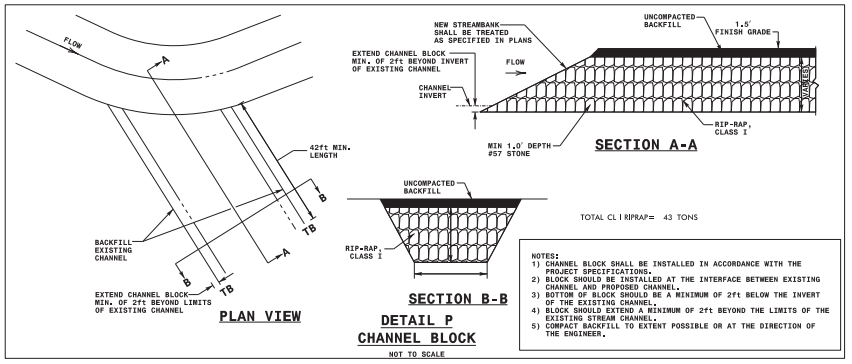
DETAIL S



OUTLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=116'
–Y5– STA. 23+02 RT

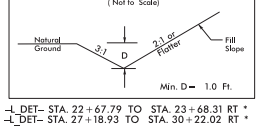
PERMANENT CHANNEL EXCAVATION

TOTAL CHANNEL EXCAVATION = 900 CY (360 CY INLET, 540 CY OUTLET)
TOTAL CL I RIP RAP = 1300 TONS (390 TONS INLET, 910 TONS OUTLET)
TOTAL GEOTEXTILE FAB. = 1200 SY (630 SY INLET, 570 SY OUTLET)



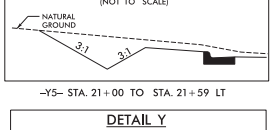
–L– STA. 43+21 LT
–Y5– STA. 23+53 RT

DETAIL U
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



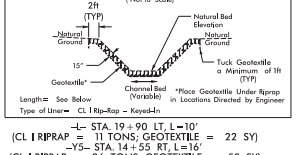
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT *
–L_DET– STA. 27+18.93 TO STA. 30+22.02 RT *

DETAIL X
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



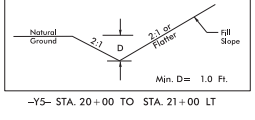
–Y5– STA. 21+00 TO STA. 21+59 LT

DETAIL T
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



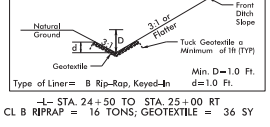
–L– STA. 19+90 LT, L=10'
(CL I RIPRAP = 11 TONS; GEOTEXTILE = 22 SY)
–Y5– STA. 14+55 RT, L=16'
(CL I RIPRAP = 26 TONS; GEOTEXTILE = 50 SY)

DETAIL V
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



–Y5– STA. 20+00 TO STA. 21+00 LT

DETAIL Y
SPECIAL 'V' DITCH
(Not to Scale)

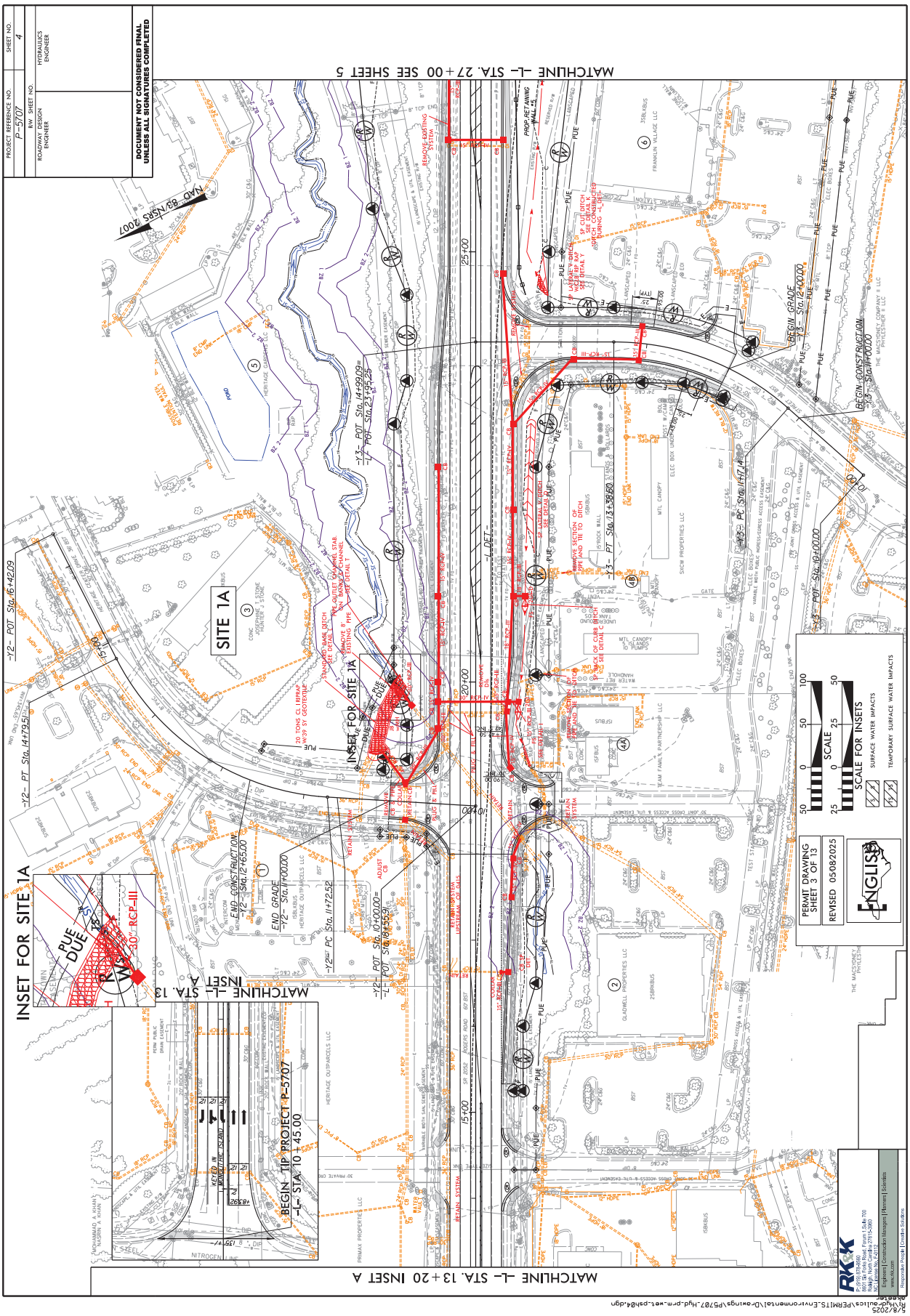


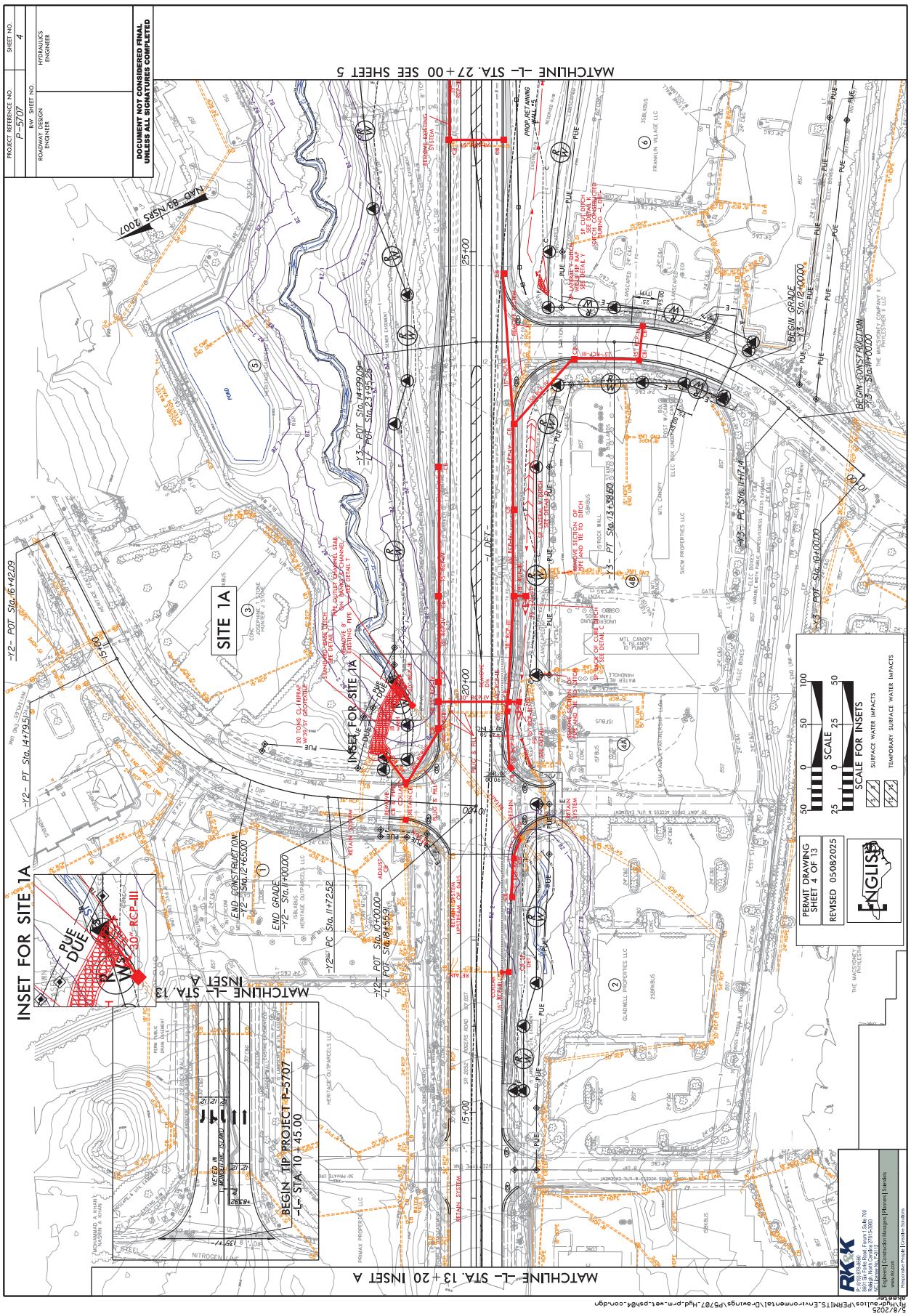
–L– STA. 24+50 TO STA. 25+00 RT
CL B RIPRAP = 16 TONS; GEOTEXTILE = 36 SY

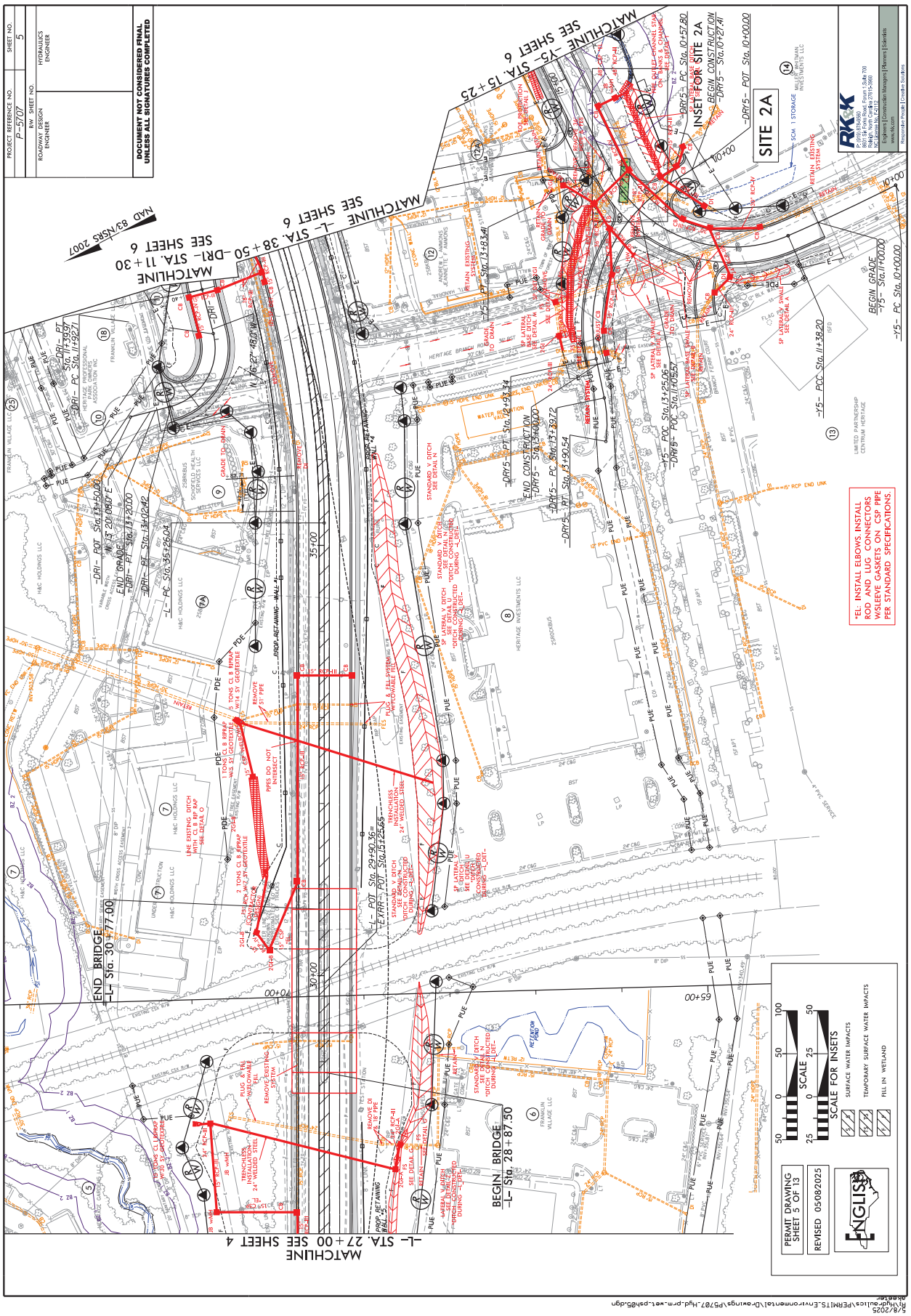
RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3060
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

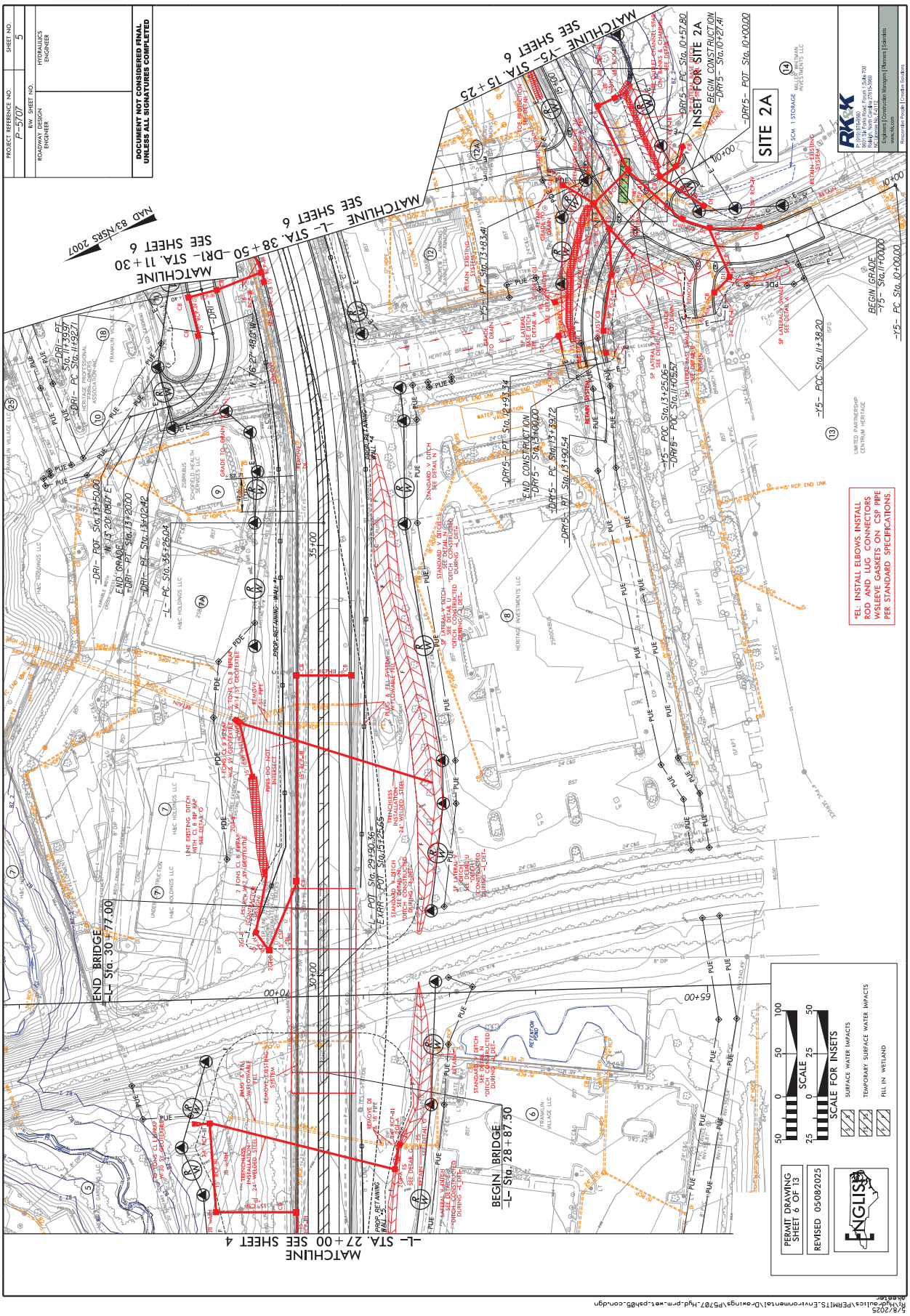
P-29

5/8/2025
R:\Projects\Roulios\PERMITS_Environmental\Drawings\P5707_Hyd_prm_Ditch Detail.dgn
dleger


PROJECT REFERENCE NO. P-5707
SHEET NO. 4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
MATCHLINE -L- STA. 27+00 SEE SHEET 5
MATCHLINE -L- STA. 13+20 INSET A
MATCHLINE -L- STA. 13 INSET A
INSET FOR SITE 1A
SITE 1A
INSET FOR SITE 1A
-Y2- POT Sta.16+42.09
-Y2- PT Sta.14+79.51
-Y2- PC Sta.11+72.52
-Y2- POT Sta.10+00.00=
-L- Sta.10+45.00
-L- BEGIN TIP PROJECT P-5707
-Y2- Sta.11+00.00
END GRADE
-Y2- Sta.12+65.00
END CONSTRUCTION
-Y3- POT Sta.14+99.09=
-Y2- POT Sta.21+95.25
-Y3- PT Sta.13+39.20
-Y3- PC Sta.14+17.44
-Y3- POT Sta.19+00.00
BEGIN GRADE
-Y3- Sta.12+00.00
BEGIN CONSTRUCTION
-Y3- Sta.13+00.00
-L- DET -
PROP. RET. WALL #5
PROP. RET. WALL #6
PROP. RET. WALL #7
PROP. RET. WALL #8
PROP. RET. WALL #9
PROP. RET. WALL #10
PROP. RET. WALL #11
PROP. RET. WALL #12
PROP. RET. WALL #13
PROP. RET. WALL #14
PROP. RET. WALL #15
PROP. RET. WALL #16
PROP. RET. WALL #17
PROP. RET. WALL #18
PROP. RET. WALL #19
PROP. RET. WALL #20
PROP. RET. WALL #21
PROP. RET. WALL #22
PROP. RET. WALL #23
PROP. RET. WALL #24
PROP. RET. WALL #25
PROP. RET. WALL #26
PROP. RET. WALL #27
PROP. RET. WALL #28
PROP. RET. WALL #29
PROP. RET. WALL #30
PROP. RET. WALL #31
PROP. RET. WALL #32
PROP. RET. WALL #33
PROP. RET. WALL #34
PROP. RET. WALL #35
PROP. RET. WALL #36
PROP. RET. WALL #37
PROP. RET. WALL #38
PROP. RET. WALL #39
PROP. RET. WALL #40
PROP. RET. WALL #41
PROP. RET. WALL #42
PROP. RET. WALL #43
PROP. RET. WALL #44
PROP. RET. WALL #45
PROP. RET. WALL #46
PROP. RET. WALL #47
PROP. RET. WALL #48
PROP. RET. WALL #49
PROP. RET. WALL #50
PROP. RET. WALL #51
PROP. RET. WALL #52
PROP. RET. WALL #53
PROP. RET. WALL #54
PROP. RET. WALL #55
PROP. RET. WALL #56
PROP. RET. WALL #57
PROP. RET. WALL #58
PROP. RET. WALL #59
PROP. RET. WALL #60
PROP. RET. WALL #61
PROP. RET. WALL #62
PROP. RET. WALL #63
PROP. RET. WALL #64
PROP. RET. WALL #65
PROP. RET. WALL #66
PROP. RET. WALL #67
PROP. RET. WALL #68
PROP. RET. WALL #69
PROP. RET. WALL #70
PROP. RET. WALL #71
PROP. RET. WALL #72
PROP. RET. WALL #73
PROP. RET. WALL #74
PROP. RET. WALL #75
PROP. RET. WALL #76
PROP. RET. WALL #77
PROP. RET. WALL #78
PROP. RET. WALL #79
PROP. RET. WALL #80
PROP. RET. WALL #81
PROP. RET. WALL #82
PROP. RET. WALL #83
PROP. RET. WALL #84
PROP. RET. WALL #85
PROP. RET. WALL #86
PROP. RET. WALL #87
PROP. RET. WALL #88
PROP. RET. WALL #89
PROP. RET. WALL #90
PROP. RET. WALL #91
PROP. RET. WALL #92
PROP. RET. WALL #93
PROP. RET. WALL #94
PROP. RET. WALL #95
PROP. RET. WALL #96
PROP. RET. WALL #97
PROP. RET. WALL #98
PROP. RET. WALL #99
PROP. RET. WALL #100
PROP. RET. WALL #101
PROP. RET. WALL #102
PROP. RET. WALL #103
PROP. RET. WALL #104
PROP. RET. WALL #105
PROP. RET. WALL #106
PROP. RET. WALL #107
PROP. RET. WALL #108
PROP. RET. WALL #109
PROP. RET. WALL #110
PROP. RET. WALL #111
PROP. RET. WALL #112
PROP. RET. WALL #113
PROP. RET. WALL #114
PROP. RET. WALL #115
PROP. RET. WALL #116
PROP. RET. WALL #117
PROP. RET. WALL #118
PROP. RET. WALL #119
PROP. RET. WALL #120
PROP. RET. WALL #121
PROP. RET. WALL #122
PROP. RET. WALL #123
PROP. RET. WALL #124
PROP. RET. WALL #125
PROP. RET. WALL #126
PROP. RET. WALL #127
PROP. RET. WALL #128
PROP. RET. WALL #129
PROP. RET. WALL #130
PROP. RET. WALL #131
PROP. RET. WALL #132
PROP. RET. WALL #133
PROP. RET. WALL #134
PROP. RET. WALL #135
PROP. RET. WALL #136
PROP. RET. WALL #137
PROP. RET. WALL #138
PROP. RET. WALL #139
PROP. RET. WALL #140
PROP. RET. WALL #141
PROP. RET. WALL #142
PROP. RET. WALL #143
PROP. RET. WALL #144
PROP. RET. WALL #145
PROP. RET. WALL #146
PROP. RET. WALL #147
PROP. RET. WALL #148
PROP. RET. WALL #149
PROP. RET. WALL #150
PROP. RET. WALL #151
PROP. RET. WALL #152
PROP. RET. WALL #153
PROP. RET. WALL #154
PROP. RET. WALL #155
PROP. RET. WALL #156
PROP. RET. WALL #157
PROP. RET. WALL #158
PROP. RET. WALL #159
PROP. RET. WALL #160
PROP. RET. WALL #161
PROP. RET. WALL #162
PROP. RET. WALL #163
PROP. RET. WALL #164
PROP. RET. WALL #165
PROP. RET. WALL #166
PROP. RET. WALL #167
PROP. RET. WALL #168
PROP. RET. WALL #169
PROP. RET. WALL #170
PROP. RET. WALL #171
PROP. RET. WALL #172
PROP. RET. WALL #173
PROP. RET. WALL #174
PROP. RET. WALL #175
PROP. RET. WALL #176
PROP. RET. WALL #177
PROP. RET. WALL #178
PROP. RET. WALL #179
PROP. RET. WALL #180
PROP. RET. WALL #181
PROP. RET. WALL #182
PROP. RET. WALL #183
PROP. RET. WALL #184
PROP. RET. WALL #185
PROP. RET. WALL #186
PROP. RET. WALL #187
PROP. RET. WALL #188
PROP. RET. WALL #189
PROP. RET. WALL #190
PROP. RET. WALL #191
PROP. RET. WALL #192
PROP. RET. WALL #193
PROP. RET. WALL #194
PROP. RET. WALL #195
PROP. RET. WALL #196
PROP. RET. WALL #197
PROP. RET. WALL #198
PROP. RET. WALL #199
PROP. RET. WALL #200
PROP. RET. WALL #201
PROP. RET. WALL #202
PROP. RET. WALL #203
PROP. RET. WALL #204
PROP. RET. WALL #205
PROP. RET. WALL #206
PROP. RET. WALL #207
PROP. RET. WALL #208
PROP. RET. WALL #209
PROP. RET. WALL #210
PROP. RET. WALL #211
PROP. RET. WALL #212
PROP. RET. WALL #213
PROP. RET. WALL #214
PROP. RET. WALL #215
PROP. RET. WALL #216
PROP. RET. WALL #217
PROP. RET. WALL #218
PROP. RET. WALL #219
PROP. RET. WALL #220
PROP. RET. WALL #221
PROP. RET. WALL #222
PROP. RET. WALL #223
PROP. RET. WALL #224
PROP. RET. WALL #225
PROP. RET. WALL #226
PROP. RET. WALL #227
PROP. RET. WALL #228
PROP. RET. WALL #229
PROP. RET. WALL #230
PROP. RET. WALL #231
PROP. RET. WALL #232
PROP. RET. WALL #233
PROP. RET. WALL #234
PROP. RET. WALL #235
PROP. RET. WALL #236
PROP. RET. WALL #237
PROP. RET. WALL #238
PROP. RET. WALL #239
PROP. RET. WALL #240
PROP. RET. WALL #241
PROP. RET. WALL #242
PROP. RET. WALL #243
PROP. RET. WALL #244
PROP. RET. WALL #245
PROP. RET. WALL #246
PROP. RET. WALL #247
PROP. RET. WALL #248
PROP. RET. WALL #249
PROP. RET. WALL #250
PROP. RET. WALL #251
PROP. RET. WALL #252
PROP. RET. WALL #253
PROP. RET. WALL #254
PROP. RET. WALL #255
PROP. RET. WALL #256
PROP. RET. WALL #257
PROP. RET. WALL #258
PROP. RET. WALL #259
PROP. RET. WALL #260
PROP. RET. WALL #261
PROP. RET. WALL #262
PROP. RET. WALL #263
PROP. RET. WALL #264
PROP. RET. WALL #265
PROP. RET. WALL #266
PROP. RET. WALL #267
PROP. RET. WALL #268
PROP. RET. WALL #269
PROP. RET. WALL #270
PROP. RET. WALL #271
PROP. RET. WALL #272
PROP. RET. WALL #273
PROP. RET. WALL #274
PROP. RET. WALL #275
PROP. RET. WALL #276
PROP. RET. WALL #277
PROP. RET. WALL #278
PROP. RET. WALL #279
PROP. RET. WALL #280
PROP. RET. WALL #281
PROP. RET. WALL #282
PROP. RET. WALL #283
PROP. RET. WALL #284
PROP. RET. WALL #285
PROP. RET. WALL #286
PROP. RET. WALL #287
PROP. RET. WALL #288
PROP. RET. WALL #289
PROP. RET. WALL #290
PROP. RET. WALL #291
PROP. RET. WALL #292
PROP. RET. WALL #293
PROP. RET. WALL #294
PROP. RET. WALL #295
PROP. RET. WALL #296
PROP. RET. WALL #297
PROP. RET. WALL #298
PROP. RET. WALL #299
PROP. RET. WALL #300
PROP. RET. WALL #301
PROP. RET. WALL #302
PROP. RET. WALL #303
PROP. RET. WALL #304
PROP. RET. WALL #305
PROP. RET. WALL #306
PROP. RET. WALL #307
PROP. RET. WALL #308
PROP. RET. WALL #309
PROP. RET. WALL #310
PROP. RET. WALL #311
PROP. RET. WALL #312
PROP. RET. WALL #313
PROP. RET. WALL #314
PROP. RET. WALL #315
PROP. RET. WALL #316
PROP. RET. WALL #317
PROP. RET. WALL #318
PROP. RET. WALL #319
PROP. RET. WALL #320
PROP. RET. WALL #321
PROP. RET. WALL #322
PROP. RET. WALL #323
PROP. RET. WALL #324
PROP. RET. WALL #325
PROP. RET. WALL #326
PROP. RET. WALL #327
PROP. RET. WALL #328
PROP. RET. WALL #329
PROP. RET. WALL #330
PROP. RET. WALL #331
PROP. RET. WALL #332
PROP. RET. WALL #333
PROP. RET. WALL #334
PROP. RET. WALL #335
PROP. RET. WALL #336
PROP. RET. WALL #337
PROP. RET. WALL #338
PROP. RET. WALL #339
PROP. RET. WALL #340
PROP. RET. WALL #341
PROP. RET. WALL #342
PROP. RET. WALL #343
PROP. RET. WALL #344
PROP. RET. WALL #345
PROP. RET. WALL #346
PROP. RET. WALL #347
PROP. RET. WALL #348
PROP. RET. WALL #349
PROP. RET. WALL #350
PROP. RET. WALL #351
PROP. RET. WALL #352
PROP. RET. WALL #353
PROP. RET. WALL #354
PROP. RET. WALL #355
PROP. RET. WALL #356
PROP. RET. WALL #357
PROP. RET. WALL #358
PROP. RET. WALL #359
PROP. RET. WALL #360
PROP. RET. WALL #361
PROP. RET. WALL #362
PROP. RET. WALL #363
PROP. RET. WALL #364
PROP. RET. WALL #365
PROP. RET. WALL #366
PROP. RET. WALL #367
PROP. RET. WALL #368
PROP. RET. WALL #369
PROP. RET. WALL #370
PROP. RET. WALL #371
PROP. RET. WALL #372
PROP. RET. WALL #373
PROP. RET. WALL #374
PROP. RET. WALL #375
PROP. RET. WALL #376
PROP. RET. WALL #377
PROP. RET. WALL #378
PROP. RET. WALL #379
PROP. RET. WALL #380
PROP. RET. WALL #381
PROP. RET. WALL #382
PROP. RET. WALL #383
PROP. RET. WALL #384
PROP. RET. WALL #385
PROP. RET. WALL #386
PROP. RET. WALL #387
PROP. RET. WALL #388
PROP. RET. WALL #389
PROP. RET. WALL #390
PROP. RET. WALL #391
PROP. RET. WALL #392
PROP. RET. WALL #393
PROP. RET. WALL #394
PROP. RET. WALL #395
PROP. RET. WALL #396
PROP. RET. WALL #397
PROP. RET. WALL #398
PROP. RET. WALL #399
PROP. RET. WALL #400
PROP. RET. WALL #401
PROP. RET. WALL #402
PROP. RET. WALL #403
PROP. RET. WALL #404
PROP. RET. WALL #405
PROP. RET. WALL #406
PROP. RET. WALL #407
PROP. RET. WALL #408
PROP. RET. WALL #409
PROP. RET. WALL #410
PROP. RET. WALL #411
PROP. RET. WALL #412
PROP. RET. WALL #413
PROP. RET. WALL #414
PROP. RET. WALL #415
PROP. RET. WALL #416
PROP. RET. WALL #417
PROP. RET. WALL #418
PROP. RET. WALL #419
PROP. RET. WALL #420
PROP. RET. WALL #421
PROP. RET. WALL #422
PROP. RET. WALL #423
PROP. RET. WALL #424
PROP. RET. WALL #425
PROP. RET. WALL #426
PROP. RET. WALL #427
PROP. RET. WALL #428
PROP. RET. WALL #429
PROP. RET. WALL #430
PROP. RET. WALL #431
PROP. RET. WALL #432
PROP. RET. WALL #433
PROP. RET. WALL #434
PROP. RET. WALL #435
PROP. RET. WALL #436
PROP. RET. WALL #437
PROP. RET. WALL #438
PROP. RET. WALL #439
PROP. RET. WALL #440
PROP. RET. WALL #441
PROP. RET. WALL #442
PROP. RET. WALL #443
PROP. RET. WALL #444
PROP. RET. WALL #445
PROP. RET. WALL #446
PROP. RET. WALL #447
PROP. RET. WALL #448
PROP. RET. WALL #449
PROP. RET. WALL #450
PROP. RET. WALL #451
PROP. RET. WALL #452
PROP. RET. WALL #453
PROP. RET. WALL #454
PROP. RET. WALL #455
PROP. RET. WALL #456
PROP. RET. WALL #457
PROP. RET. WALL #458
PROP. RET. WALL #459
PROP. RET. WALL #460
PROP. RET. WALL #461
PROP. RET. WALL #462
PROP. RET. WALL #463
PROP. RET. WALL #464
PROP. RET. WALL #465
PROP. RET. WALL #466
PROP. RET. WALL #467
PROP. RET. WALL #468
PROP. RET. WALL #469
PROP. RET. WALL #470
PROP. RET. WALL #471
PROP. RET. WALL #472
PROP. RET. WALL #473
PROP. RET. WALL #474
PROP. RET. WALL #475
PROP. RET. WALL #476
PROP. RET. WALL #477
PROP. RET. WALL #478
PROP. RET. WALL #479
PROP. RET. WALL #480
PROP. RET. WALL #481
PROP. RET. WALL #482
PROP. RET. WALL #483
PROP. RET. WALL #484
PROP. RET. WALL #485
PROP. RET. WALL #486
PROP. RET. WALL #487
PROP. RET. WALL #488
PROP. RET. WALL #489
PROP. RET. WALL #490
PROP. RET. WALL #491
PROP. RET. WALL #492
PROP. RET. WALL #493
PROP. RET. WALL #494
PROP. RET. WALL #495
PROP. RET. WALL #496
PROP. RET. WALL #497
PROP. RET. WALL #498
PROP. RET. WALL #499
PROP. RET. WALL #500
PROP. RET. WALL #501
PROP. RET. WALL #502
PROP. RET. WALL #503
PROP. RET. WALL #504
PROP. RET. WALL #505
PROP. RET. WALL #506
PROP. RET. WALL #507
PROP. RET. WALL #508
PROP. RET. WALL #509
PROP. RET. WALL #510
PROP. RET. WALL #511
PROP. RET. WALL #512
PROP. RET. WALL #513
PROP. RET. WALL #514
PROP. RET. WALL #515
PROP. RET. WALL #516
PROP. RET. WALL #517
PROP. RET. WALL #518
PROP. RET. WALL #519
PROP. RET. WALL #520
PROP. RET. WALL #521
PROP. RET. WALL #522
PROP. RET. WALL #523
PROP. RET. WALL #524
PROP. RET. WALL #525
PROP. RET. WALL #526
PROP. RET. WALL #527
PROP. RET. WALL #528
PROP. RET. WALL #529
PROP. RET. WALL #530
PROP. RET. WALL #531
PROP. RET. WALL #532
PROP. RET. WALL #533
PROP. RET. WALL #534
PROP. RET. WALL #535
PROP. RET. WALL #536
PROP. RET. WALL #537
PROP. RET. WALL #538
PROP. RET. WALL #539
PROP. RET. WALL #540
PROP. RET. WALL #541
PROP. RET. WALL #542
PROP. RET. WALL #543
PROP. RET. WALL #544
PROP. RET. WALL #545
PROP. RET. WALL #546
PROP. RET. WALL #547
PROP. RET. WALL #548
PROP. RET. WALL #549
PROP. RET. WALL #550
PROP. RET. WALL #551
PROP. RET. WALL #552
PROP. RET. WALL #553
PROP. RET. WALL #554
PROP. RET. WALL #555
PROP. RET. WALL #556
PROP. RET. WALL #557
PROP. RET. WALL #558
PROP. RET. WALL #559
PROP. RET. WALL #560
PROP. RET. WALL #561
PROP. RET. WALL #562
PROP. RET. WALL #563
PROP. RET. WALL #564
PROP. RET. WALL #565
PROP. RET. WALL #566
PROP. RET. WALL #567
PROP. RET. WALL #568
PROP. RET. WALL #569
PROP. RET. WALL #570
PROP. RET. WALL #571
PROP. RET. WALL #572
PROP. RET. WALL #573
PROP. RET. WALL #574
PROP. RET. WALL #575
PROP. RET. WALL #576
PROP. RET. WALL #577
PROP. RET. WALL #578
PROP. RET. WALL #579
PROP. RET. WALL #580
PROP. RET. WALL #581
PROP. RET. WALL #582
PROP. RET. WALL #583
PROP. RET. WALL #584
PROP. RET. WALL #585
PROP. RET. WALL #586
PROP. RET. WALL #587
PROP. RET. WALL #588
PROP. RET. WALL #589
PROP. RET. WALL #590
PROP. RET. WALL #591
PROP. RET. WALL #592
PROP. RET. WALL #593
PROP. RET. WALL #594
PROP. RET. WALL #595
PROP. RET. WALL #596
PROP. RET. WALL #597
PROP. RET. WALL #598
PROP. RET. WALL #599
PROP. RET. WALL #600
PROP. RET. WALL #601
PROP. RET. WALL #602
PROP. RET. WALL #603
PROP. RET. WALL #604
PROP. RET. WALL #605
PROP. RET. WALL #606
PROP. RET. WALL #607
PROP. RET. WALL #608
PROP. RET. WALL #609
PROP. RET. WALL #610
PROP. RET. WALL #611
PROP. RET. WALL #612
PROP. RET. WALL #613
PROP. RET. WALL #614
PROP. RET. WALL #615
PROP. RET. WALL #616
PROP. RET. WALL #617
PROP. RET. WALL #618
PROP. RET. WALL #619
PROP. RET. WALL #620
PROP. RET. WALL #621
PROP. RET. WALL #622
PROP. RET. WALL #623
PROP. RET. WALL #624
PROP. RET. WALL #625
PROP. RET. WALL #626
PROP. RET. WALL #627
PROP. RET. WALL #628
PROP. RET. WALL #629
PROP. RET. WALL #630
PROP. RET. WALL #631
PROP. RET. WALL #632
PROP. RET. WALL #633
PROP. RET. WALL #634
PROP. RET. WALL #635
PROP. RET. WALL #636
PROP. RET. WALL #637
PROP. RET. WALL #638
PROP. RET. WALL #639
PROP. RET. WALL #640
PROP. RET. WALL #641
PROP. RET. WALL #642
PROP. RET. WALL #643
PROP. RET. WALL #644
PROP. RET. WALL #645
PROP. RET. WALL #646
PROP. RET. WALL #647
PROP. RET. WALL #648
PROP. RET. WALL #649
PROP. RET. WALL #650
PROP. RET. WALL #651
PROP. RET. WALL #652
PROP. RET. WALL #653
PROP. RET. WALL #654
PROP. RET. WALL #655
PROP. RET. WALL #656
PROP. RET. WALL #657
PROP. RET. WALL #658
PROP. RET. WALL #659
PROP. RET. WALL #660
PROP. RET. WALL #661
PROP. RET. WALL #662
PROP. RET. WALL #663
PROP. RET. WALL #664
PROP. RET. WALL #665
PROP. RET. WALL #666
PROP. RET. WALL #667
PROP. RET. WALL #668
PROP. RET. WALL #669
PROP. RET. WALL #670
PROP. RET. WALL #671
PROP. RET. WALL #672
PROP. RET. WALL #673
PROP. RET. WALL #674
PROP. RET. WALL #675
PROP. RET. WALL #676
PROP. RET. WALL #677
PROP. RET. WALL #678
PROP. RET. WALL #679
PROP. RET. WALL #680
PROP. RET. WALL #681
PROP. RET. WALL #682
PROP. RET. WALL #683
PROP. RET. WALL #684
PROP. RET. WALL #685
PROP. RET. WALL #686
PROP. RET. WALL #687
PROP. RET. WALL #688
PROP. RET. WALL #689
PROP. RET. WALL #690
PROP. RET. WALL #691
PROP. RET. WALL #692
PROP. RET. WALL #693
PROP. RET. WALL #694
PROP. RET. WALL #695
PROP. RET. WALL #696
PROP. RET. WALL #697
PROP. RET. WALL #698
PROP. RET. WALL #699
PROP. RET. WALL #700
PROP. RET. WALL #701
PROP. RET. WALL #702
PROP. RET. WALL #703
PROP. RET. WALL #704
PROP. RET. WALL #705
PROP. RET. WALL #706
PROP. RET. WALL #707
PROP. RET. WALL #708
PROP. RET. WALL #709
PROP. RET. WALL #710
PROP. RET. WALL #711
PROP. RET. WALL #712
PROP. RET. WALL #713
PROP. RET. WALL #714
PROP. RET. WALL #715
PROP. RET. WALL #716
PROP. RET. WALL #717
PROP. RET. WALL #718
PROP. RET. WALL #719
PROP. RET. WALL #720
PROP. RET. WALL #721
PROP. RET. WALL #722
PROP. RET. WALL #723
PROP. RET. WALL #724
PROP. RET. WALL #725
PROP. RET. WALL #726
PROP. RET. WALL #727
PROP. RET. WALL #728
PROP. RET. WALL #729
PROP. RET. WALL #730
PROP. RET. WALL #731
PROP. RET. WALL #732
PROP. RET. WALL #733
PROP. RET. WALL #734
PROP. RET. WALL #735
PROP. RET. WALL #736
PROP. RET. WALL #737
PROP. RET. WALL #738
PROP. RET. WALL #739
PROP. RET. WALL #740
PROP. RET. WALL #741
PROP. RET. WALL #742
PROP. RET. WALL #743
PROP. RET. WALL #744
PROP. RET. WALL #745
PROP. RET. WALL #746
PROP. RET. WALL #747
PROP. RET. WALL #748
PROP. RET. WALL #749
PROP. RET. WALL #750
PROP. RET. WALL #751
PROP. RET. WALL #752
PROP. RET. WALL #753
PROP. RET. WALL #754
PROP. RET. WALL #755
PROP. RET. WALL #756
PROP. RET. WALL #757
PROP. RET. WALL #758
PROP. RET. WALL #759
PROP. RET. WALL #760
PROP. RET. WALL #761
PROP. RET. WALL #762
PROP. RET. WALL #763
PROP. RET. WALL #764
PROP. RET. WALL #765
PROP. RET. WALL #766
PROP. RET. WALL #767
PROP. RET. WALL #768
PROP. RET. WALL #769
PROP. RET. WALL #770
PROP. RET. WALL #771
PROP. RET. WALL #772
PROP. RET. WALL #773
PROP. RET. WALL #774
PROP. RET. WALL #775
PROP. RET. WALL #776
PROP. RET. WALL #777
PROP. RET. WALL #778
PROP. RET. WALL #779
PROP. RET. WALL #780
PROP. RET. WALL #781
PROP. RET. WALL #782
PROP. RET. WALL #783
PROP. RET. WALL #784
PROP. RET. WALL #785
PROP. RET. WALL #786
PROP. RET. WALL #787
PROP. RET. WALL #788
PROP. RET. WALL #789
PROP. RET. WALL #790
PROP. RET. WALL #791
PROP. RET. WALL #792
PROP. RET. WALL #793
PROP. RET. WALL #794
PROP. RET. WALL #795
PROP. RET. WALL #796
PROP. RET. WALL #797
PROP. RET. WALL #798
PROP. RET. WALL #799
PROP. RET. WALL #800
PROP. RET. WALL #801
PROP. RET. WALL #802
PROP. RET. WALL #803
PROP. RET. WALL #804
PROP. RET. WALL #805
PROP. RET. WALL #806
PROP. RET. WALL #807
PROP. RET. WALL #808
PROP. RET. WALL #809
PROP. RET. WALL #810
PROP. RET. WALL #811
PROP. RET. WALL #812
PROP. RET. WALL #813
PROP. RET. WALL #814
PROP. RET. WALL #815
PROP. RET. WALL #816
PROP. RET. WALL #817
PROP. RET. WALL #818
PROP. RET. WALL #819
PROP. RET. WALL #820
PROP. RET. WALL #821
PROP. RET. WALL #822
PROP. RET. WALL #823
PROP. RET. WALL #824
PROP. RET. WALL #825
PROP. RET. WALL #826
PROP. RET. WALL #827
PROP. RET. WALL #828
PROP. RET. WALL #829
PROP. RET. WALL #830
PROP. RET. WALL #831
PROP. RET. WALL #832
PROP. RET. WALL #833
PROP. RET. WALL #834
PROP. RET. WALL #835
PROP. RET. WALL #836
PROP. RET. WALL #837
PROP. RET. WALL #838
PROP. RET. WALL #839
PROP. RET. WALL #840
PROP. RET. WALL #841
PROP. RET. WALL #842
PROP. RET. WALL #843
PROP. RET. WALL #844
PROP. RET. WALL #845
PROP. RET. WALL #846
PROP. RET. WALL #847
PROP. RET. WALL #848
PROP. RET. WALL #849
PROP. RET. WALL #850
PROP. RET. WALL #851
PROP. RET. WALL #852
PROP. RET. WALL #853
PROP. RET. WALL #854
PROP. RET. WALL #855
PROP. RET. WALL #856
PROP. RET. WALL #857
PROP. RET. WALL #858
PROP. RET. WALL #859
PROP. RET. WALL #860
PROP. RET. WALL #861
PROP. RET. WALL #862
PROP. RET. WALL #863
PROP. RET. WALL #864
PROP. RET. WALL #865
PROP. RET. WALL #866
PROP. RET. WALL #867
PROP. RET. WALL #868
PROP. RET. WALL #869
PROP. RET. WALL #870
PROP. RET. WALL #871
PROP. RET. WALL #872
PROP. RET. WALL #873
PROP. RET. WALL #874
PROP. RET. WALL #875
PROP. RET. WALL #876
PROP. RET. WALL #877
PROP. RET. WALL #878
PROP. RET. WALL #879
PROP. RET. WALL #880
PROP. RET. WALL #881
PROP. RET. WALL #882
PROP. RET. WALL #883
PROP. RET. WALL #884
PROP. RET. WALL #885
PROP. RET. WALL #886
PROP. RET. WALL #887
PROP. RET. WALL #888
PROP. RET. WALL #889
PROP. RET. WALL #890
PROP. RET. WALL #891
PROP. RET. WALL #892
PROP. RET. WALL #893
PROP. RET. WALL #894
PROP. RET. WALL #895
PROP. RET. WALL #896
PROP. RET. WALL #897
PROP. RET. WALL #898
PROP. RET. WALL #899
PROP. RET. WALL #900
PROP. RET. WALL #901
PROP. RET. WALL #902
PROP. RET. WALL #903
PROP. RET. WALL #904
PROP. RET. WALL #905
PROP. RET. WALL #906
PROP. RET. WALL #907
PROP. RET. WALL #908
PROP. RET. WALL #909
PROP. RET. WALL #910
PROP. RET. WALL #911
PROP. RET. WALL #912
PROP. RET. WALL #913
PROP. RET. WALL #914
PROP. RET. WALL #915
PROP. RET. WALL #916
PROP. RET. WALL #917
PROP. RET. WALL #918
PROP. RET. WALL #919
PROP. RET. WALL #920
PROP. RET. WALL #921
PROP. RET. WALL #922
PROP. RET. WALL #923
PROP. RET. WALL #924
PROP. RET. WALL #925
PROP. RET. WALL #926
PROP. RET. WALL #927
PROP. RET. WALL #928
PROP. RET. WALL #929
PROP. RET. WALL #930
PROP. RET. WALL #931
PROP. RET. WALL #932
PROP. RET. WALL #933
PROP. RET. WALL #934
PROP. RET. WALL #935
PROP. RET. WALL #936
PROP. RET. WALL #937
PROP. RET. WALL #938
PROP. RET. WALL #939
PROP. RET. WALL #940
PROP. RET. WALL #941
PROP. RET. WALL #942
PROP. RET. WALL #943
PROP. RET. WALL #944
PROP. RET. WALL #945
PROP. RET. WALL #946
PROP. RET. WALL #947
PROP. RET. WALL #948
PROP. RET. WALL #949
PROP. RET. WALL #950
PROP. RET. WALL #951
PROP. RET. WALL #952
PROP. RET. WALL #953
PROP. RET. WALL #954
PROP. RET. WALL #955
PROP. RET. WALL #956
PROP. RET. WALL #957
PROP. RET. WALL #958
PROP. RET. WALL #959
PROP. RET. WALL #960
PROP. RET. WALL #961
PROP. RET. WALL #962
PROP. RET. WALL #963
PROP. RET. WALL #964
PROP. RET. WALL #965
PROP. RET. WALL #966
PROP. RET. WALL #967
PROP. RET. WALL #968
PROP. RET. WALL #969
PROP. RET. WALL #970
PROP. RET. WALL #971
PROP. RET. WALL #972
PROP. RET. WALL #973
PROP. RET. WALL #974
PROP. RET. WALL #975
PROP. RET. WALL #976
PROP. RET. WALL #977
PROP. RET. WALL #978
PROP. RET. WALL #979
PROP. RET. WALL #980
PROP. RET. WALL #981
PROP. RET. WALL #982
PROP. RET. WALL #983
PROP. RET. WALL #984
PROP. RET. WALL #985
PROP. RET. WALL #986
PROP. RET. WALL #987
PROP. RET. WALL #988
PROP. RET. WALL #989
PROP. RET. WALL #990
PROP. RET. WALL #991
PROP. RET. WALL #992
PROP. RET. WALL #993
PROP. RET. WALL #994
PROP. RET. WALL #995
PROP. RET. WALL #996
PROP. RET. WALL #997
PROP. RET. WALL #998
PROP. RET. WALL #999
PROP. RET. WALL #1000
PERMIT DRAWING SHEET 3 OF 13
REVISED 05082025
ENGLISH
SCALE
SCALE FOR INSETS
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
RKK
Responsive People | Creative Solutions
8/8/2025
P5707Hyd-plans\PERMITS-Environmental\D-anings\P5707_Hyd-prm-set-psht04.dgn


PROJECT REFERENCE NO.
P-5707
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
MATCHLINE -L- STA. 27+00 SEE SHEET 5
MATCHLINE -L- STA. 13+20 INSET A
INSET FOR SITE 1A
SITE 1A
INSET FOR SITE 1A
MATCHLINE -L- STA. 13 INSET A
BEGIN TIP PROJECT R-5707
-L- STA. 10+45.00
-Y2- POT Sta.16+42.09
-Y2- PT Sta.14+79.51
-Y2- PC Sta.12+65.00
-Y2- POT Sta.10+00.00
-L1- POT Sta.10+55.59
-Y2- Sta.11+72.52
END GRADE
-Y2- Sta.11+00.00
END CONSTRUCTION
-Y2- Sta.12+65.00
-Y3- POT Sta.14+99.09
-L2- POT Sta.21+95.26
-Y3- PT Sta.13+39.20
-Y3- PC Sta.11+71.14
-Y3- POT Sta.10+00.00
BEGIN GRADE
-Y3- Sta.12+40.00
BEGIN CONSTRUCTION
-Y3- Sta.11+00.00
-L- DET -
PROP. RET.WALL #1
-L- STA. 25+00
-L- STA. 20+00
-L- STA. 15+00
-L- STA. 10+00
NAD 83 NSRS 2007
PERMIT DRAWING SHEET 4 OF 13
REVISED 05082025
ENGLISH
SCALE
SCALE FOR INSETS
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
RKK
Responsive People | Creative Solutions
8/8/2025
P:\Hydraulics\PERMITS-Environmental\Drawings\P5707_Hyd-prm-set-psh04-con.dgn


PROJECT REFERENCE NO.
P-5707
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
5
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/NSRS 2007
MATCHLINE -L- STA. 38+50 -DR1- STA. 11+30 SEE SHEET 6
MATCHLINE -L- STA. 27+00 SEE SHEET 4
MATCHLINE -Y5- STA. 15+25 SEE SHEET 6
SITE 2A
INSET FOR SITE 2A
BEGIN CONSTRUCTION -DRY5- Sta. 10+27.41
-DRY5- POT Sta. 10+00.00
-DRY5- PC Sta. 10+57.80
BEGIN GRADE -Y5- Sta. 11+00.00
-Y5- PCC Sta. 11+38.20
-Y5- PC Sta. 13+25.06
-DRY5- POT Sta. 11+40.57
-DRY5- PT Sta. 12+93.34
END CONSTRUCTION -DRY5- Sta. 13+40.00
-DRY5- PC Sta. 13+39.72
-DRY5- PT Sta. 13+90.54
-DR1- POT Sta. 13+50.00
-DR1- PC Sta. 13+19.71
-DR1- PT Sta. 13+02.42
-DR1- POT Sta. 13+20.00
-L- PC Sta. 35+29.04
-DR1- PT Sta. 13+42.00
END GRADE -DR1- Sta. 13+50.80
END BRIDGE -L- Sta. 30+77.00
-L- POT Sta. 29+90.36
-L- PT Sta. 31+12.65
BEGIN BRIDGE -L- Sta. 28+87.50
PROP. RET. WALL #4
PROP. RET. WALL #5
PROP. RET. WALL #6
TEL: INSTALL ELBOWS, INSTALL ROD AND LUG CONNECTORS, W/SLEEVE GASKETS ON CSP PIPE PER STANDARD SPECIFICATIONS.
RK&K
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions
SCALE FOR INSETS
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
FILL IN WETLAND
SCALE
PERMIT DRAWING SHEET 5 OF 13
REVISED 05/08/2025
ENGLISH
5/8/2025
R:\Hydraulics\PERMITS_Environmental\Drawings\P5707_Hyd_prm_set_psh05.dgn

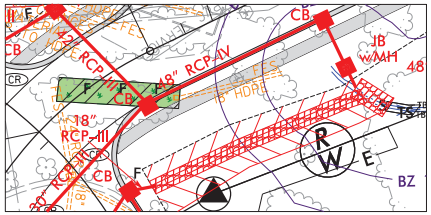

PROJECT REFERENCE NO. P-5707
SHEET NO. 5
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/NSRS 2007
MATCHLINE -L- STA. 38+50 -DR1- STA. 11+30 SEE SHEET 6
MATCHLINE -L- STA. 27+00 SEE SHEET 4
MATCHLINE -Y5- STA. 15+25 SEE SHEET 6
END BRIDGE -L- Sta. 30+77.00
BEGIN BRIDGE -L- Sta. 28+87.50
INSET FOR SITE 2A
SITE 2A
-DR1- PC Sta. 13+50.00
-DR1- PT Sta. 13+92.71
-DR1- POT Sta. 13+20.80
-DR1- PT Sta. 13+02.42
-DR1- PC Sta. 13+26.04
-L- PC Sta. 35+26.04
-DR5- PC Sta. 10+57.80
-DR5- Sta. 10+63.34
-DR5- Sta. 10+27.41
-DR5- POT Sta. 10+00.00
-Y5- PCC Sta. 11+38.20
-Y5- Sta. 11+00.00
-Y5- PC Sta. 10+00.00
-DR5- PT Sta. 12+93.34
-DR5- PC Sta. 13+39.72
-DR5- PT Sta. 13+90.54
-Y5- PCC Sta. 13+25.06
-Y5- POT Sta. 11+40.57
END CONSTRUCTION
BEGIN CONSTRUCTION
BEGIN GRADE
-Y5- PC Sta. 10+00.00
-DR5- POT Sta. 10+00.00
-L- PC Sta. 29+90.36
-L- POT Sta. 31+12.56
-L- PT Sta. 31+34.00
-L- PT Sta. 32+30.54
-L- PC Sta. 33+39.72
-L- PT Sta. 33+90.54
-L- PC Sta. 34+25.06
-L- POT Sta. 34+40.57
-L- PT Sta. 35+26.04
-L- PC Sta. 36+26.04
-L- POT Sta. 36+20.80
-L- PT Sta. 36+02.42
-L- PC Sta. 36+50.00
-L- PT Sta. 36+92.71
-L- PC Sta. 37+50.00
-L- PT Sta. 37+92.71
-L- PC Sta. 38+50.00
-L- PT Sta. 38+92.71
-L- PC Sta. 39+50.00
-L- PT Sta. 39+92.71
-L- PC Sta. 40+50.00
-L- PT Sta. 40+92.71
-L- PC Sta.

PROJECT REFERENCE NO.	SHEET NO.
P-5707	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83 NSRS 2007

INSET FOR SITE 2A



PERMIT DRAWING
SHEET 7 OF 13

REVISED 05/08/2025

ENGLISH

SCALE
50 0 50 100

SCALE FOR INSETS
25 0 25 50

SURFACE WATER IMPACTS

TEMPORARY SURFACE WATER IMPACTS

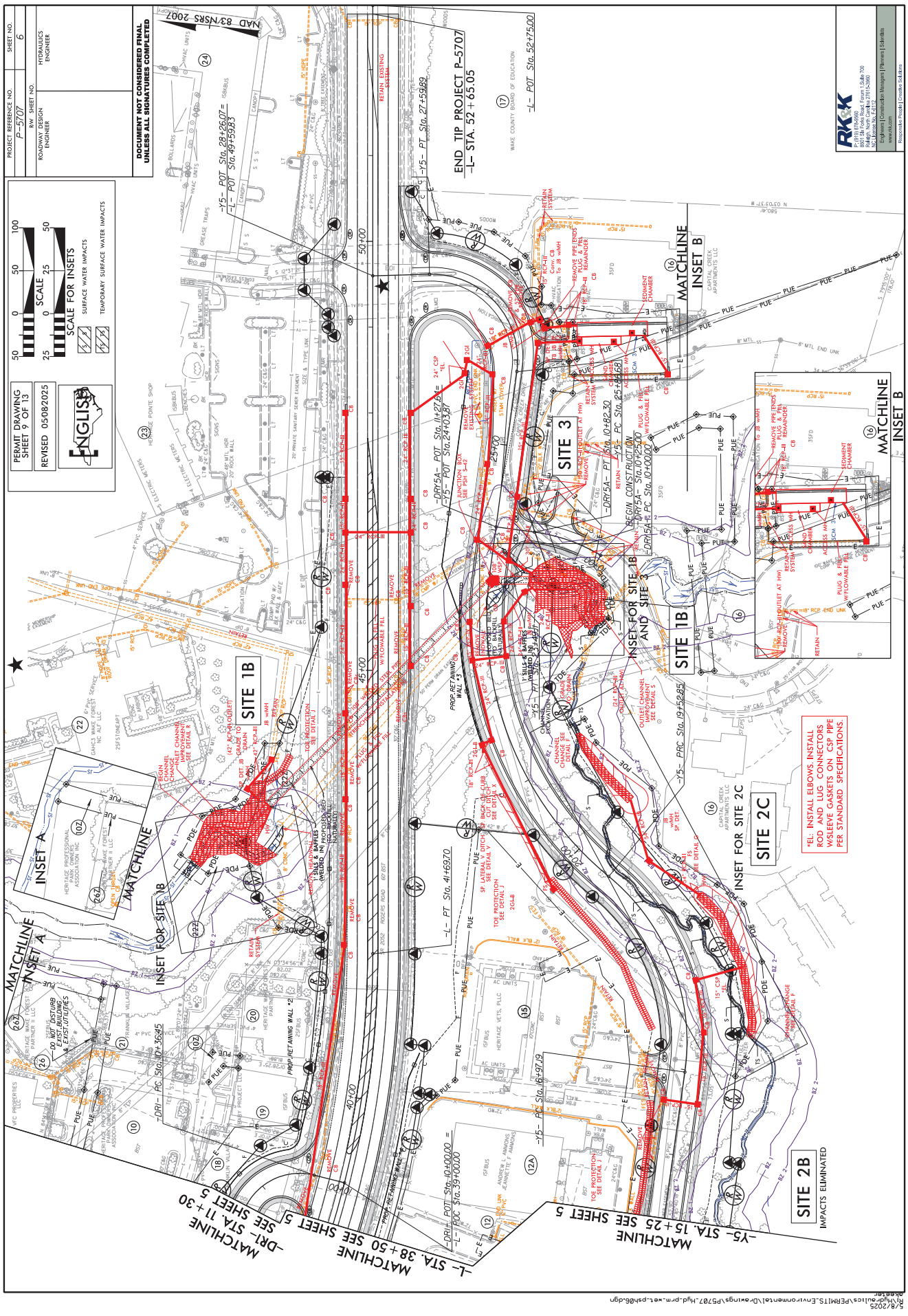
FILL IN WETLAND

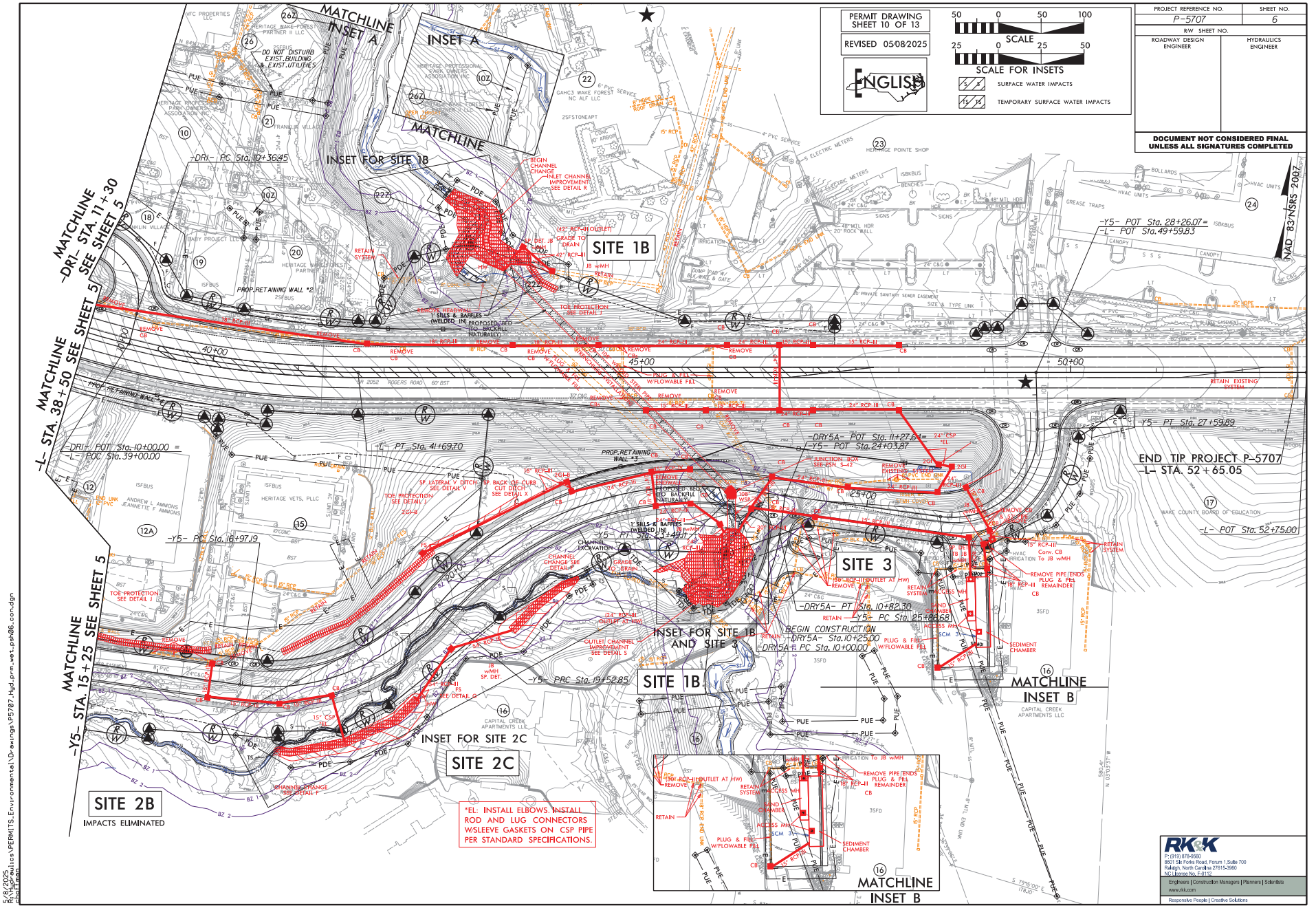
RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3980
NC License No. P-0113
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

5/8/2025
R:\5707\Roadway\Civil\Drawings\PERMITS_Environmental\Drawings\P5707_Hyd_prm_wet_psh05_detail.dgn
dbaker

P-34

5/8/2025
P:\Projects\ENVIRMTS_Environmental\Drawings\P5707-prm-xpl_Site 2A_Y5_13+50.dgn
6/23/16


PROJECT REFERENCE NO. P-5707
SHEET NO. 6
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 9 OF 13
REVISED 05082025
SCALE 50 0 50 100
SCALE 25 0 25 50
SCALE FOR INSETS
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
NAD 83/NSRS 2007
SITE 1B
SITE 2B
SITE 2C
SITE 3
INSET FOR SITE 1B AND SITE 3
INSET FOR SITE 2C
INSET A
INSET B
MATCHLINE
END TIP PROJECT P-5707
-L- STA. 52+65.05
-L- POT Sta. 52+75.00
-Y5- POT Sta. 28+26.07 = -L- POT Sta. 49+59.83
-Y5- PT Sta. 27+59.89
-DRY5A- POT Sta. 11+27.64 = -Y5- POT Sta. 24+03.87
-DRY5A- PT Sta. 10+82.30
-DRY5A- PC Sta. 25+06.68
BEGIN CONSTRUCTION -DRY5A- Sta. 10+25.00
-DRY5A- Sta. 10+00.00
-Y5- PRC Sta. 19+52.85
-L- PT Sta. 41+69.70
-L- PC Sta. 41+97.19
-DRI- POT Sta. 10+00.00 = -L- ROC Sta. 39+00.00
-DRI- PC Sta. 10+36.45
-DRI- STA. 11+30 SEE SHEET 5
-L- STA. 38+50 SEE SHEET 5
-Y5- STA. 15+25 SEE SHEET 5
*EL: INSTALL ELBOWS. INSTALL ROD AND LUG CONNECTORS W/SLEEVE GASKETS ON CSP PIPE PER STANDARD SPECIFICATIONS.
IMPACTS ELIMINATED
RK&K
Raleigh, North Carolina 27615-3880
Phone: 919.790.8033
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions
5/8/2025
R:\Projects\Divisions\Environmental\Drawings\P5707_Hyd-prm_wet_psh06.dgn
psh06fz

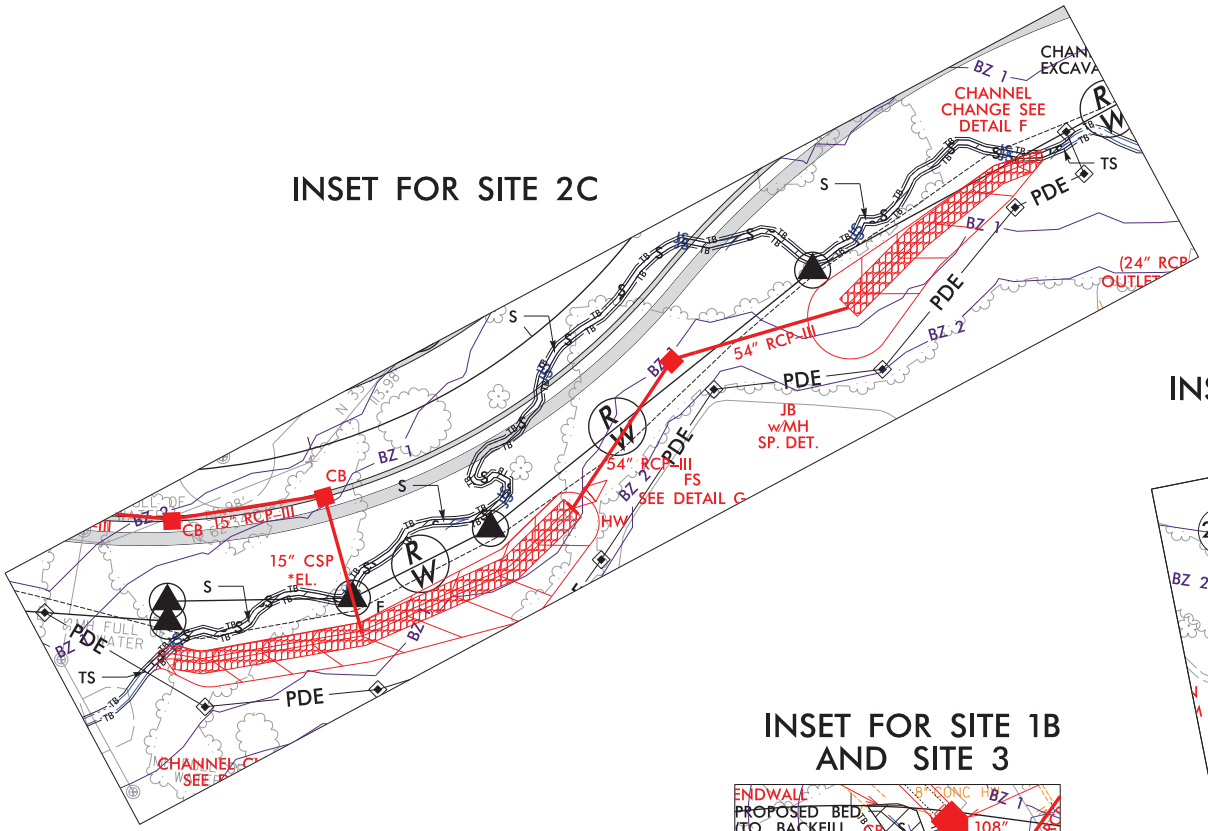

PERMIT DRAWING SHEET 10 OF 13
REVISED 05/08/2025
ENGLISH
SCALE
50 0 50 100
25 0 25 50
SCALE FOR INSETS
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
PROJECT REFERENCE NO.
P-5707
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/NSRS 2007
MATCHLINE -DRI- STA. 11+30 SEE SHEET 5
MATCHLINE -L- STA. 38+50 SEE SHEET 5
MATCHLINE -Y5- STA. 15+25 SEE SHEET 5
INSET A
MATCHLINE INSET A
INSET FOR SITE 1B
SITE 1B
-DRI- PC Sta. 10+36.45
-DRI- POT Sta. 10+00.00 =
-L- POC Sta. 39+00.00
-L- PT Sta. 41+69.70
-Y5- PC Sta. 16+97.19
-Y5- PRC Sta. 19+52.85
-Y5- PT Sta. 21+49.71
-Y5- POT Sta. 28+26.07=
-L- POT Sta. 49+59.83
-Y5- PT Sta. 27+59.89
END TIP PROJECT P-5707
-L- STA. 52+65.05
-L- POT Sta. 52+75.00
-DRY5A- POT Sta. 11+27.64=
-Y5- POT Sta. 24+03.87
-DRY5A- PT Sta. 10+82.30
-Y5- PC Sta. 25+88.68
-DRY5A- Sta. 10+25.00
-DRY5A- PC Sta. 10+00.00
BEGIN CONSTRUCTION
SITE 3
INSET FOR SITE 1B AND SITE 3
MATCHLINE INSET B
INSET FOR SITE 2C
SITE 2C
SITE 2B
IMPACTS ELIMINATED
*EL: INSTALL ELBOWS, INSTALL ROD AND LUG CONNECTORS W/SLEEVE GASKETS ON CSP PIPE PER STANDARD SPECIFICATIONS.
PROP. RETAINING WALL *2
PROP. RETAINING WALL *3
RETAIN EXISTING SYSTEM
RETAIN SYSTEM
REMOVE PIPE/ENDS PLUG & FILL REMAINDER
SEDIMENT CHAMBER
ACCESS MH
PLUG & FILL W/FLOWABLE FILL
TOE PROTECTION SEE DETAIL J
CHANNEL CHANGE SEE DETAIL F
CHANNEL EXCAVATION
OUTLET CHANNEL IMPROVEMENT SEE DETAIL S
INLET CHANNEL IMPROVEMENT SEE DETAIL R
SF LATERAL V DITCH SEE DETAIL V
BACK OF CURB CUT DITCH SEE DETAIL X
RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

PROJECT REFERENCE NO.	SHEET NO.
P-5707	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

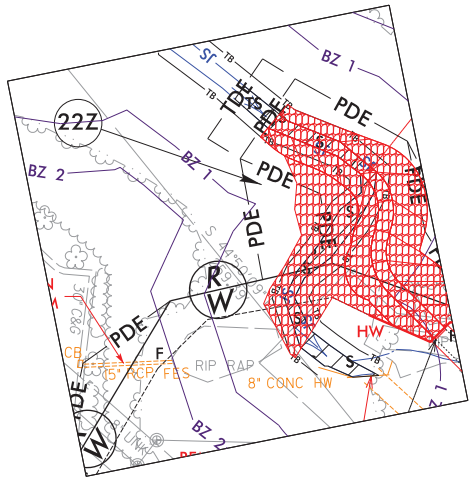
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

INSET FOR SITE 2C



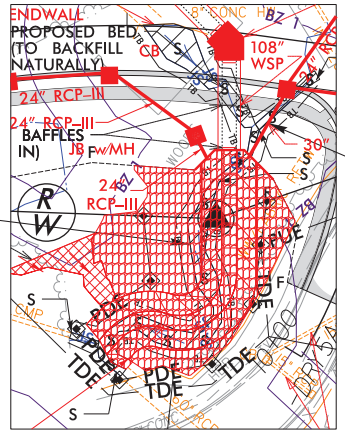
INSET FOR SITE 1B



INSET FOR SITE 1B AND SITE 3

SITE 1B

SITE 3



PERMIT DRAWING SHEET 11 OF 13

REVISED 05/08/2025

ENGLISH

SCALE

50 0 50 100

SCALE FOR INSETS

25 0 25 50

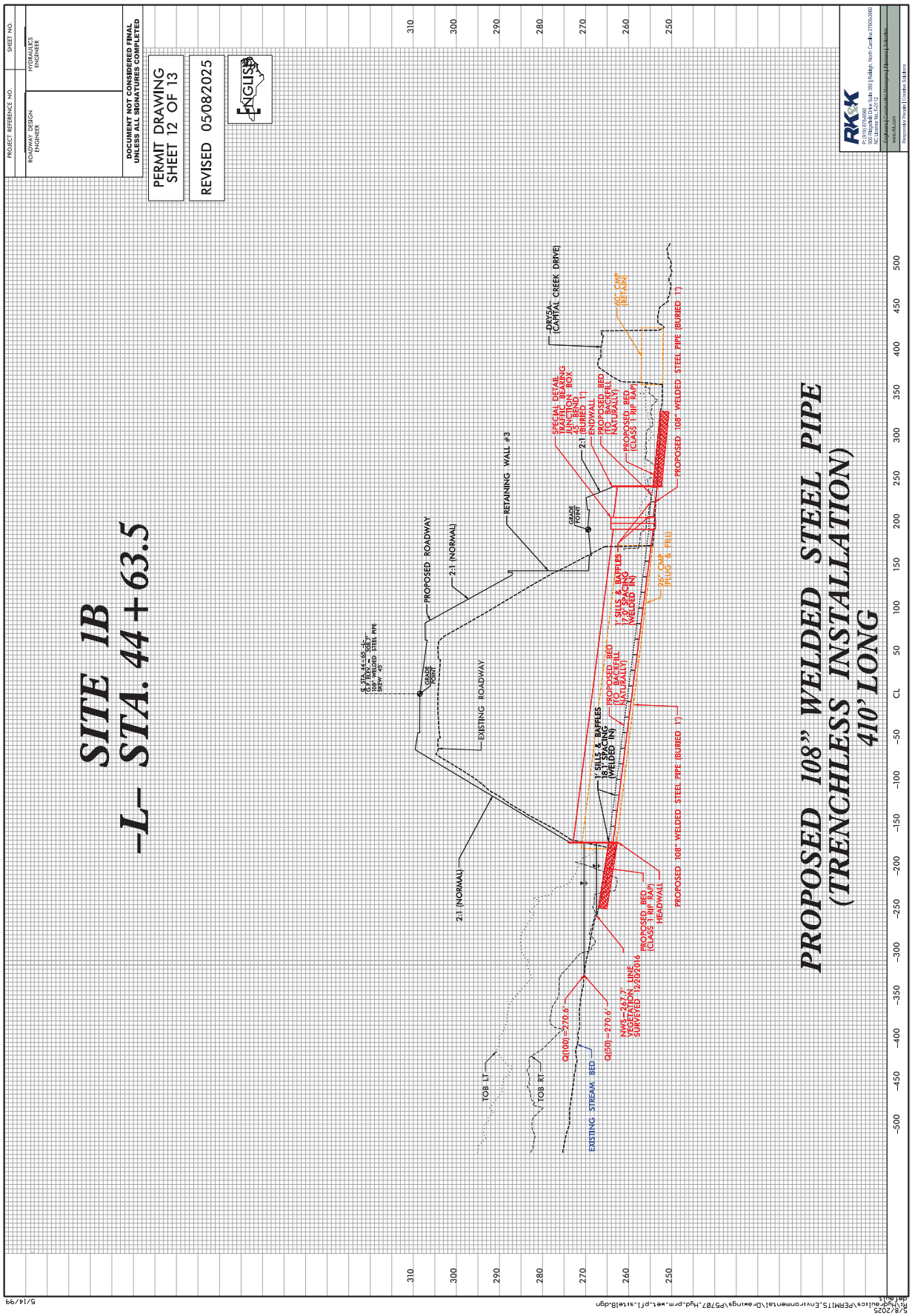
SURFACE WATER IMPACTS

TEMPORARY SURFACE WATER IMPACTS

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1,Suite 700
Raleigh, North Carolina 27615-3960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

P-38

R:\Projects\Publics\PERMITS_Environmental\Drawings\P5707_Hyd_prm_wet_pak06_detail.dgn
6/4/2025
RKK\abeaver


PROJECT REFERENCE NO.
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 12 OF 13
REVISED 05/08/2025
ENGLISH
RK&K
SITE 1B
-L- STA. 44+63.5
PROPOSED 108" WELDED STEEL PIPE (TRENCHLESS INSTALLATION) 410' LONG
PROPOSED ROADWAY
EXISTING ROADWAY
RETAINING WALL #3
2:1 (NORMAL)
GRADE POINT
PROPOSED 108" WELDED STEEL PIPE (BURIED 1')
1' SILLS & BAFFLES (6'-0" SPACING (WELDED IN)
PROPOSED BED MATERIAL (TO BACKFILL NATURALLY)
PROPOSED BED (CLASS 1 RIP RAP)
ENDWALL
2:1 (BURIED 1')
SPECIAL DETAIL TRAFFIC BEARING JUNCTION BOX
DRY CAMP (RETAIN)
DRY CAMP (PLUG & FILL)
DRY CAMP (REMOVE)
DRWSA (CAPITAL CREEK DRIVE)
TOB LT
TOB RT
EXISTING STREAM BED
Q(100) = 270.6
Q(50) = 270.6
NWS = 2677
HWS = 2677
SURVEYED 11/2025
PROPOSED BED MATERIAL (CLASS 1 RIP RAP) HEADWALL
-L- STA. 44+85.36
108" WELDED STEEL PIPE
SKEW 45°
310
300
290
280
270
260
250
-500
-450
-400
-350
-300
-250
-200
-150
-100
-50
CL
50
100
150
200
250
300
350
400
450
500
5/14/99
5/8/2025
dgn 1

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1A	-L- 19+85 LT	Ex. 30" Pipe, SA						< 0.01		13		
	-L- 20+00 LT	Channel Stabilization, SA						< 0.01	< 0.01	15	10	
1B	-L- 42+80 to 46+16 LT & RT	Prop. 108" WSP, SA						0.03		184		
	-L- 42+60 to 43+12 LT	Channel Stabilization, SA						< 0.01	< 0.01	39	15	
	-Y5- 23+40 RT	Channel Stabilization, SA						0.02		146		
	-Y5- 22+80 RT	Channel Stabilization, SB						< 0.01		12		
2A	-Y5- 13+39 to 14+76 RT	Channel Stabilization, SB, WA	0.01					< 0.01	< 0.01	2	12	
2B	-Y5- 15+08 to 16+00 RT	Impacts Eliminated										
2C	-Y5- 17+40 to 21+40	Roadway Fill, SB						0.020	< 0.01	495	17	
3	-Y5- 23+56 to 23+80 RT	Roadway Fill, SC						< 0.01		32		
TOTALS*:			0.01					0.08	< 0.01	938	54	

*Rounded totals are sum of actual impacts

NOTES:

Site 1A - The originally permitted 15 LF of bank stabilization has been changed to channel stabilization with countersunk riprap in the flow line (remaining at 15 LF of permanent surface water impacts.

Site 1B - 71 LF of permanent surface water impacts has been moved from culvert installation to channel stabilization at Y5 Sta. 23+45 RT.

Total impacts to SA have remained the same from original permit. Bank stabilization changed to channel stabilization with countersunk riprap.

Additional segment of stream SB identified at Y5 Sta. 22+80. <0.01 ac permanent SW impacts and 12 LF of permanent surface water impacts added.

Site 2A - The originally permitted 2 LF of bank stabilization has been changed to channel stabilization with countersunk riprap in the flow line.

Site 2B - Impacts eliminated.

Site 2C - Channel change length increased requiring additional 25 LF of permanent surface water impacts and 12 LF of temporary surface water impacts.

Site 3 - No changes from originally permitted impacts.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

October 2023 (REVISED 05/08/2025)

WAKE

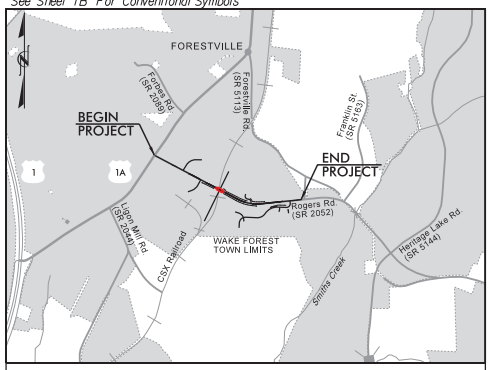
P-5707

44643.1.1

SHEET 13 OF 13

CONTRACT: C204338 TIP PROJECT: P-5707

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
NCDOT RAIL DIVISION

WAKE COUNTY

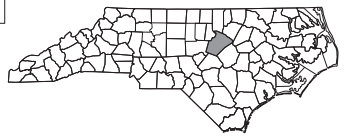
BUFFER DRAWING SHEET 1 OF 6

REVISED 05/08/2025

ENGLISH

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5707	1	

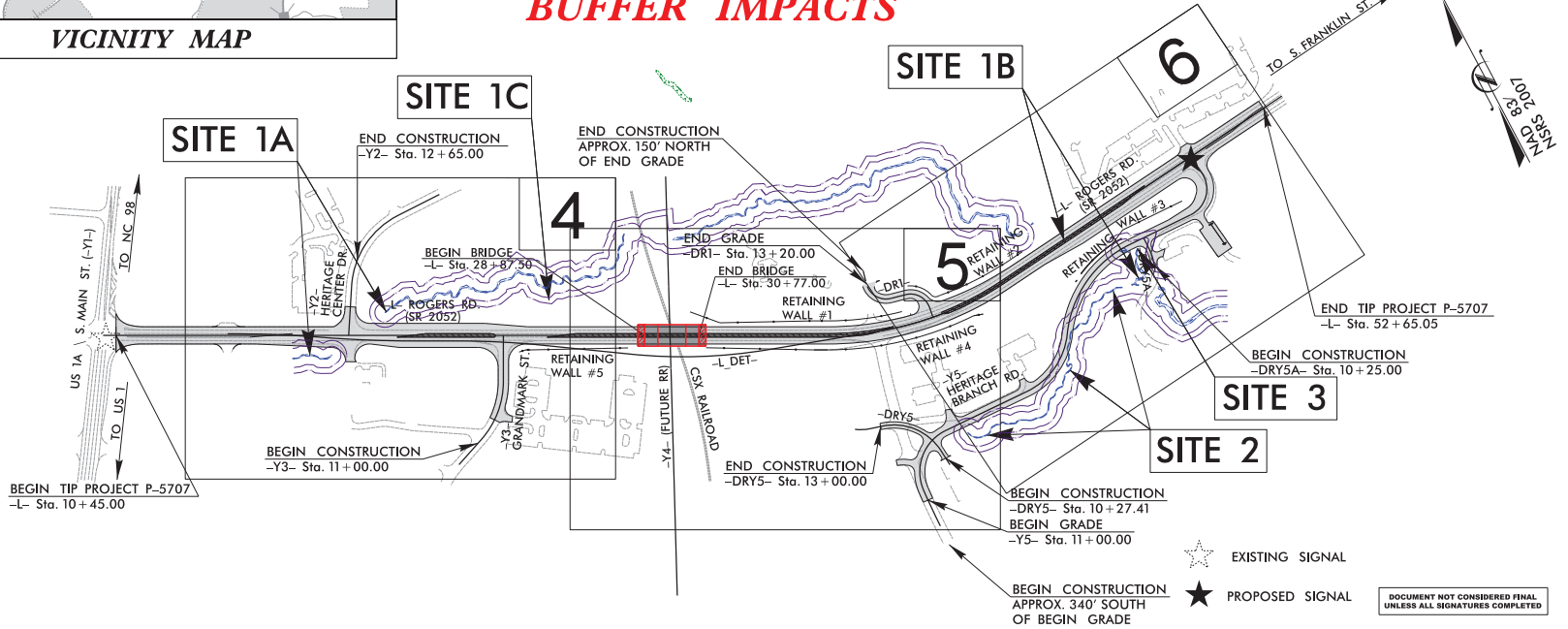
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
44643.1.1		PE
44643.2.1		ROW & UTILITIES
44643.3.1		CONSTRUCTION



LOCATION: *ROGERS ROAD (SR 2052) GRADE SEPARATION OVER CSX RAILROAD (CROSSING NO. 633905Y) AT MILE POST S 142.53*

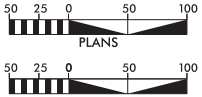
TYPE OF WORK: *DRAINAGE, GRADING, PAVING, SIGNALS, STRUCTURE, WIDENING & RETAINING WALLS*

BUFFER IMPACTS



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2025 = 27,905
ADT 2045 = 38,166
D = 55%
K = 8%
T = 3% *
V = 50 MPH

*TTST 1.0% / DUAL 2.0%
FUNC CLASS = URBAN MAJOR COLLECTOR

SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT P-5707..... 0.763 miles

LENGTH STRUCTURE TIP PROJECT P-5707..... 0.036 miles

TOTAL LENGTH OF PROJECT P-5707..... 0.799 miles

PLANS PREPARED BY:

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1,Suite 700
Raleigh, North Carolina 27615-3960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

RIGHT OF WAY DATE: June 12, 2018

LETTING DATE: August 19, 2025

Brandon McInnis, P.E.
PROJECT ENGINEER

Jillian Huskey, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

NC DEPARTMENT OF TRANSPORTATION
RAIL DIVISION
ENGINEERING COORDINATION AND SAFETY

2024 STANDARD SPECIFICATIONS

NCDOT RAIL DIVISION
CONTACT: Brian Gackstetter, E.I.

5/8/2025
R:\Hydraulics\PERMITS_Environmental\Drawings\P5707_Hyd_Buf_tsh.dgn
cksetter

05/08/25

DRAINAGE DITCH DETAILS

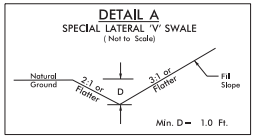
REVISED 05/08/2025

PROJECT REFERENCE NO.	SHEET NO.
P-5707	2D-1
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

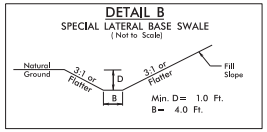
BUFFER DRAWING SHEET 2 OF 6

DETAIL A
SPECIAL LATERAL 'V' SWALE
(Not to Scale)



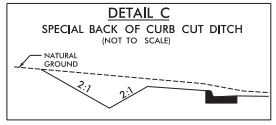
–DRY5– STA. 11+44 TO STA. 12+00 LT
–Y5– STA. 11+50 TO STA. 12+07 LT

DETAIL B
SPECIAL LATERAL BASE SWALE
(Not to Scale)



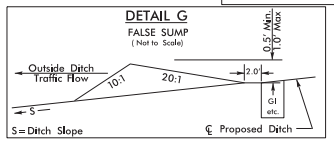
–Y5– STA. 12+50 TO STA. 13+00 LT (DDE = [134] CY)

DETAIL C
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



–L– STA. 19+00 TO STA. 21+50 RT

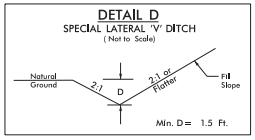
DETAIL G
FALSE SUMP
(Not to Scale)



–L– STA. 27+86 RT
–L– STA. 28+14 RT
–Y5– 18+90 RT

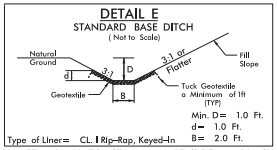
ENGLISH

DETAIL D
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



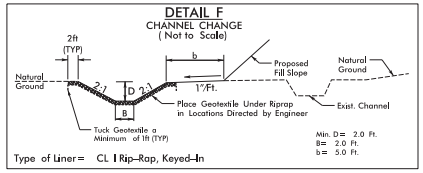
–L– STA. 21+50 TO STA. 23+00 RT

DETAIL E
STANDARD BASE DITCH
(Not to Scale)



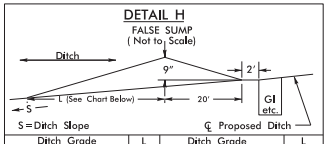
–Y5– STA. 13+50 TO STA. 14+55 RT (DDE = 201 CY;
CL I RIPRAP = 85 TONS; GEOTEXTILE = 163 SY)

DETAIL F
CHANNEL CHANGE
(Not to Scale)



–Y5– STA. 17+36.86 TO STA. 18+75 RT (DDE = 261 CY;
CL I RIPRAP = 144 TONS; GEOTEXTILE = 255 SY)
–Y5– STA. 20+00 TO STA. 21+24 RT (DDE = 298 CY;
CL I RIPRAP = 143 TONS; GEOTEXTILE = 253 SY)

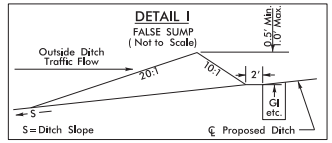
DETAIL H
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

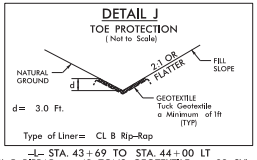
–L_DET– STA. 22+01 LT

DETAIL I
FALSE SUMP
(Not to Scale)



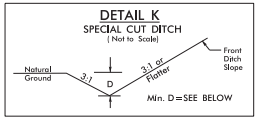
–DRY5– STA. 12+29 RT
–DRY5– STA. 12+63 RT
–L– STA. 19+65 RT
–L– STA. 20+88 RT

DETAIL J
TOE PROTECTION
(Not to Scale)



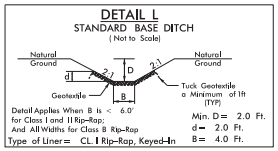
–L– STA. 43+69 TO STA. 44+00 LT
(CL B RIPRAP = 42 TONS; GEOTEXTILE = 92 SY)
–Y5– STA. 14+90 TO STA. 16+60 LT
(CL B RIPRAP = 105 TONS; GEOTEXTILE = 254 SY)
–Y5– STA. 17+50 TO STA. 20+00 LT
(CL B RIPRAP = 185 TONS; GEOTEXTILE = 425 SY)

DETAIL K
SPECIAL CUT DITCH
(Not to Scale)



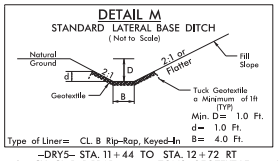
–L_DET– STA. 17+66.44 TO STA. 19+16.47 RT, D/d=1.5'
–L_DET– STA. 20+16.62 TO STA. 20+66.79 RT, D/d=1.0'
–L_DET– STA. 20+66.79 TO STA. 22+67.79 RT, D/d=1.0' *
–L_DET– STA. 21+17.02 TO STA. 23+15.66 LT, D/d=1.0'
–L_DET– STA. 31+23.65 TO STA. 31+74.39 RT, D/d=1.0'

DETAIL L
STANDARD BASE DITCH
(Not to Scale)



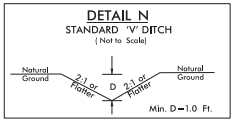
–Y2– STA. 11+11 RT, L=82', S=9.40%,
BEG ELEV=342.5, END ELEV=334.8
CL I RIPRAP = 75 TON
GEOTEXTILE = 163 SY
(DDE = 55 CY)

DETAIL M
STANDARD LATERAL BASE DITCH
(Not to Scale)



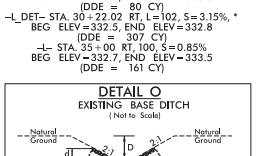
–DRY5– STA. 11+44 TO STA. 12+72 RT
(DDE = 125 CY; CL B RIPRAP = 75 TONS; GEOTEXTILE = 205 SY)

DETAIL N
STANDARD 'V' DITCH
(Not to Scale)



–L_DET– STA. 23+68.31 RT, L=189', S=2.33%, *
BEG ELEV=347.4, END ELEV=342.6
(DDE = 147 CY)
–L_DET– STA. 24+67.66 LT, L=24', S=3.45%,
BEG ELEV=346.8, END ELEV=346.0
(DDE = 44 CY)
–L_DET– STA. 24+91.41 LT, L=66', S=3.05%,
BEG ELEV=346.0, END ELEV=346.2
(DDE = 58 CY)
–L_DET– STA. 26+18.82 RT, L=100', S=6.94%, *
BEG ELEV=343.2, END ELEV=336.3
(DDE = 80 CY)
–L_DET– STA. 30+22.02 RT, L=102, S=3.15%, *
BEG ELEV=332.7, END ELEV=333.5
(DDE = 161 CY)
–L– STA. 35+00 RT, 100, S=0.85%
BEG ELEV=332.7, END ELEV=333.5
(DDE = 161 CY)

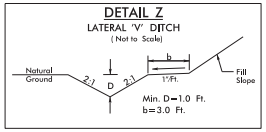
DETAIL O
EXISTING BASE DITCH
(Not to Scale)



–L– STA. 31+21 TO STA. 32+17 LT
(CL B RIPRAP = 50 TONS; GEOTEXTILE = 111 SY)

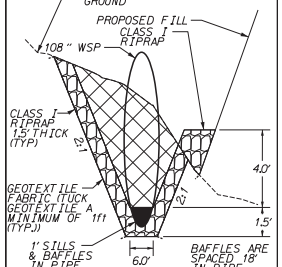
*DITCH TO BE CONSTRUCTED DURING DETOUR PHASE AND RETAINED THROUGH FINAL CONSTRUCTION

DETAIL Z
LATERAL 'V' DITCH
(Not to Scale)



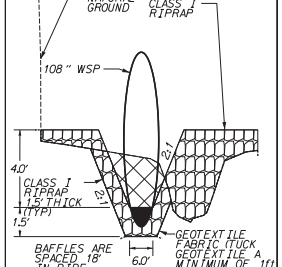
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT

DETAIL R



INLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=76'
–L– STA. 43+36 LT

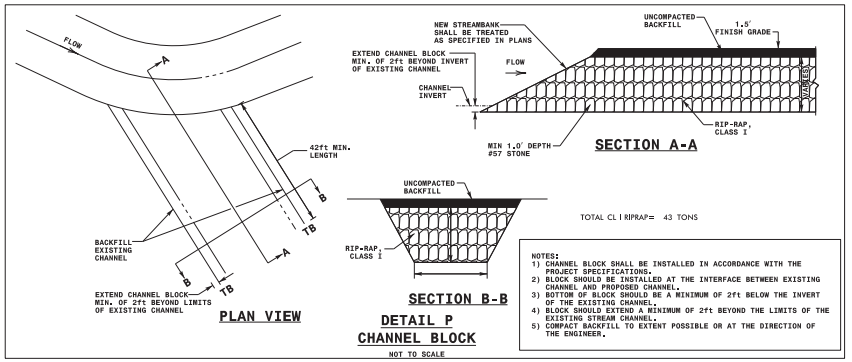
DETAIL S



OUTLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=116'
–Y5– STA. 23+02 RT

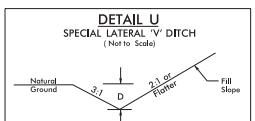
PERMANENT CHANNEL EXCAVATION

TOTAL CHANNEL EXCAVATION = 900 CY (360 CY INLET, 540 CY OUTLET)
TOTAL CL I RIP RAP = 1300 TONS (390 TONS INLET, 910 TONS OUTLET)
TOTAL GEOTEXTILE FAB. = 1200 SY (630 SY INLET, 570 SY OUTLET)



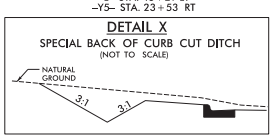
–L– STA. 43+21 LT
–Y5– STA. 23+53 RT

DETAIL U
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



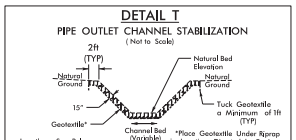
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT *
–L_DET– STA. 27+18.93 TO STA. 30+22.02 RT *

DETAIL X
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



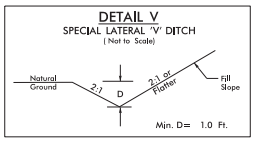
–Y5– STA. 21+00 TO STA. 21+59 LT

DETAIL T
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



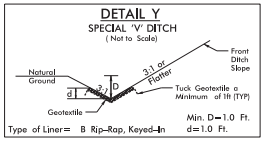
–L– STA. 19+90 LT, L=10'
(CL I RIPRAP = 11 TONS; GEOTEXTILE = 22 SY)
–Y5– STA. 14+55 RT, L=16'
(CL I RIPRAP = 26 TONS; GEOTEXTILE = 50 SY)

DETAIL V
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



–Y5– STA. 20+00 TO STA. 21+00 LT

DETAIL Y
SPECIAL 'V' DITCH
(Not to Scale)

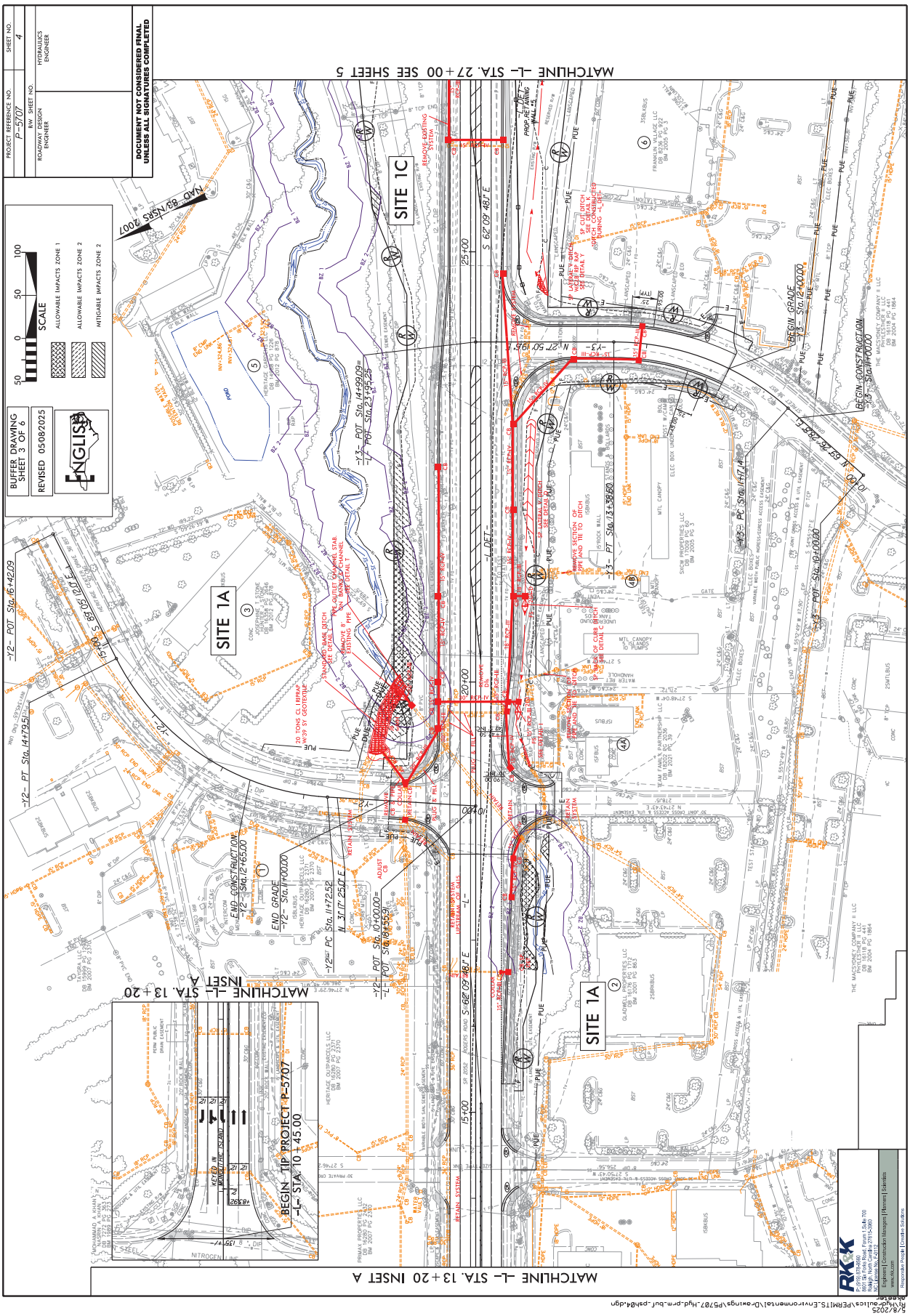


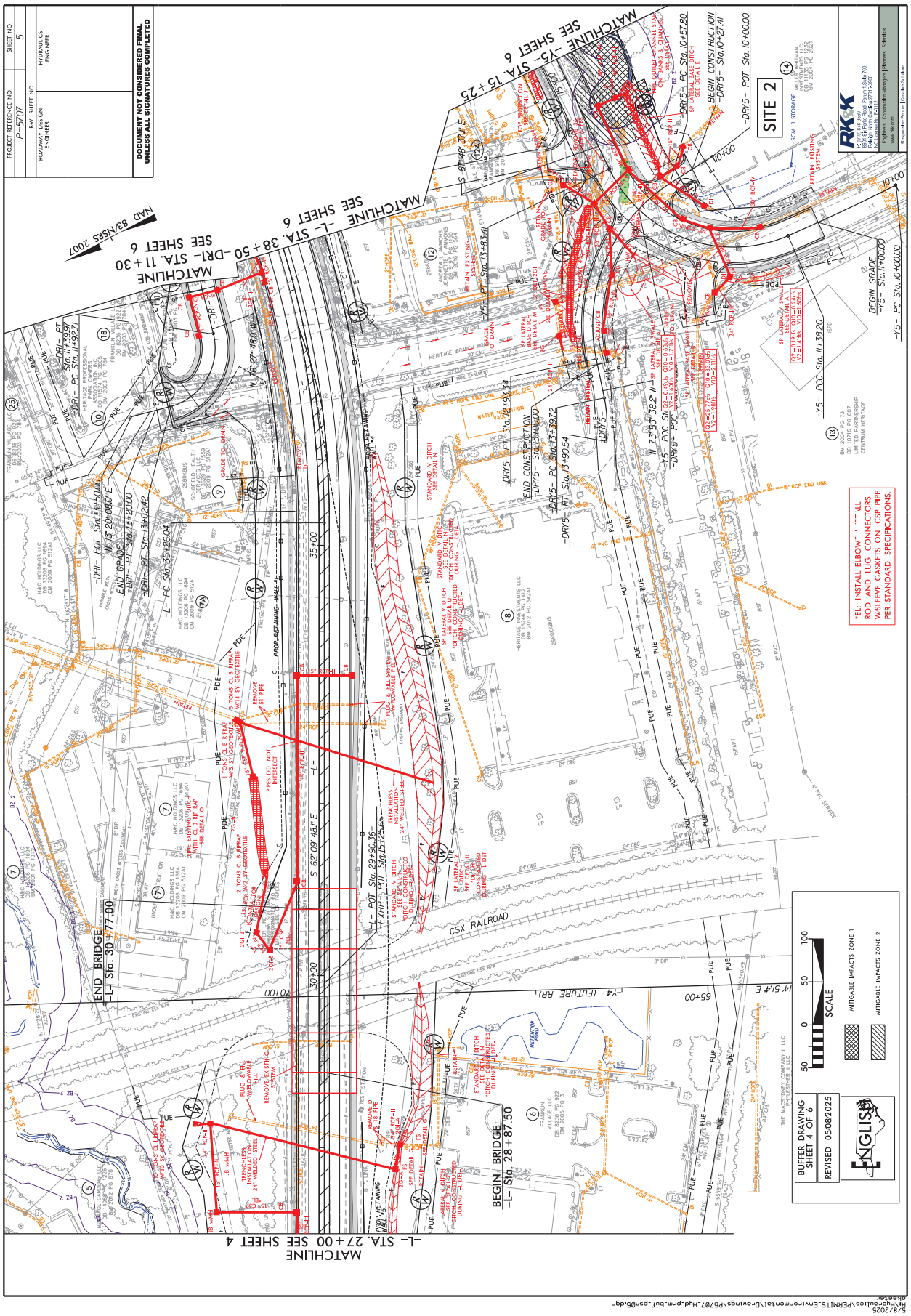
–L– STA. 24+50 TO STA. 25+00 RT
CL B RIPRAP = 16 TONS; GEOTEXTILE = 36 SY

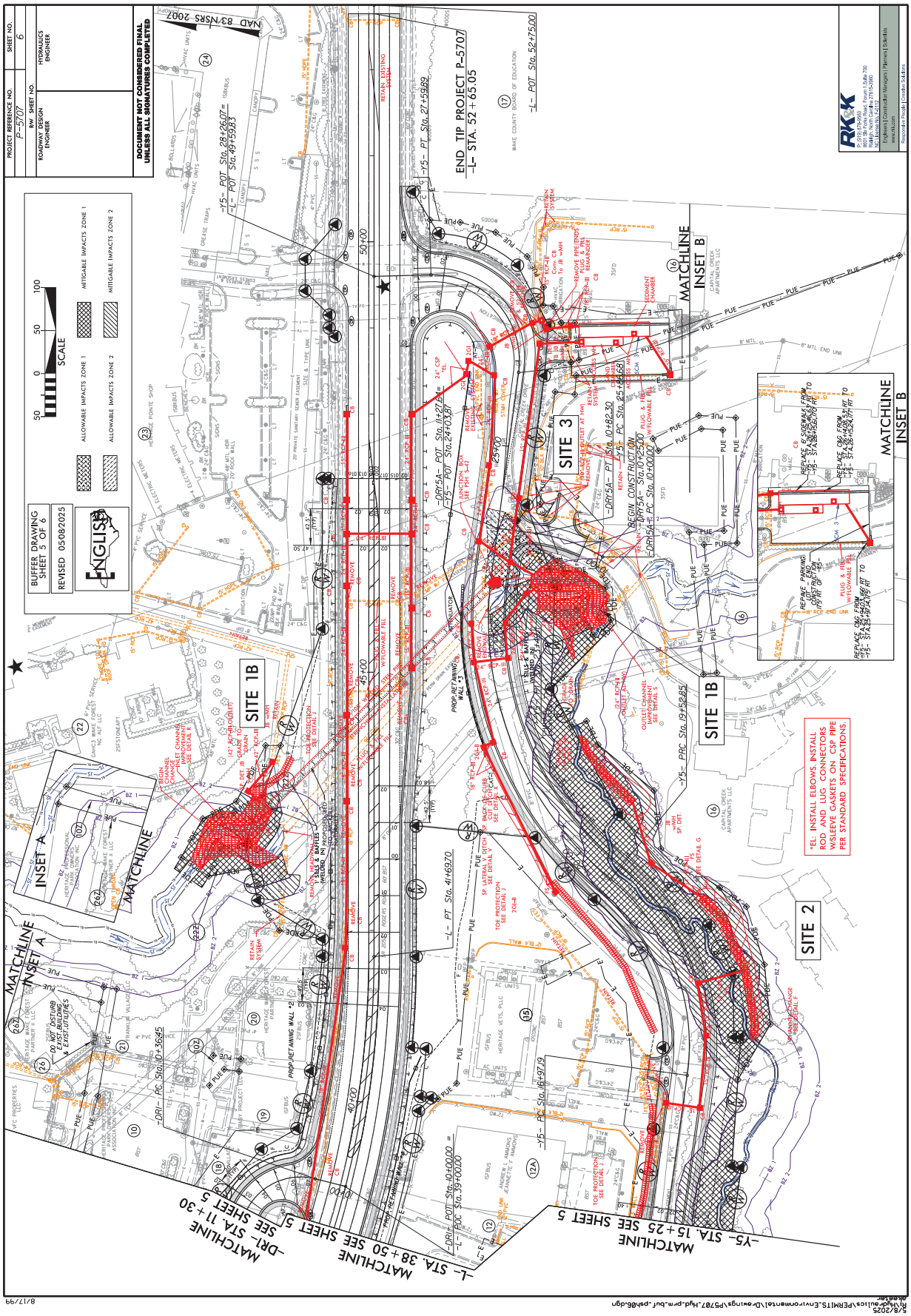
RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3060
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

P-42

5/8/2025
R:\Projects\Raulies\PERMITS_Environmental\Drawings\P5707_Hyd.buf_Ditch Detail.dgn
dteger


PROJECT REFERENCE NO.
P-5707
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
BUFFER DRAWING SHEET 3 OF 6
REVISED 05082025
ENGLISH
SCALE
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 2
NAD 83 NSRS 2007
MATCHLINE -L- STA. 27+00 SEE SHEET 5
MATCHLINE -L- STA. 13+20 INSET A
INSET A
MATCHLINE -L- STA. 13+20
BEGIN TIP PROJECT P-5707
-L- STA. 10+45.00
SITE 1A
SITE 1C
SITE 1A
-L-
-Y2- POT Sta.16+42.09
-Y2- PT Sta.14+79.51
-Y2- POT Sta.14+99.09
-Y2- PC Sta.12+65.00
-Y2- Sta.11+00.00
-Y2- POT Sta.10+00.00
-Y2- POT Sta.18+55.59
-Y3- POT Sta.14+99.09
-Y3- POT Sta.21+95.25
-Y3- PT Sta.13+39.20
-Y3- PC Sta.11+17.44
-Y3- POT Sta.10+00.00
END CONSTRUCTION
END GRADE
BEGIN GRADE
BEGIN CONSTRUCTION
-L- DET -
PROP. RET. WALL #5
PROP. RET. WALL #4
PROP. RET. WALL #3
PROP. RET. WALL #2
PROP. RET. WALL #1
RETAIN SYSTEM
S 62° 09' 48" E
N 27° 50' 52" E
N 31° 17' 25" E
S 27° 49' 43" E
S 62° 09' 48" E
N 62° 09' 48" W
S 62° 09' 48" E
N 27° 50' 52" E
N 31° 17' 25" E
S 27° 49' 43" E
S 62° 09' 48" E
N 62° 09' 48" W
S 62° 09' 48" E
N 27° 50' 52" E
N 31° 17' 25" E
S 27° 49' 43" E
S 62° 09' 48" E
N 62° 09' 48" W
RK&K
Responsible People | Creative Solutions
8/8/2025
R:\Hydraulics\PERMITS-Environmental\Drawings\P5707_Hyd-prm-buf_psh04.dgn


PROJECT REFERENCE NO.
P-5707
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
5
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SITE 2
BUFFER DRAWING SHEET 4 OF 6
REVISED 05082025
SCALE
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2
ENGLISH
RK&K
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsible People | Creative Solutions
MATCHLINE -L- STA. 27+00 SEE SHEET 4
MATCHLINE -L- STA. 38+50 -DR1- STA. 11+30 SEE SHEET 6
MATCHLINE -Y5- STA. 15+25 SEE SHEET 6
NAD 83/NSRS 2007
END BRIDGE -L- Sta. 30+77.00
BEGIN BRIDGE -L- Sta. 28+87.50
CSX RAILROAD
-L- PC Sta. 35+86.04
-DR1- POT Sta. 13+20.80
-DR1- PT Sta. 13+20.42
END GRADE -DR1- PT Sta. 13+20.00
-DR1- PC Sta. 13+19.71
-DR1- PT Sta. 12+93.34
-DRY5- PC Sta. 13+83.41
-DRY5- PT Sta. 13+90.54
END CONSTRUCTION -DRY5- Sta. 13+40.00
-DRY5- PC Sta. 13+39.72
-DRY5- PT Sta. 12+93.38
-Y5- POC Sta. 11+38.20
-Y5- PCC Sta. 11+38.20
BEGIN GRADE -Y5- PC Sta. 10+00.00
-DRY5- POT Sta. 10+57.80
-DRY5- PT Sta. 10+27.41
BEGIN CONSTRUCTION -DRY5- Sta. 10+00.00
-Y4- (FUTURE RR)
-L- PC Sta. 29+90.36
-L- POT Sta. 32+35.65
-L- PT Sta. 32+65.48
-L- PC Sta. 33+26.42
-L- PT Sta. 33+42.00
-L- POT Sta. 33+86.04
-L- PC Sta. 34+77.71
-L- PT Sta. 34+92.71
-L- POT Sta. 35+38.60
-L- PC Sta. 36+29.42
-L- PT Sta. 36+45.42
-L- POT Sta. 36+89.46
-L- PC Sta. 37+80.17
-L- PT Sta. 37+95.17
-L- POT Sta. 38+39.21
-L- PC Sta. 39+29.92
-L- PT Sta. 39+45.92
-L- POT Sta. 39+89.96
-L- PC Sta. 40+80.67
-L- PT Sta. 40+95.67
-L- POT Sta. 41+39.71
-L- PC Sta. 42+30.42
-L- PT Sta. 42+45.42
-L- POT Sta. 42+89.46
-L- PC Sta. 43+80.17
-L- PT Sta. 43+95.17
-L- POT Sta. 44+39.21
-L- PC Sta. 45+29.92
-L- PT Sta. 45+45.92
-L- POT Sta. 45+89.96
-L- PC Sta. 46+80.67
-L- PT Sta. 46+95.67
-L- POT Sta. 47+39.71
-L- PC Sta. 48+30.42
-L- PT Sta. 48+45.42
-L- POT Sta. 48+89.46
-L- PC Sta. 49+80.17
-L- PT Sta. 49+95.17
-L- POT Sta. 50+39.21
-L- PC Sta. 51+29.92
-L- PT Sta. 51+45.92
-L- POT Sta. 51+89.96
-L- PC Sta. 52+80.67
-L- PT Sta. 52+95.67
-L- POT Sta. 53+39.71
-L- PC Sta. 54+30.42
-L- PT Sta. 54+45.42
-L- POT Sta. 54+89.46
-L- PC Sta. 55+80.17
-L- PT Sta. 55+95.17
-L- POT Sta. 56+39.21
-L- PC Sta. 57+29.92
-L- PT Sta. 57+45.92
-L- POT Sta. 57+89.96
-L- PC Sta. 58+80.67
-L- PT Sta. 58+95.67
-L- POT Sta. 59+39.71
-L- PC Sta. 60+30.42
-L- PT Sta. 60+45.42
-L- POT Sta. 60+89.46
-L- PC Sta. 61+80.17
-L- PT Sta. 61+95.17
-L- POT Sta. 62+39.21
-L- PC Sta. 63+29.92
-L- PT Sta. 63+45.92
-L- POT Sta. 63+89.96
-L- PC Sta. 64+80.67
-L- PT Sta. 64+95.67
-L- POT Sta. 65+39.71
-L- PC Sta. 66+30.42
-L- PT Sta. 66+45.42
-L- POT Sta. 66+89.46
-L- PC Sta. 67+80.17
-L- PT Sta. 67+95.17
-L- POT Sta. 68+39.21
-L- PC Sta. 69+29.92
-L- PT Sta. 69+45.92
-L- POT Sta. 69+89.96
-L- PC Sta. 70+80.67
-L- PT Sta. 70+95.67
-L- POT Sta. 71+39.71
-L- PC Sta. 72+30.42
-L- PT Sta. 72+45.42
-L- POT Sta. 72+89.46
-L- PC Sta. 73+80.17
-L- PT Sta. 73+95.17
-L- POT Sta. 74+39.21
-L- PC Sta. 75+29.92
-L- PT Sta. 75+45.92
-L- POT Sta. 75+89.96
-L- PC Sta. 76+80.67
-L- PT Sta. 76+95.67
-L- POT Sta. 77+39.71
-L- PC Sta. 78+30.42
-L- PT Sta. 78+45.42
-L- POT Sta. 78+89.46
-L- PC Sta. 79+80.17
-L- PT Sta. 79+95.17
-L- POT Sta. 80+39.21
-L- PC Sta. 81+29.92
-L- PT Sta. 81+45.92
-L- POT Sta. 81+89.96
-L- PC Sta. 82+80.67
-L- PT Sta. 82+95.67
-L- POT Sta. 83+39.71
-L- PC Sta. 84+30.42
-L- PT Sta. 84+45.42
-L- POT Sta. 84+89.46
-L- PC Sta. 85+80.17
-L- PT Sta. 85+95.17
-L- POT Sta. 86+39.21
-L- PC Sta. 87+29.92
-L- PT Sta. 87+45.92
-L- POT Sta. 87+89.96
-L- PC Sta. 88+80.67
-L- PT Sta. 88+95.67
-L- POT Sta. 89+39.71
-L- PC Sta. 90+30.42
-L- PT Sta. 90+45.42
-L- POT Sta. 90+89.46
-L- PC Sta. 91+80.17
-L- PT Sta. 91+95.17
-L- POT Sta. 92+39.21
-L- PC Sta. 93+29.92
-L- PT Sta. 93+45.92
-L- POT Sta. 93+89.96
-L- PC Sta. 94+80.67
-L- PT Sta. 94+95.67
-L- POT Sta. 95+39.71
-L- PC Sta. 96+30.42
-L- PT Sta. 96+45.42
-L- POT Sta. 96+89.46
-L- PC Sta. 97+80.17
-L- PT Sta. 97+95.17
-L- POT Sta. 98+39.21
-L- PC Sta. 99+29.92
-L- PT Sta. 99+45.92
-L- POT Sta. 99+89.96
-L- PC Sta. 100+80.67
-L- PT Sta. 100+95.67
-L- POT Sta. 101+39.71
-L- PC Sta. 102+30.42
-L- PT Sta. 102+45.42
-L- POT Sta. 102+89.46
-L- PC Sta. 103+80.17
-L- PT Sta. 103+95.17
-L- POT Sta. 104+39.21
-L- PC Sta. 105+29.92
-L- PT Sta. 105+45.92
-L- POT Sta. 105+89.96
-L- PC Sta. 106+80.67
-L- PT Sta. 106+95.67
-L- POT Sta. 107+39.71
-L- PC Sta. 108+30.42
-L- PT Sta. 108+45.42
-L- POT Sta. 108+89.46
-L- PC Sta. 109+80.17
-L- PT Sta. 109+95.17
-L- POT Sta. 110+39.21
-L- PC Sta. 111+29.92
-L- PT Sta. 111+45.92
-L- POT Sta. 111+89.96
-L- PC Sta. 112+80.67
-L- PT Sta. 112+95.67
-L- POT Sta. 113+39.71
-L- PC Sta. 114+30.42
-L- PT Sta. 114+45.42
-L- POT Sta. 114+89.46
-L- PC Sta. 115+80.17
-L- PT Sta. 115+95.17
-L- POT Sta. 116+39.21
-L- PC Sta. 117+29.92
-L- PT Sta. 117+45.92
-L- POT Sta. 117+89.96
-L- PC Sta. 118+80.67
-L- PT Sta. 118+95.67
-L- POT Sta. 119+39.71
-L- PC Sta. 120+30.42
-L- PT Sta. 120+45.42
-L- POT Sta. 120+89.46
-L- PC Sta. 121+80.17
-L- PT Sta. 121+95.17
-L- POT Sta. 122+39.21
-L- PC Sta. 123+29.92
-L- PT Sta. 123+45.92
-L- POT Sta. 123+89.96
-L- PC Sta. 124+80.67
-L- PT Sta. 124+95.67
-L- POT Sta. 125+39.71
-L- PC Sta. 126+30.42
-L- PT Sta. 126+45.42
-L- POT Sta. 126+89.46
-L- PC Sta. 127+80.17
-L- PT Sta. 127+95.17
-L- POT Sta. 128+39.21
-L- PC Sta. 129+29.92
-L- PT Sta. 129+45.92
-L- POT Sta. 129+89.96
-L- PC Sta. 130+80.67
-L- PT Sta. 130+95.67
-L- POT Sta. 131+39.71
-L- PC Sta. 132+30.42
-L- PT Sta. 132+45.42
-L- POT Sta. 132+89.46
-L- PC Sta. 133+80.17
-L- PT Sta. 133+95.17
-L- POT Sta. 134+39.21
-L- PC Sta. 135+29.92
-L- PT Sta. 135+45.92
-L- POT Sta. 135+89.96
-L- PC Sta. 136+80.67
-L- PT Sta. 136+95.67
-L- POT Sta. 137+39.71
-L- PC Sta. 138+30.42
-L- PT Sta. 138+45.42
-L- POT Sta. 138+89.46
-L- PC Sta. 139+80.17
-L- PT Sta. 139+95.17
-L- POT Sta. 140+39.21
-L- PC Sta. 141+29.92
-L- PT Sta. 141+45.92
-L- POT Sta. 141+89.96
-L- PC Sta. 142+80.67
-L- PT Sta. 142+95.67
-L- POT Sta. 143+39.71
-L- PC Sta. 144+30.42
-L- PT Sta. 144+45.42
-L- POT Sta. 144+89.46
-L- PC Sta. 145+80.17
-L- PT Sta. 145+95.17
-L- POT Sta. 146+39.21
-L- PC Sta. 147+29.92
-L- PT Sta. 147+45.92
-L- POT Sta. 147+89.96
-L- PC Sta. 148+80.67
-L- PT Sta. 148+95.67
-L- POT Sta. 149+39.71
-L- PC Sta. 150+30.42
-L- PT Sta. 150+45.42
-L- POT Sta. 150+89.46
-L- PC Sta. 151+80.17
-L- PT Sta. 151+95.17
-L- POT Sta. 152+39.21
-L- PC Sta. 153+29.92
-L- PT Sta. 153+45.92
-L- POT Sta. 153+89.96
-L- PC Sta. 154+80.67
-L- PT Sta. 154+95.67
-L- POT Sta. 155+39.71
-L- PC Sta. 156+30.42
-L- PT Sta. 156+45.42
-L- POT Sta. 156+89.46
-L- PC Sta. 157+80.17
-L- PT Sta. 157+95.17
-L- POT Sta. 158+39.21
-L- PC Sta. 159+29.92
-L- PT Sta. 159+45.92
-L- POT Sta. 159+89.96
-L- PC Sta. 160+80.67
-L- PT Sta. 160+95.67
-L- POT Sta. 161+39.71
-L- PC Sta. 162+30.42
-L- PT Sta. 162+45.42
-L- POT Sta. 162+89.46
-L- PC Sta. 163+80.17
-L- PT Sta. 163+95.17
-L- POT Sta. 164+39.21
-L- PC Sta. 165+29.92
-L- PT Sta. 165+45.92
-L- POT Sta. 165+89.96
-L- PC Sta. 166+80.67
-L- PT Sta. 166+95.67
-L- POT Sta. 167+39.71
-L- PC Sta. 168+30.42
-L- PT Sta. 168+45.42
-L- POT Sta. 168+89.46
-L- PC Sta. 169+80.17
-L- PT Sta. 169+95.17
-L- POT Sta. 170+39.21
-L- PC Sta. 171+29.92
-L- PT Sta. 171+45.92
-L- POT Sta. 171+89.96
-L- PC Sta. 172+80.67
-L- PT Sta. 172+95.67
-L- POT Sta. 173+39.71
-L- PC Sta. 174+30.42
-L- PT Sta. 174+45.42
-L- POT Sta. 174+89.46
-L- PC Sta. 175+80.17
-L- PT Sta. 175+95.17
-L- POT Sta. 176+39.21
-L- PC Sta. 177+29.92
-L- PT Sta. 177+45.92
-L- POT Sta. 177+89.96
-L- PC Sta. 178+80.67
-L- PT Sta. 178+95.67
-L- POT Sta. 179+39.71
-L- PC Sta. 180+30.42
-L- PT Sta. 180+45.42
-L- POT Sta. 180+89.46
-L- PC Sta. 181+80.17
-L- PT Sta. 181+95.17
-L- POT Sta. 182+39.21
-L- PC Sta. 183+29.92
-L- PT Sta. 183+45.92
-L- POT Sta. 183+89.96
-L- PC Sta. 184+80.67
-L- PT Sta. 184+95.67
-L- POT Sta. 185+39.71
-L- PC Sta. 186+30.42
-L- PT Sta. 186+45.42
-L- POT Sta. 186+89.46
-L- PC Sta. 187+80.17
-L- PT Sta. 187+95.17
-L- POT Sta. 188+39.21
-L- PC Sta. 189+29.92
-L- PT Sta. 189+45.92
-L- POT Sta. 189+89.96
-L- PC Sta. 190+80.67
-L- PT Sta. 190+95.67
-L- POT Sta. 191+39.71
-L- PC Sta. 192+30.42
-L- PT Sta. 192+45.42
-L- POT Sta. 192+89.46
-L- PC Sta. 193+80.17
-L- PT Sta. 193+95.17
-L- POT Sta. 194+39.21
-L- PC Sta. 195+29.92
-L- PT Sta. 195+45.92
-L- POT Sta. 195+89.96
-L- PC Sta. 196+80.67
-L- PT Sta. 196+95.67
-L- POT Sta. 197+39.71
-L- PC Sta. 198+30.42
-L- PT Sta. 198+45.42
-L- POT Sta. 198+89.46
-L- PC Sta. 199+80.17
-L- PT Sta. 199+95.17
-L- POT Sta. 200+39.21
-L- PC Sta. 201+29.92
-L- PT Sta. 201+45.92
-L- POT Sta. 201+89.96
-L- PC Sta. 202+80.67
-L- PT Sta. 202+95.67
-L- POT Sta. 203+39.71
-L- PC Sta. 204+30.42
-L- PT Sta. 204+45.42
-L- POT Sta. 204+89.46
-L- PC Sta. 205+80.17
-L- PT Sta. 205+95.17
-L- POT Sta. 206+39.21
-L- PC Sta. 207+29.92
-L- PT Sta. 207+45.92
-L- POT Sta. 207+89.96
-L- PC Sta. 208+80.67
-L- PT Sta. 208+95.67
-L- POT Sta. 209+39.71
-L- PC Sta. 210+30.42
-L- PT Sta. 210+45.42
-L- POT Sta. 210+89.46
-L- PC Sta. 211+80.17
-L- PT Sta. 211+95.17
-L- POT Sta. 212+39.21
-L- PC Sta. 213+29.92
-L- PT Sta. 213+45.92
-L- POT Sta. 213+89.96
-L- PC Sta. 214+80.67
-L- PT Sta. 214+95.67
-L- POT Sta. 215+39.71
-L- PC Sta. 216+30.42
-L- PT Sta. 216+45.42
-L- POT Sta. 216+89.46
-L- PC Sta. 217+80.17
-L- PT Sta. 217+95.17
-L- POT Sta. 218+39.21
-L- PC Sta. 219+29.92
-L- PT Sta. 219+45.92
-L- POT Sta. 219+89.96
-L- PC Sta. 220+80.67
-L- PT Sta. 220+95.67
-L- POT Sta. 221+39.71
-L- PC Sta. 222+30.42
-L- PT Sta. 222+45.42
-L- POT Sta. 222+89.46
-L- PC Sta. 223+80.17
-L- PT Sta. 223+95.17
-L- POT Sta. 224+39.21
-L- PC Sta. 225+29.92
-L- PT Sta. 225+45.92
-L- POT Sta. 225+89.96
-L- PC Sta. 226+80.67
-L- PT Sta. 226+95.67
-L- POT Sta. 227+39.71
-L- PC Sta. 228+30.42
-L- PT Sta. 228+45.42
-L- POT Sta. 228+89.46
-L- PC Sta. 229+80.17
-L- PT Sta. 229+95.17
-L- POT Sta. 230+39.21
-L- PC Sta. 231+29.92
-L- PT Sta. 231+45.92
-L- POT Sta. 231+89.96
-L- PC Sta. 232+80.67
-L- PT Sta. 232+95.67
-L- POT Sta. 233+39.71
-L- PC Sta. 234+30.42
-L- PT Sta. 234+45.42
-L- POT Sta. 234+89.46
-L- PC Sta. 235+80.17
-L- PT Sta. 235+95.17
-L- POT Sta. 236+39.21
-L- PC Sta. 237+29.92
-L- PT Sta. 237+45.92
-L- POT Sta. 237+89.96
-L- PC Sta. 238+80.67
-L- PT Sta. 238+95.67
-L- POT Sta. 239+39.71
-L- PC Sta. 240+30.42
-L- PT Sta. 240+45.42
-L- POT Sta. 240+89.46
-L- PC Sta. 241+80.17
-L- PT Sta. 241+95.17
-L- POT Sta. 242+39.21
-L- PC Sta. 243+29.92
-L- PT Sta. 243+45.92
-L- POT Sta. 243+89.96
-L- PC Sta. 244+80.67
-L- PT Sta. 244+95.67
-L- POT Sta. 245+39.71
-L- PC Sta. 246+30.42
-L- PT Sta. 246+45.42
-L- POT Sta. 246+89.46
-L- PC Sta. 247+80.17
-L- PT Sta. 247+95.17
-L- POT Sta. 248+39.21
-L- PC Sta. 249+29.92
-L- PT Sta. 249+45.92
-L- POT Sta. 249+89.96
-L- PC Sta. 250+80.67
-L- PT Sta. 250+95.67
-L- POT Sta. 251+39.71
-L- PC Sta. 252+30.42
-L- PT Sta. 252+45.42
-L- POT Sta. 252+89.46
-L- PC Sta. 253+80.17
-L- PT Sta. 253+95.17
-L- POT Sta. 254+39.21
-L- PC Sta. 255+29.92
-L- PT Sta. 255+45.92
-L- POT Sta. 255+89.96
-L- PC Sta. 256+80.67
-L- PT Sta. 256+95.67
-L- POT Sta. 257+39.71
-L- PC Sta. 258+30.42
-L- PT Sta. 258+45.42
-L- POT Sta. 258+89.46
-L- PC Sta. 259+80.17
-L- PT Sta. 259+95.17
-L- POT Sta. 260+39.21
-L- PC Sta. 261+29.92
-L- PT Sta. 261+45.92
-L- POT Sta. 261+89.96
-L- PC Sta. 262+80.67
-L- PT Sta. 262+95.67
-L- POT Sta. 263+39.71
-L- PC Sta. 264+30.42
-L- PT Sta. 264+45.42
-L- POT Sta. 264+89.46
-L- PC Sta. 265+80.17
-L- PT Sta. 265+95.17
-L- POT Sta. 266+39.21
-L- PC Sta. 267+29.92
-L- PT Sta. 267+45.92
-L- POT Sta. 267+89.96
-L- PC Sta. 268+80.67
-L- PT Sta. 268+95.67
-L- POT Sta. 269+39.71
-L- PC Sta. 270+30.42
-L- PT Sta. 270+45.42
-L- POT Sta. 270+89.46
-L- PC Sta. 271+80.17
-L- PT Sta. 271+95.17
-L- POT Sta. 272+39.21
-L- PC Sta. 273+29.92
-L- PT Sta. 273+45.92
-L- POT Sta. 273+89.96
-L- PC Sta. 274+80.67
-L- PT Sta. 274+95.67
-L- POT Sta. 275+39.71
-L- PC Sta. 276+30.42
-L- PT Sta. 276+45.42
-L- POT Sta. 276+89.46
-L- PC Sta. 277+80.17
-L- PT Sta. 277+95.17
-L- POT Sta. 278+39.21
-L- PC Sta. 279+29.92
-L- PT Sta. 279+45.92
-L- POT Sta. 279+89.96
-L- PC Sta. 280+80.67
-L- PT Sta. 280+95.67
-L- POT Sta. 281+39.71
-L- PC Sta. 282+30.42
-L- PT Sta. 282+45.42
-L- POT Sta. 282+89.46
-L- PC Sta. 283+80.17
-L- PT Sta. 283+95.17
-L- POT Sta. 284+39.21
-L- PC Sta. 285+29.92
-L- PT Sta. 285+45.92
-L- POT Sta. 285+89.96
-L- PC Sta. 286+80.67
-L- PT Sta. 286+95.67
-L- POT Sta. 287+39.71
-L- PC Sta. 288+30.42
-L- PT Sta. 288+45.42
-L- POT Sta. 288+89.46
-L- PC Sta. 289+80.17
-L- PT Sta. 289+95.17
-L- POT Sta. 290+39.21
-L- PC Sta. 291+29.92
-L- PT Sta. 291+45.92
-L- POT Sta. 291+89.96
-L- PC Sta. 292+80.67
-L- PT Sta. 292+95.67
-L- POT Sta. 293+39.71
-L- PC Sta. 294+30.42
-L- PT Sta. 294+45.42
-L- POT Sta. 294+89.46
-L- PC Sta. 295+80.17
-L- PT Sta. 295+95.17
-L- POT Sta. 296+39.21
-L- PC Sta. 297+29.92
-L- PT Sta. 297+45.92
-L- POT Sta. 297+89.96
-L- PC Sta. 298+80.67
-L- PT Sta. 298+95.67
-L- POT Sta. 299+39.71
-L- PC Sta. 300+30.42
-L- PT Sta. 300+45.42
-L- POT Sta. 300+89.46
-L- PC Sta. 301+80.17
-L- PT Sta. 301+95.17
-L- POT Sta. 302+39.21
-L- PC Sta. 303+29.92
-L- PT Sta. 303+45.92
-L- POT Sta. 303+89.96
-L- PC Sta. 304+80.67
-L- PT Sta. 304+95.67
-L- POT Sta. 305+39.71
-L- PC Sta. 306+30.42
-L- PT Sta. 306+45.42
-L- POT Sta. 306+89.46
-L- PC Sta. 307+80.17
-L- PT Sta. 307+95.17
-L- POT Sta. 308+39.21
-L- PC Sta. 309+29.92
-L- PT Sta. 309+45.92
-L- POT Sta. 309+89.96
-L- PC Sta. 310+80.67
-L- PT Sta. 310+95.67
-L- POT Sta. 311+39.71
-L- PC Sta. 312+30.42
-L- PT Sta. 312+45.42
-L- POT Sta. 312+89.46
-L- PC Sta. 313+80.17
-L- PT Sta. 313+95.17
-L- POT Sta. 314+39.21
-L- PC Sta. 315+29.92
-L- PT Sta. 315+45.92
-L- POT Sta. 315+89.96
-L- PC Sta. 316+80.67
-L- PT Sta. 316+95.67
-L- POT Sta. 317+39.71
-L- PC Sta. 318+30.42
-L- PT Sta. 318+45.42
-L- POT Sta. 318+89.46
-L- PC Sta. 319+80.17
-L- PT Sta. 319+95.17
-L- POT Sta. 320+39.21
-L- PC Sta. 321+29.92
-L- PT Sta. 321+45.92
-L- POT Sta. 321+89.96
-L- PC Sta. 322+80.67
-L- PT Sta. 322+95.67
-L- POT Sta. 323+39.71
-L- PC Sta. 324+30.42
-L- PT Sta. 324+45.42
-L- POT Sta. 324+89.46
-L- PC Sta. 325+80.17
-L- PT Sta. 325+95.17
-L- POT Sta. 326+39.21
-L- PC Sta. 327+29.92
-L- PT Sta. 327+45.92
-L- POT Sta. 327+89.96
-L- PC Sta. 328+80.67
-L- PT Sta. 328+95.67
-L- POT Sta. 329+39.71
-L- PC Sta. 330+30.42
-L- PT Sta. 330+45.42
-L- POT Sta. 330+89.46
-L- PC Sta. 331+80.17
-L- PT Sta. 331+95.17
-L- POT Sta. 332+39.21
-L- PC Sta. 333+29.92
-L- PT Sta. 333+45.92
-L- POT Sta. 333+89.96
-L- PC Sta. 334+80.67
-L- PT Sta. 334+95.67
-L- POT Sta. 335+39.71
-L- PC Sta. 336+30.42
-L- PT Sta. 336+45.42
-L- POT Sta. 336+89.46
-L- PC Sta. 337+80.17
-L- PT Sta. 337+95.17
-L- POT Sta. 338+39.21
-L- PC Sta. 339+29.92
-L- PT Sta. 339+45.92
-L- POT Sta. 339+89.96
-L- PC Sta. 340+80.67
-L- PT Sta. 340+95.67
-L- POT Sta. 341+39.71
-L- PC Sta. 342+30.42
-L- PT Sta. 342+45.42
-L- POT Sta. 342+89.46
-L- PC Sta. 343+80.17
-L- PT Sta. 343+95.17
-L- POT Sta. 344+39.21
-L- PC Sta. 345+29.92
-L- PT Sta. 345+45.92
-L- POT Sta. 345+89.96
-L- PC Sta. 346+80.67
-L- PT Sta. 346+95.67
-L- POT Sta. 347+39.71
-L- PC Sta. 348+30.42
-L- PT Sta. 348+45.42
-L- POT Sta. 348+89.46
-L- PC Sta. 349+80.17
-L- PT Sta. 349+95.17
-L- POT Sta. 350+39.21
-L- PC Sta. 351+29.92
-L- PT Sta. 351+45.92
-L- POT Sta. 351+89.96
-L- PC Sta. 352+80.67
-L- PT Sta. 352+95.67
-L- POT Sta. 353+39.71
-L- PC Sta. 354+30.42
-L- PT Sta. 354+45.42
-L- POT Sta. 354+89.46
-L- PC Sta. 355+80.17
-L- PT Sta. 355+95.17
-L- POT Sta. 356+39.21
-L- PC Sta. 357+29.92
-L- PT Sta. 357+45.92
-L- POT Sta. 357+89.96
-L- PC Sta. 358+80.67
-L- PT Sta. 358+95.67
-L- POT Sta. 359+39.71
-L- PC Sta. 360+30.42
-L- PT Sta. 360+45.42
-L- POT Sta. 360+89.46
-L- PC Sta. 361+80.17
-L- PT Sta. 361+95.17
-L- POT Sta. 362+39.21
-L- PC Sta. 363+29.92
-L- PT Sta. 363+45.92
-L- POT Sta. 363+89.96
-L- PC Sta. 364+80.67
-L- PT Sta. 364+95.67
-L- POT Sta. 365+39.71
-L- PC Sta. 366+30.42
-L- PT Sta. 366+45.42
-L- POT Sta. 366+89.46
-L- PC Sta. 367+80.17
-L- PT Sta. 367+95.17
-L- POT Sta. 368+39.21
-L- PC Sta. 369+29.92
-L- PT Sta. 369+45.92
-L- POT Sta. 369+89.96
-L- PC Sta. 370+80.67
-L- PT Sta. 370+95.67
-L- POT Sta. 371+39.71
-L- PC Sta. 372+30.42
-L- PT Sta. 372+45.42
-L- POT Sta. 372+89.46
-L- PC Sta. 373+80.17
-L- PT Sta. 373+95.17
-L- POT Sta. 374+39.21
-L- PC Sta. 375+29.92
-L- PT Sta. 375+45.92
-L- POT Sta. 375+89.96
-L- PC Sta. 376+80.67
-L- PT Sta. 376+95.67
-L- POT Sta. 377+39.71
-L- PC Sta. 378+30.42
-L- PT Sta. 378+45.42
-L- POT Sta. 378+89.46
-L- PC Sta. 379+80.17
-L- PT Sta. 379+95.17
-L- POT Sta. 380+39.21
-L- PC Sta. 381+29.92
-L- PT Sta. 381+45.92
-L- POT Sta. 381+89.96
-L- PC Sta. 382+80.67
-L- PT Sta. 382+95.67
-L- POT Sta. 383+39.71
-L- PC Sta. 384+30.42
-L- PT Sta. 384+45.42
-L- POT Sta. 384+89.46
-L- PC Sta. 385+80.17
-L- PT Sta. 385+95.17
-L- POT Sta. 386+39.21
-L- PC Sta. 387+29.92
-L- PT Sta. 387+45.92
-L- POT Sta. 387+89.96
-L- PC Sta. 388+80.67
-L- PT Sta. 388+95.67
-L- POT Sta. 389+39.71
-L- PC Sta. 390+30.42
-L- PT Sta. 390+45.42
-L- POT Sta. 390+89.46
-L- PC Sta. 391+80.17
-L- PT Sta. 391+95.17
-L- POT Sta. 392+39.21
-L- PC Sta. 393+29.92
-L- PT Sta. 393+45.92
-L- POT Sta. 393+89.96
-L- PC Sta. 394+80.67
-L- PT Sta. 394+95.67
-L- POT Sta. 395+39.71
-L- PC Sta. 396+30.42
-L- PT Sta. 396+45.42
-L- POT Sta. 396+89.46
-L- PC Sta. 397+80.17
-L- PT Sta. 397+95.17
-L- POT Sta. 398+39.21
-L- PC Sta. 399+29.92
-L- PT Sta. 399+45.92
-L- POT Sta. 399+89.96
-L- PC Sta. 400+80.67
-L- PT Sta. 400+95.67
-L- POT Sta. 401+39.71
-L- PC Sta. 402+30.42
-L- PT Sta. 402+45.42
-L- POT Sta. 402+89.46
-L- PC Sta. 403+80.17
-L- PT Sta. 403+95.17
-L- POT Sta. 404+39.21
-L- PC Sta. 405+29.92
-L- PT Sta. 405+45.92
-L- POT Sta. 405+89.96
-L- PC Sta. 406+80.67
-L- PT Sta. 406+95.67
-L- POT Sta. 407+39.71
-L- PC Sta. 408+30.42
-L- PT Sta. 408+45.42
-L- POT Sta. 408+89.46
-L- PC Sta. 409+80.17
-L- PT Sta. 409+95.17
-L- POT Sta. 410+39.21
-L- PC Sta. 411+29.92
-L- PT Sta. 411+45.92
-L- POT Sta. 411+89.96
-L- PC Sta. 412+80.67
-L- PT Sta. 412+95.67
-L- POT Sta. 413+39.71
-L- PC Sta. 414+30.42
-L- PT Sta. 414+45.42
-L- POT Sta. 414+89.46
-L- PC Sta. 415+80.17
-L- PT Sta. 415+95.17
-L- POT Sta. 416+39.21
-L- PC Sta. 417+29.92
-L- PT Sta. 417+45.92
-L- POT Sta. 417+89.96
-L- PC Sta. 418+80.67
-L- PT Sta. 418+95.67
-L- POT Sta. 419+39.71
-L- PC Sta. 420+30.42
-L- PT Sta. 420+45.42
-L- POT Sta. 420+89.46
-L- PC Sta. 421+80.17
-L- PT Sta. 421+95.17
-L- POT Sta. 422+39.21
-L- PC Sta. 423+29.92
-L- PT Sta. 423+45.92
-L- POT Sta. 423+89.96
-L- PC Sta. 424+80.67
-L- PT Sta. 424+95.67
-L- POT Sta. 425+39.71
-L- PC Sta. 426+30.42
-L- PT Sta. 426+45.42
-L- POT Sta. 426+89.46
-L- PC Sta. 427+80.17
-L- PT Sta. 427+95.17
-L- POT Sta. 428+39.21
-L- PC Sta. 429+29.92
-L- PT Sta. 429+45.92
-L- POT Sta. 429+89.96
-L- PC Sta. 430+80.67
-L- PT Sta. 430+95.67
-L- POT Sta. 431+39.71
-L- PC Sta. 432+30.42
-L- PT Sta. 432+45.42
-L- POT Sta. 432+89.46
-L- PC Sta. 433+80.17
-L- PT Sta. 433+95.17
-L- POT Sta. 434+39.21
-L- PC Sta. 435+29.92
-L- PT Sta. 435+45.92
-L- POT Sta. 435+89.96
-L- PC Sta. 436+80.67
-L- PT Sta. 436+95.67
-L- POT Sta. 437+39.71
-L- PC Sta. 438+30.42
-L- PT Sta. 438+45.42
-L- POT Sta. 438+89.46
-L- PC Sta. 439+80.17
-L- PT Sta. 439+95.17
-L- POT Sta. 440+39.21
-L- PC Sta. 441+29.92
-L- PT Sta. 441+45.92
-L- POT Sta. 441+89.96
-L- PC Sta. 442+80.67
-L- PT Sta. 442+95.67
-L- POT Sta. 443+39.71
-L- PC Sta. 444+30.42
-L- PT Sta. 444+45.42
-L- POT Sta. 444+89.46
-L- PC Sta. 445+80.17
-L- PT Sta. 445+95.17
-L- POT Sta. 446+39.21
-L- PC Sta. 447+29.92
-L- PT Sta. 447+45.92
-L- POT Sta. 447+89.96
-L- PC Sta. 448+80.67
-L- PT Sta. 448+95.67
-L- POT Sta. 449+39.71
-L- PC Sta. 450+30.42
-L- PT Sta. 450+45.42
-L- POT Sta. 450+89.46
-L- PC Sta. 451+80.17
-L- PT Sta. 451+95.17
-L- POT Sta. 452+39.21
-L- PC Sta. 453+29.92
-L- PT Sta. 453+45.92
-L- POT Sta. 453+89.96
-L- PC Sta. 454+80.67
-L- PT Sta. 454+95.67
-L- POT Sta. 455+39.71
-L- PC Sta. 456+30.42
-L- PT Sta. 456+45.42
-L- POT Sta. 456+89.46
-L- PC Sta. 457+80.17
-L- PT Sta. 457+95.17
-L- POT Sta. 458+39.21
-L- PC Sta. 459+29.92
-L- PT Sta. 459+45.92
-L- POT Sta. 459+89.96
-L- PC Sta. 460+80.67
-L- PT Sta. 460+95.67
-L- POT Sta. 461+39.71
-L- PC Sta. 462+30.42
-L- PT Sta. 462+45.42
-L- POT Sta. 462+89.46
-L- PC Sta. 463+80.17
-L- PT Sta. 463+95.17
-L- POT Sta. 464+39.21
-L- PC Sta. 465+29.92
-L- PT Sta. 465+45.92
-L- POT Sta. 465+89.96
-L- PC Sta. 466+80.67
-L- PT Sta. 466+95.67
-L- POT Sta. 467+39.71
-L- PC Sta. 468+30.42
-L- PT Sta. 468+45.42
-L- POT Sta. 468+89.46
-L- PC Sta. 469+80.17
-L- PT Sta. 469+95.17
-L- POT Sta. 470+39.21
-L- PC Sta. 471+29.92
-L- PT Sta. 471+45.92
-L- POT Sta. 471+89.96
-L- PC Sta. 472+80.67
-L- PT Sta. 472+95.67
-L- POT Sta. 473+39.71
-L- PC Sta. 474+30.42
-L- PT Sta. 474+45.42
-L- POT Sta. 474+89.46
-L- PC Sta. 475+80.17
-L- PT Sta. 475+95.17
-L- POT Sta. 476+39.21
-L- PC Sta. 477+29.92
-L- PT Sta. 477+45.92
-L- POT Sta. 477+89.96
-L- PC Sta. 478+80.67
-L- PT Sta. 478+95.67
-L- POT Sta. 479+39.71
-L- PC Sta. 480+30.42
-L- PT Sta. 480+45.42
-L- POT Sta. 480+89.46
-L- PC Sta. 481+80.17
-L- PT Sta. 481+95.17
-L- POT Sta. 482+39.21
-L- PC Sta. 483+29.92
-L- PT Sta. 483+45.92
-L- POT Sta. 483+89.96
-L- PC Sta. 484+80.67
-L- PT Sta. 484+95.67
-L- POT Sta. 485+39.71
-L- PC Sta. 486+30.42
-L- PT Sta. 486+45.42
-L- POT Sta. 486+89.46
-L- PC Sta. 487+80.17
-L- PT Sta. 487+95.17
-L- POT Sta. 488+39.21
-L- PC Sta. 489+29.92
-L- PT Sta. 489+45.92
-L- POT Sta. 489+89.96
-L- PC Sta. 490+80.67
-L- PT Sta. 490+95.67
-L- POT Sta. 491+39.71
-L- PC Sta. 492+30.42
-L- PT Sta. 492+45.42
-L- POT Sta. 492+89.46
-L- PC Sta. 493+80.17
-L- PT Sta. 493+95.17
-L- POT Sta. 494+39.21
-L- PC Sta. 495+29.92
-L- PT Sta. 495+45.92
-L- POT Sta. 495+89.96
-L- PC Sta. 496+80.67
-L- PT Sta. 496+95.67
-L- POT Sta. 497+39.71
-L- PC Sta. 498+30.42
-L- PT Sta. 498+45.42
-L- POT Sta. 498+89.46
-L- PC Sta. 499+80.17
-L- PT Sta. 499+95.17
-L- POT Sta. 500+39.21
-L- PC Sta. 501+29.92
-L- PT Sta. 501+45.92
-L- POT Sta. 501+89.96
-L- PC Sta. 502+80.67
-L- PT Sta. 502+95.67
-L- POT Sta. 503+39.71
-L- PC Sta. 504+30


PROJECT REFERENCE NO.
P-5707
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
6
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/NSRS 2007
BUFFER DRAWING SHEET 5 OF 6
REVISED 05082025
SCALE
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2
END TIP PROJECT P-5707
-L- STA. 52+65.05
-L- POT Sta. 52+75.00
-Y5- POT Sta. 28+26.07 = -L- POT Sta. 49+59.23
-Y5- PT Sta. 27+59.69
SITE 1B
SITE 2
SITE 3
INSET A
INSET B
MATCHLINE
-L- STA. 38+50 SEE SHEET 5
-DRI- STA. 11+30 SEE SHEET 5
-Y5- STA. 15+25 SEE SHEET 5
-DRI- PC Sta. 10+36.45
-DRI- POT Sta. 10+00.00 = -L- POT Sta. 39+00.00
-Y5- PRC Sta. 16+97.19
-L- PT Sta. 41+69.70
-Y5- PRC Sta. 19+58.25
-DR5A- PT Sta. 10+82.30
-DR5A- PC Sta. 10+40.00
-DR5A- POT Sta. 11+27.04 = -Y5- POT Sta. 24+03.37
BEGIN CONSTRUCTION -DR5A- Sta. 10+25.00
-DR5A- PC Sta. 10+40.00
REMOVE
REMOVE & RESET
RETAIN
RETAIN EXISTING SIGNAGE
PROP. RETAINING WALL #2
PROP. RETAINING WALL #3
PROP. RETAINING WALL #4
PROP. RETAINING WALL #5
PROP. RETAINING WALL #6
PROP. RETAINING WALL #7
PROP. RETAINING WALL #8
PROP. RETAINING WALL #9
PROP. RETAINING WALL #10
PROP. RETAINING WALL #11
PROP. RETAINING WALL #12
PROP. RETAINING WALL #13
PROP. RETAINING WALL #14
PROP. RETAINING WALL #15
PROP. RETAINING WALL #16
PROP. RETAINING WALL #17
PROP. RETAINING WALL #18
PROP. RETAINING WALL #19
PROP. RETAINING WALL #20
PROP. RETAINING WALL #21
PROP. RETAINING WALL #22
PROP. RETAINING WALL #23
PROP. RETAINING WALL #24
PROP. RETAINING WALL #25
PROP. RETAINING WALL #26
PROP. RETAINING WALL #27
PROP. RETAINING WALL #28
PROP. RETAINING WALL #29
PROP. RETAINING WALL #30
PROP. RETAINING WALL #31
PROP. RETAINING WALL #32
PROP. RETAINING WALL #33
PROP. RETAINING WALL #34
PROP. RETAINING WALL #35
PROP. RETAINING WALL #36
PROP. RETAINING WALL #37
PROP. RETAINING WALL #38
PROP. RETAINING WALL #39
PROP. RETAINING WALL #40
PROP. RETAINING WALL #41
PROP. RETAINING WALL #42
PROP. RETAINING WALL #43
PROP. RETAINING WALL #44
PROP. RETAINING WALL #45
PROP. RETAINING WALL #46
PROP. RETAINING WALL #47
PROP. RETAINING WALL #48
PROP. RETAINING WALL #49
PROP. RETAINING WALL #50
PROP. RETAINING WALL #51
PROP. RETAINING WALL #52
PROP. RETAINING WALL #53
PROP. RETAINING WALL #54
PROP. RETAINING WALL #55
PROP. RETAINING WALL #56
PROP. RETAINING WALL #57
PROP. RETAINING WALL #58
PROP. RETAINING WALL #59
PROP. RETAINING WALL #60
PROP. RETAINING WALL #61
PROP. RETAINING WALL #62
PROP. RETAINING WALL #63
PROP. RETAINING WALL #64
PROP. RETAINING WALL #65
PROP. RETAINING WALL #66
PROP. RETAINING WALL #67
PROP. RETAINING WALL #68
PROP. RETAINING WALL #69
PROP. RETAINING WALL #70
PROP. RETAINING WALL #71
PROP. RETAINING WALL #72
PROP. RETAINING WALL #73
PROP. RETAINING WALL #74
PROP. RETAINING WALL #75
PROP. RETAINING WALL #76
PROP. RETAINING WALL #77
PROP. RETAINING WALL #78
PROP. RETAINING WALL #79
PROP. RETAINING WALL #80
PROP. RETAINING WALL #81
PROP. RETAINING WALL #82
PROP. RETAINING WALL #83
PROP. RETAINING WALL #84
PROP. RETAINING WALL #85
PROP. RETAINING WALL #86
PROP. RETAINING WALL #87
PROP. RETAINING WALL #88
PROP. RETAINING WALL #89
PROP. RETAINING WALL #90
PROP. RETAINING WALL #91
PROP. RETAINING WALL #92
PROP. RETAINING WALL #93
PROP. RETAINING WALL #94
PROP. RETAINING WALL #95
PROP. RETAINING WALL #96
PROP. RETAINING WALL #97
PROP. RETAINING WALL #98
PROP. RETAINING WALL #99
PROP. RETAINING WALL #100
PROP. RETAINING WALL #101
PROP. RETAINING WALL #102
PROP. RETAINING WALL #103
PROP. RETAINING WALL #104
PROP. RETAINING WALL #105
PROP. RETAINING WALL #106
PROP. RETAINING WALL #107
PROP. RETAINING WALL #108
PROP. RETAINING WALL #109
PROP. RETAINING WALL #110
PROP. RETAINING WALL #111
PROP. RETAINING WALL #112
PROP. RETAINING WALL #113
PROP. RETAINING WALL #114
PROP. RETAINING WALL #115
PROP. RETAINING WALL #116
PROP. RETAINING WALL #117
PROP. RETAINING WALL #118
PROP. RETAINING WALL #119
PROP. RETAINING WALL #120
PROP. RETAINING WALL #121
PROP. RETAINING WALL #122
PROP. RETAINING WALL #123
PROP. RETAINING WALL #124
PROP. RETAINING WALL #125
PROP. RETAINING WALL #126
PROP. RETAINING WALL #127
PROP. RETAINING WALL #128
PROP. RETAINING WALL #129
PROP. RETAINING WALL #130
PROP. RETAINING WALL #131
PROP. RETAINING WALL #132
PROP. RETAINING WALL #133
PROP. RETAINING WALL #134
PROP. RETAINING WALL #135
PROP. RETAINING WALL #136
PROP. RETAINING WALL #137
PROP. RETAINING WALL #138
PROP. RETAINING WALL #139
PROP. RETAINING WALL #140
PROP. RETAINING WALL #141
PROP. RETAINING WALL #142
PROP. RETAINING WALL #143
PROP. RETAINING WALL #144
PROP. RETAINING WALL #145
PROP. RETAINING WALL #146
PROP. RETAINING WALL #147
PROP. RETAINING WALL #148
PROP. RETAINING WALL #149
PROP. RETAINING WALL #150
PROP. RETAINING WALL #151
PROP. RETAINING WALL #152
PROP. RETAINING WALL #153
PROP. RETAINING WALL #154
PROP. RETAINING WALL #155
PROP. RETAINING WALL #156
PROP. RETAINING WALL #157
PROP. RETAINING WALL #158
PROP. RETAINING WALL #159
PROP. RETAINING WALL #160
PROP. RETAINING WALL #161
PROP. RETAINING WALL #162
PROP. RETAINING WALL #163
PROP. RETAINING WALL #164
PROP. RETAINING WALL #165
PROP. RETAINING WALL #166
PROP. RETAINING WALL #167
PROP. RETAINING WALL #168
PROP. RETAINING WALL #169
PROP. RETAINING WALL #170
PROP. RETAINING WALL #171
PROP. RETAINING WALL #172
PROP. RETAINING WALL #173
PROP. RETAINING WALL #174
PROP. RETAINING WALL #175
PROP. RETAINING WALL #176
PROP. RETAINING WALL #177
PROP. RETAINING WALL #178
PROP. RETAINING WALL #179
PROP. RETAINING WALL #180
PROP. RETAINING WALL #181
PROP. RETAINING WALL #182
PROP. RETAINING WALL #183
PROP. RETAINING WALL #184
PROP. RETAINING WALL #185
PROP. RETAINING WALL #186
PROP. RETAINING WALL #187
PROP. RETAINING WALL #188
PROP. RETAINING WALL #189
PROP. RETAINING WALL #190
PROP. RETAINING WALL #191
PROP. RETAINING WALL #192
PROP. RETAINING WALL #193
PROP. RETAINING WALL #194
PROP. RETAINING WALL #195
PROP. RETAINING WALL #196
PROP. RETAINING WALL #197
PROP. RETAINING WALL #198
PROP. RETAINING WALL #199
PROP. RETAINING WALL #200
PROP. RETAINING WALL #201
PROP. RETAINING WALL #202
PROP. RETAINING WALL #203
PROP. RETAINING WALL #204
PROP. RETAINING WALL #205
PROP. RETAINING WALL #206
PROP. RETAINING WALL #207
PROP. RETAINING WALL #208
PROP. RETAINING WALL #209
PROP. RETAINING WALL #210
PROP. RETAINING WALL #211
PROP. RETAINING WALL #212
PROP. RETAINING WALL #213
PROP. RETAINING WALL #214
PROP. RETAINING WALL #215
PROP. RETAINING WALL #216
PROP. RETAINING WALL #217
PROP. RETAINING WALL #218
PROP. RETAINING WALL #219
PROP. RETAINING WALL #220
PROP. RETAINING WALL #221
PROP. RETAINING WALL #222
PROP. RETAINING WALL #223
PROP. RETAINING WALL #224
PROP. RETAINING WALL #225
PROP. RETAINING WALL #226
PROP. RETAINING WALL #227
PROP. RETAINING WALL #228
PROP. RETAINING WALL #229
PROP. RETAINING WALL #230
PROP. RETAINING WALL #231
PROP. RETAINING WALL #232
PROP. RETAINING WALL #233
PROP. RETAINING WALL #234
PROP. RETAINING WALL #235
PROP. RETAINING WALL #236
PROP. RETAINING WALL #237
PROP. RETAINING WALL #238
PROP. RETAINING WALL #239
PROP. RETAINING WALL #240
PROP. RETAINING WALL #241
PROP. RETAINING WALL #242
PROP. RETAINING WALL #243
PROP. RETAINING WALL #244
PROP. RETAINING WALL #245
PROP. RETAINING WALL #246
PROP. RETAINING WALL #247
PROP. RETAINING WALL #248
PROP. RETAINING WALL #249
PROP. RETAINING WALL #250
PROP. RETAINING WALL #251
PROP. RETAINING WALL #252
PROP. RETAINING WALL #253
PROP. RETAINING WALL #254
PROP. RETAINING WALL #255
PROP. RETAINING WALL #256
PROP. RETAINING WALL #257
PROP. RETAINING WALL #258
PROP. RETAINING WALL #259
PROP. RETAINING WALL #260
PROP. RETAINING WALL #261
PROP. RETAINING WALL #262
PROP. RETAINING WALL #263
PROP. RETAINING WALL #264
PROP. RETAINING WALL #265
PROP. RETAINING WALL #266
PROP. RETAINING WALL #267
PROP. RETAINING WALL #268
PROP. RETAINING WALL #269
PROP. RETAINING WALL #270
PROP. RETAINING WALL #271
PROP. RETAINING WALL #272
PROP. RETAINING WALL #273
PROP. RETAINING WALL #274
PROP. RETAINING WALL #275
PROP. RETAINING WALL #276
PROP. RETAINING WALL #277
PROP. RETAINING WALL #278
PROP. RETAINING WALL #279
PROP. RETAINING WALL #280
PROP. RETAINING WALL #281
PROP. RETAINING WALL #282
PROP. RETAINING WALL #283
PROP. RETAINING WALL #284
PROP. RETAINING WALL #285
PROP. RETAINING WALL #286
PROP. RETAINING WALL #287
PROP. RETAINING WALL #288
PROP. RETAINING WALL #289
PROP. RETAINING WALL #290
PROP. RETAINING WALL #291
PROP. RETAINING WALL #292
PROP. RETAINING WALL #293
PROP. RETAINING WALL #294
PROP. RETAINING WALL #295
PROP. RETAINING WALL #296
PROP. RETAINING WALL #297
PROP. RETAINING WALL #298
PROP. RETAINING WALL #299
PROP. RETAINING WALL #300
PROP. RETAINING WALL #301
PROP. RETAINING WALL #302
PROP. RETAINING WALL #303
PROP. RETAINING WALL #304
PROP. RETAINING WALL #305
PROP. RETAINING WALL #306
PROP. RETAINING WALL #307
PROP. RETAINING WALL #308
PROP. RETAINING WALL #309
PROP. RETAINING WALL #310
PROP. RETAINING WALL #311
PROP. RETAINING WALL #312
PROP. RETAINING WALL #313
PROP. RETAINING WALL #314
PROP. RETAINING WALL #315
PROP. RETAINING WALL #316
PROP. RETAINING WALL #317
PROP. RETAINING WALL #318
PROP. RETAINING WALL #319
PROP. RETAINING WALL #320
PROP. RETAINING WALL #321
PROP. RETAINING WALL #322
PROP. RETAINING WALL #323
PROP. RETAINING WALL #324
PROP. RETAINING WALL #325
PROP. RETAINING WALL #326
PROP. RETAINING WALL #327
PROP. RETAINING WALL #328
PROP. RETAINING WALL #329
PROP. RETAINING WALL #330
PROP. RETAINING WALL #331
PROP. RETAINING WALL #332
PROP. RETAINING WALL #333
PROP. RETAINING WALL #334
PROP. RETAINING WALL #335
PROP. RETAINING WALL #336
PROP. RETAINING WALL #337
PROP. RETAINING WALL #338
PROP. RETAINING WALL #339
PROP. RETAINING WALL #340
PROP. RETAINING WALL #341
PROP. RETAINING WALL #342
PROP. RETAINING WALL #343
PROP. RETAINING WALL #344
PROP. RETAINING WALL #345
PROP. RETAINING WALL #346
PROP. RETAINING WALL #347
PROP. RETAINING WALL #348
PROP. RETAINING WALL #349
PROP. RETAINING WALL #350
PROP. RETAINING WALL #351
PROP. RETAINING WALL #352
PROP. RETAINING WALL #353
PROP. RETAINING WALL #354
PROP. RETAINING WALL #355
PROP. RETAINING WALL #356
PROP. RETAINING WALL #357
PROP. RETAINING WALL #358
PROP. RETAINING WALL #359
PROP. RETAINING WALL #360
PROP. RETAINING WALL #361
PROP. RETAINING WALL #362
PROP. RETAINING WALL #363
PROP. RETAINING WALL #364
PROP. RETAINING WALL #365
PROP. RETAINING WALL #366
PROP. RETAINING WALL #367
PROP. RETAINING WALL #368
PROP. RETAINING WALL #369
PROP. RETAINING WALL #370
PROP. RETAINING WALL #371
PROP. RETAINING WALL #372
PROP. RETAINING WALL #373
PROP. RETAINING WALL #374
PROP. RETAINING WALL #375
PROP. RETAINING WALL #376
PROP. RETAINING WALL #377
PROP. RETAINING WALL #378
PROP. RETAINING WALL #379
PROP. RETAINING WALL #380
PROP. RETAINING WALL #381
PROP. RETAINING WALL #382
PROP. RETAINING WALL #383
PROP. RETAINING WALL #384
PROP. RETAINING WALL #385
PROP. RETAINING WALL #386
PROP. RETAINING WALL #387
PROP. RETAINING WALL #388
PROP. RETAINING WALL #389
PROP. RETAINING WALL #390
PROP. RETAINING WALL #391
PROP. RETAINING WALL #392
PROP. RETAINING WALL #393
PROP. RETAINING WALL #394
PROP. RETAINING WALL #395
PROP. RETAINING WALL #396
PROP. RETAINING WALL #397
PROP. RETAINING WALL #398
PROP. RETAINING WALL #399
PROP. RETAINING WALL #400
PROP. RETAINING WALL #401
PROP. RETAINING WALL #402
PROP. RETAINING WALL #403
PROP. RETAINING WALL #404
PROP. RETAINING WALL #405
PROP. RETAINING WALL #406
PROP. RETAINING WALL #407
PROP. RETAINING WALL #408
PROP. RETAINING WALL #409
PROP. RETAINING WALL #410
PROP. RETAINING WALL #411
PROP. RETAINING WALL #412
PROP. RETAINING WALL #413
PROP. RETAINING WALL #414
PROP. RETAINING WALL #415
PROP. RETAINING WALL #416
PROP. RETAINING WALL #417
PROP. RETAINING WALL #418
PROP. RETAINING WALL #419
PROP. RETAINING WALL #420
PROP. RETAINING WALL #421
PROP. RETAINING WALL #422
PROP. RETAINING WALL #423
PROP. RETAINING WALL #424
PROP. RETAINING WALL #425
PROP. RETAINING WALL #426
PROP. RETAINING WALL #427
PROP. RETAINING WALL #428
PROP. RETAINING WALL #429
PROP. RETAINING WALL #430
PROP. RETAINING WALL #431
PROP. RETAINING WALL #432
PROP. RETAINING WALL #433
PROP. RETAINING WALL #434
PROP. RETAINING WALL #435
PROP. RETAINING WALL #436
PROP. RETAINING WALL #437
PROP. RETAINING WALL #438
PROP. RETAINING WALL #439
PROP. RETAINING WALL #440
PROP. RETAINING WALL #441
PROP. RETAINING WALL #442
PROP. RETAINING WALL #443
PROP. RETAINING WALL #444
PROP. RETAINING WALL #445
PROP. RETAINING WALL #446
PROP. RETAINING WALL #447
PROP. RETAINING WALL #448
PROP. RETAINING WALL #449
PROP. RETAINING WALL #450
PROP. RETAINING WALL #451
PROP. RETAINING WALL #452
PROP. RETAINING WALL #453
PROP. RETAINING WALL #454
PROP. RETAINING WALL #455
PROP. RETAINING WALL #456
PROP. RETAINING WALL #457
PROP. RETAINING WALL #458
PROP. RETAINING WALL #459
PROP. RETAINING WALL #460
PROP. RETAINING WALL #461
PROP. RETAINING WALL #462
PROP. RETAINING WALL #463
PROP. RETAINING WALL #464
PROP. RETAINING WALL #465
PROP. RETAINING WALL #466
PROP. RETAINING WALL #467
PROP. RETAINING WALL #468
PROP. RETAINING WALL #469
PROP. RETAINING WALL #470
PROP. RETAINING WALL #471
PROP. RETAINING WALL #472
PROP. RETAINING WALL #473
PROP. RETAINING WALL #474
PROP. RETAINING WALL #475
PROP. RETAINING WALL #476
PROP. RETAINING WALL #477
PROP. RETAINING WALL #478
PROP. RETAINING WALL #479
PROP. RETAINING WALL #480
PROP. RETAINING WALL #481
PROP. RETAINING WALL #482
PROP. RETAINING WALL #483
PROP. RETAINING WALL #484
PROP. RETAINING WALL #485
PROP. RETAINING WALL #486
PROP. RETAINING WALL #487
PROP. RETAINING WALL #488
PROP. RETAINING WALL #489
PROP. RETAINING WALL #490
PROP. RETAINING WALL #491
PROP. RETAINING WALL #492
PROP. RETAINING WALL #493
PROP. RETAINING WALL #494
PROP. RETAINING WALL #495
PROP. RETAINING WALL #496
PROP. RETAINING WALL #497
PROP. RETAINING WALL #498
PROP. RETAINING WALL #499
PROP. RETAINING WALL #500
PROP. RETAINING WALL #501
PROP. RETAINING WALL #502
PROP. RETAINING WALL #503
PROP. RETAINING WALL #504
PROP. RETAINING WALL #505
PROP. RETAINING WALL #506
PROP. RETAINING WALL #507
PROP. RETAINING WALL #508
PROP. RETAINING WALL #509
PROP. RETAINING WALL #510
PROP. RETAINING WALL #511
PROP. RETAINING WALL #512
PROP. RETAINING WALL #513
PROP. RETAINING WALL #514
PROP. RETAINING WALL #515
PROP. RETAINING WALL #516
PROP. RETAINING WALL #517
PROP. RETAINING WALL #518
PROP. RETAINING WALL #519
PROP. RETAINING WALL #520
PROP. RETAINING WALL #521
PROP. RETAINING WALL #522
PROP. RETAINING WALL #523
PROP. RETAINING WALL #524
PROP. RETAINING WALL #525
PROP. RETAINING WALL #526
PROP. RETAINING WALL #527
PROP. RETAINING WALL #528
PROP. RETAINING WALL #529
PROP. RETAINING WALL #530
PROP. RETAINING WALL #531
PROP. RETAINING WALL #532
PROP. RETAINING WALL #533
PROP. RETAINING WALL #534
PROP. RETAINING WALL #535
PROP. RETAINING WALL #536
PROP. RETAINING WALL #537
PROP. RETAINING WALL #538
PROP. RETAINING WALL #539
PROP. RETAINING WALL #540
PROP. RETAINING WALL #541
PROP. RETAINING WALL #542
PROP. RETAINING WALL #543
PROP. RETAINING WALL #544
PROP. RETAINING WALL #545
PROP. RETAINING WALL #546
PROP. RETAINING WALL #547
PROP. RETAINING WALL #548
PROP. RETAINING WALL #549
PROP. RETAINING WALL #550
PROP. RETAINING WALL #551
PROP. RETAINING WALL #552
PROP. RETAINING WALL #553
PROP. RETAINING WALL #554
PROP. RETAINING WALL #555
PROP. RETAINING WALL #556
PROP. RETAINING WALL #557
PROP. RETAINING WALL #558
PROP. RETAINING WALL #559
PROP. RETAINING WALL #560
PROP. RETAINING WALL #561
PROP. RETAINING WALL #562
PROP. RETAINING WALL #563
PROP. RETAINING WALL #564
PROP. RETAINING WALL #565
PROP. RETAINING WALL #566
PROP. RETAINING WALL #567
PROP. RETAINING WALL #568
PROP. RETAINING WALL #569
PROP. RETAINING WALL #570
PROP. RETAINING WALL #571
PROP. RETAINING WALL #572
PROP. RETAINING WALL #573
PROP. RETAINING WALL #574
PROP. RETAINING WALL #575
PROP. RETAINING WALL #576
PROP. RETAINING WALL #577
PROP. RETAINING WALL #578
PROP. RETAINING WALL #579
PROP. RETAINING WALL #580
PROP. RETAINING WALL #581
PROP. RETAINING WALL #582
PROP. RETAINING WALL #583
PROP. RETAINING WALL #584
PROP. RETAINING WALL #585
PROP. RETAINING WALL #586
PROP. RETAINING WALL #587
PROP. RETAINING WALL #588
PROP. RETAINING WALL #589
PROP. RETAINING WALL #590
PROP. RETAINING WALL #591
PROP. RETAINING WALL #592
PROP. RETAINING WALL #593
PROP. RETAINING WALL #594
PROP. RETAINING WALL #595
PROP. RETAINING WALL #596
PROP. RETAINING WALL #597
PROP. RETAINING WALL #598
PROP. RETAINING WALL #599
PROP. RETAINING WALL #600
PROP. RETAINING WALL #601
PROP. RETAINING WALL #602
PROP. RETAINING WALL #603
PROP. RETAINING WALL #604
PROP. RETAINING WALL #605
PROP. RETAINING WALL #606
PROP. RETAINING WALL #607
PROP. RETAINING WALL #608
PROP. RETAINING WALL #609
PROP. RETAINING WALL #610
PROP. RETAINING WALL #611
PROP. RETAINING WALL #612
PROP. RETAINING WALL #613
PROP. RETAINING WALL #614
PROP. RETAINING WALL #615
PROP. RETAINING WALL #616
PROP. RETAINING WALL #617
PROP. RETAINING WALL #618
PROP. RETAINING WALL #619
PROP. RETAINING WALL #620
PROP. RETAINING WALL #621
PROP. RETAINING WALL #622
PROP. RETAINING WALL #623
PROP. RETAINING WALL #624
PROP. RETAINING WALL #625
PROP. RETAINING WALL #626
PROP. RETAINING WALL #627
PROP. RETAINING WALL #628
PROP. RETAINING WALL #629
PROP. RETAINING WALL #630
PROP. RETAINING WALL #631
PROP. RETAINING WALL #632
PROP. RETAINING WALL #633
PROP. RETAINING WALL #634
PROP. RETAINING WALL #635
PROP. RETAINING WALL #636
PROP. RETAINING WALL #637
PROP. RETAINING WALL #638
PROP. RETAINING WALL #639
PROP. RETAINING WALL #640
PROP. RETAINING WALL #641
PROP. RETAINING WALL #642
PROP. RETAINING WALL #643
PROP. RETAINING WALL #644
PROP. RETAINING WALL #645
PROP. RETAINING WALL #646
PROP. RETAINING WALL #647
PROP. RETAINING WALL #648
PROP. RETAINING WALL #649
PROP. RETAINING WALL #650
PROP. RETAINING WALL #651
PROP. RETAINING WALL #652
PROP. RETAINING WALL #653
PROP. RETAINING WALL #654
PROP. RETAINING WALL #655
PROP. RETAINING WALL #656
PROP. RETAINING WALL #657
PROP. RETAINING WALL #658
PROP. RETAINING WALL #659
PROP. RETAINING WALL #660
PROP. RETAINING WALL #661
PROP. RETAINING WALL #662
PROP. RETAINING WALL #663
PROP. RETAINING WALL #664
PROP. RETAINING WALL #665
PROP. RETAINING WALL #666
PROP. RETAINING WALL #667
PROP. RETAINING WALL #668
PROP. RETAINING WALL #669
PROP. RETAINING WALL #670
PROP. RETAINING WALL #671
PROP. RETAINING WALL #672
PROP. RETAINING WALL #673
PROP. RETAINING WALL #674
PROP. RETAINING WALL #675
PROP. RETAINING WALL #676
PROP. RETAINING WALL #677
PROP. RETAINING WALL #678
PROP. RETAINING WALL #679
PROP. RETAINING WALL #680
PROP. RETAINING WALL #681
PROP. RETAINING WALL #682
PROP. RETAINING WALL #683
PROP. RETAINING WALL #684
PROP. RETAINING WALL #685
PROP. RETAINING WALL #686
PROP. RETAINING WALL #687
PROP. RETAINING WALL #688
PROP. RETAINING WALL #689
PROP. RETAINING WALL #690
PROP. RETAINING WALL #691
PROP. RETAINING WALL #692
PROP. RETAINING WALL #693
PROP. RETAINING WALL #694
PROP. RETAINING WALL #695
PROP. RETAINING WALL #696
PROP. RETAINING WALL #697
PROP. RETAINING WALL #698
PROP. RETAINING WALL #699
PROP. RETAINING WALL #700
PROP. RETAINING WALL #701
PROP. RETAINING WALL #702
PROP. RETAINING WALL #703
PROP. RETAINING WALL #704
PROP. RETAINING WALL #705
PROP. RETAINING WALL #706
PROP. RETAINING WALL #707
PROP. RETAINING WALL #708
PROP. RETAINING WALL #709
PROP. RETAINING WALL #710
PROP. RETAINING WALL #711
PROP. RETAINING WALL #712
PROP. RETAINING WALL #713
PROP. RETAINING WALL #714
PROP. RETAINING WALL #715
PROP. RETAINING WALL #716
PROP. RETAINING WALL #717
PROP. RETAINING WALL #718
PROP. RETAINING WALL #719
PROP. RETAINING WALL #720
PROP. RETAINING WALL #721
PROP. RETAINING WALL #722
PROP. RETAINING WALL #723
PROP. RETAINING WALL #724
PROP. RETAINING WALL #725
PROP. RETAINING WALL #726
PROP. RETAINING WALL #727
PROP. RETAINING WALL #728
PROP. RETAINING WALL #729
PROP. RETAINING WALL #730
PROP. RETAINING WALL #731
PROP. RETAINING WALL #732
PROP. RETAINING WALL #733
PROP. RETAINING WALL #734
PROP. RETAINING WALL #735
PROP. RETAINING WALL #736
PROP. RETAINING WALL #737
PROP. RETAINING WALL #738
PROP. RETAINING WALL #739
PROP. RETAINING WALL #740
PROP. RETAINING WALL #741
PROP. RETAINING WALL #742
PROP. RETAINING WALL #743
PROP. RETAINING WALL #744
PROP. RETAINING WALL #745
PROP. RETAINING WALL #746
PROP. RETAINING WALL #747
PROP. RETAINING WALL #748
PROP. RETAINING WALL #749
PROP. RETAINING WALL #750
PROP. RETAINING WALL #751
PROP. RETAINING WALL #752
PROP. RETAINING WALL #753
PROP. RETAINING WALL #754
PROP. RETAINING WALL #755
PROP. RETAINING WALL #756
PROP. RETAINING WALL #757
PROP. RETAINING WALL #758
PROP. RETAINING WALL #759
PROP. RETAINING WALL #760
PROP. RETAINING WALL #761
PROP. RETAINING WALL #762
PROP. RETAINING WALL #763
PROP. RETAINING WALL #764
PROP. RETAINING WALL #765
PROP. RETAINING WALL #766
PROP. RETAINING WALL #767
PROP. RETAINING WALL #768
PROP. RETAINING WALL #769
PROP. RETAINING WALL #770
PROP. RETAINING WALL #771
PROP. RETAINING WALL #772
PROP. RETAINING WALL #773
PROP. RETAINING WALL #774
PROP. RETAINING WALL #775
PROP. RETAINING WALL #776
PROP. RETAINING WALL #777
PROP. RETAINING WALL #778
PROP. RETAINING WALL #779
PROP. RETAINING WALL #780
PROP. RETAINING WALL #781
PROP. RETAINING WALL #782
PROP. RETAINING WALL #783
PROP. RETAINING WALL #784
PROP. RETAINING WALL #785
PROP. RETAINING WALL #786
PROP. RETAINING WALL #787
PROP. RETAINING WALL #788
PROP. RETAINING WALL #789
PROP. RETAINING WALL #790
PROP. RETAINING WALL #791
PROP. RETAINING WALL #792
PROP. RETAINING WALL #793
PROP. RETAINING WALL #794
PROP. RETAINING WALL #795
PROP. RETAINING WALL #796
PROP. RETAINING WALL #797
PROP. RETAINING WALL #798
PROP. RETAINING WALL #799
PROP. RETAINING WALL #800
PROP. RETAINING WALL #801
PROP. RETAINING WALL #802
PROP. RETAINING WALL #803
PROP. RETAINING WALL #804
PROP. RETAINING WALL #805
PROP. RETAINING WALL #806
PROP. RETAINING WALL #807
PROP. RETAINING WALL #808
PROP. RETAINING WALL #809
PROP. RETAINING WALL #810
PROP. RETAINING WALL #811
PROP. RETAINING WALL #812
PROP. RETAINING WALL #813
PROP. RETAINING WALL #814
PROP. RETAINING WALL #815
PROP. RETAINING WALL #816
PROP. RETAINING WALL #817
PROP. RETAINING WALL #818
PROP. RETAINING WALL #819
PROP. RETAINING WALL #820
PROP. RETAINING WALL #821
PROP. RETAINING WALL #822
PROP. RETAINING WALL #823
PROP. RETAINING WALL #824
PROP. RETAINING WALL #825
PROP. RETAINING WALL #826
PROP. RETAINING WALL #827
PROP. RETAINING WALL #828
PROP. RETAINING WALL #829
PROP. RETAINING WALL #830
PROP. RETAINING WALL #831
PROP. RETAINING WALL #832
PROP. RETAINING WALL #833
PROP. RETAINING WALL #834
PROP. RETAINING WALL #835
PROP. RETAINING WALL #836
PROP. RETAINING WALL #837
PROP. RETAINING WALL #838
PROP. RETAINING WALL #839
PROP. RETAINING WALL #840
PROP. RETAINING WALL #841
PROP. RETAINING WALL #842
PROP. RETAINING WALL #843
PROP. RETAINING WALL #844
PROP. RETAINING WALL #845
PROP. RETAINING WALL #846
PROP. RETAINING WALL #847
PROP. RETAINING WALL #848
PROP. RETAINING WALL #849
PROP. RETAINING WALL #850
PROP. RETAINING WALL #851
PROP. RETAINING WALL #852
PROP. RETAINING WALL #853
PROP. RETAINING WALL #854
PROP. RETAINING WALL #855
PROP. RETAINING WALL #856
PROP. RETAINING WALL #857
PROP. RETAINING WALL #858
PROP. RETAINING WALL #859
PROP. RETAINING WALL #860
PROP. RETAINING WALL #861
PROP. RETAINING WALL #862
PROP. RETAINING WALL #863
PROP. RETAINING WALL #864
PROP. RETAINING WALL #865
PROP. RETAINING WALL #866
PROP. RETAINING WALL #867
PROP. RETAINING WALL #868
PROP. RETAINING WALL #869
PROP. RETAINING WALL #870
PROP. RETAINING WALL #871
PROP. RETAINING WALL #872
PROP. RETAINING WALL #873
PROP. RETAINING WALL #874
PROP. RETAINING WALL #875
PROP. RETAINING WALL #876
PROP. RETAINING WALL #877
PROP. RETAINING WALL #878
PROP. RETAINING WALL #879
PROP. RETAINING WALL #880
PROP. RETAINING WALL #881
PROP. RETAINING WALL #882
PROP. RETAINING WALL #883
PROP. RETAINING WALL #884
PROP. RETAINING WALL #885
PROP. RETAINING WALL #886
PROP. RETAINING WALL #887
PROP. RETAINING WALL #888
PROP. RETAINING WALL #889
PROP. RETAINING WALL #890
PROP. RETAINING WALL #891
PROP. RETAINING WALL #892
PROP. RETAINING WALL #893
PROP. RETAINING WALL #894
PROP. RETAINING WALL #895
PROP. RETAINING WALL #896
PROP. RETAINING WALL #897
PROP. RETAINING WALL #898
PROP. RETAINING WALL #899
PROP. RETAINING WALL #900
PROP. RETAINING WALL #901
PROP. RETAINING WALL #902
PROP. RETAINING WALL #903
PROP. RETAINING WALL #904
PROP. RETAINING WALL #905
PROP. RETAINING WALL #906
PROP. RETAINING WALL #907
PROP. RETAINING WALL #908
PROP. RETAINING WALL #909
PROP. RETAINING WALL #910
PROP. RETAINING WALL #911
PROP. RETAINING WALL #912
PROP. RETAINING WALL #913
PROP. RETAINING WALL #914
PROP. RETAINING WALL #915
PROP. RETAINING WALL #916
PROP. RETAINING WALL #917
PROP. RETAINING WALL #918
PROP. RETAINING WALL #919
PROP. RETAINING WALL #920
PROP. RETAINING WALL #921
PROP. RETAINING WALL #922
PROP. RETAINING WALL #923
PROP. RETAINING WALL #924
PROP. RETAINING WALL #925
PROP. RETAINING WALL #926
PROP. RETAINING WALL #927
PROP. RETAINING WALL #928
PROP. RETAINING WALL #929
PROP. RETAINING WALL #930
PROP. RETAINING WALL #931
PROP. RETAINING WALL #932
PROP. RETAINING WALL #933
PROP. RETAINING WALL #934
PROP. RETAINING WALL #935
PROP. RETAINING WALL #936
PROP. RETAINING WALL #937
PROP. RETAINING WALL #938
PROP. RETAINING WALL #939
PROP. RETAINING WALL #940
PROP. RETAINING WALL #941
PROP. RETAINING WALL #942
PROP. RETAINING WALL #943
PROP. RETAINING WALL #944
PROP. RETAINING WALL #945
PROP. RETAINING WALL #946
PROP. RETAINING WALL #947
PROP. RETAINING WALL #948
PROP. RETAINING WALL #949
PROP. RETAINING WALL #950
PROP. RETAINING WALL #951
PROP. RETAINING WALL #952
PROP. RETAINING WALL #953
PROP. RETAINING WALL #954
PROP. RETAINING WALL #955
PROP. RETAINING WALL #956
PROP. RETAINING WALL #957
PROP. RETAINING WALL #958
PROP. RETAINING WALL #959
PROP. RETAINING WALL #960
PROP. RETAINING WALL #961
PROP. RETAINING WALL #962
PROP. RETAINING WALL #963
PROP. RETAINING WALL #964
PROP. RETAINING WALL #965
PROP. RETAINING WALL #966
PROP. RETAINING WALL #967
PROP. RETAINING WALL #968
PROP. RETAINING WALL #969
PROP. RETAINING WALL #970
PROP. RETAINING WALL #971
PROP. RETAINING WALL #972
PROP. RETAINING WALL #973
PROP. RETAINING WALL #974
PROP. RETAINING WALL #975
PROP. RETAINING WALL #976
PROP. RETAINING WALL #977
PROP. RETAINING WALL #978
PROP. RETAINING WALL #979
PROP. RETAINING WALL #980
PROP. RETAINING WALL #981
PROP. RETAINING WALL #982
PROP. RETAINING WALL #983
PROP. RETAINING WALL #984
PROP. RETAINING WALL #985
PROP. RETAINING WALL #986
PROP. RETAINING WALL #987
PROP. RETAINING WALL #988
PROP. RETAINING WALL #989
PROP. RETAINING WALL #990
PROP. RETAINING WALL #991
PROP. RETAINING WALL #992
PROP. RETAINING WALL #993
PROP. RETAINING WALL #994
PROP. RETAINING WALL #995
PROP. RETAINING WALL #996
PROP. RETAINING WALL #997
PROP. RETAINING WALL #998
PROP. RETAINING WALL #999
PROP. RETAINING WALL #1000
*EL: INSTALL ELBOWS, INSTALL ROD AND LUG CONNECTORS W/SLEEVE GASKETS ON CSP PIPE PER STANDARD SPECIFICATIONS.
RKK
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions
8/17/99
5/8/2025
P:\Active Projects\PERMITS-Environmental\Drawings\P5707_Hyd-prm-buf_psh06.dgn

RIPARIAN BUFFER IMPACTS SUMMARY

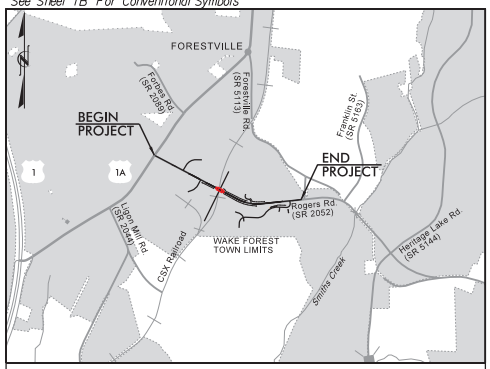
Site No.	Station (From/To)	Structure Size / Type	IMPACTS									BUFFER REPLACEMENT	
			TYPE			ALLOWABLE			MITIGABLE				
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
1A	-L- 16+65 to 22+70	Ex. 30" Pipe, SA	X			4990	4809	9799					
1B	-L- 42+50 to 46+00	Prop. 108" WSP, SA	X						11444	4100	15544		
1C	-L- 25+35 to 25+77	Roadway Fill, SA			X					271			
2	-L- 40+70 to 46+00	Roadway Fill, SB			X				37909	25349	63258		
3	-L- 23+67 RT	Roadway Fill, SC	X			2878	667	3545					
TOTALS*:						**7868**	**5476**	**13344**	**49353**	**29720**	**78802**	**0**	**0**

NOTES:
Site 1A - Buffer impacts increased due to PUE on upstream end of 30" RCP.
Site 1B - Buffer impacts increased due to accouting for impacts within adjusted easements.
Site 1C - Added due to impacts being determined to be parallel impacts, requiring mitigation. Original impacts were listed with Site 1A as perpendicular allowable impacts.
Site 2 - Buffer impacts increased due to accounting for impacts within adjusted TDE.
Site 3 - No changes to originally permitted buffer impacts.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
October 2019 (REVISED 05/08/2025)
WAKE
P-5707
44643.1.1
SHEET 6 OF 6

CONTRACT: C204338 TIP PROJECT: P-5707

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
NCDOT RAIL DIVISION

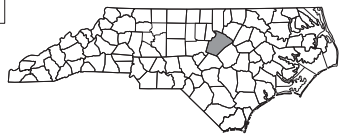
WAKE COUNTY

UTILITY BUFFER DRAWING
SHEET 1 OF 5

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5707	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
44643.1.1		PE
44643.2.1		ROW & UTILITIES
44643.3.1		CONSTRUCTION

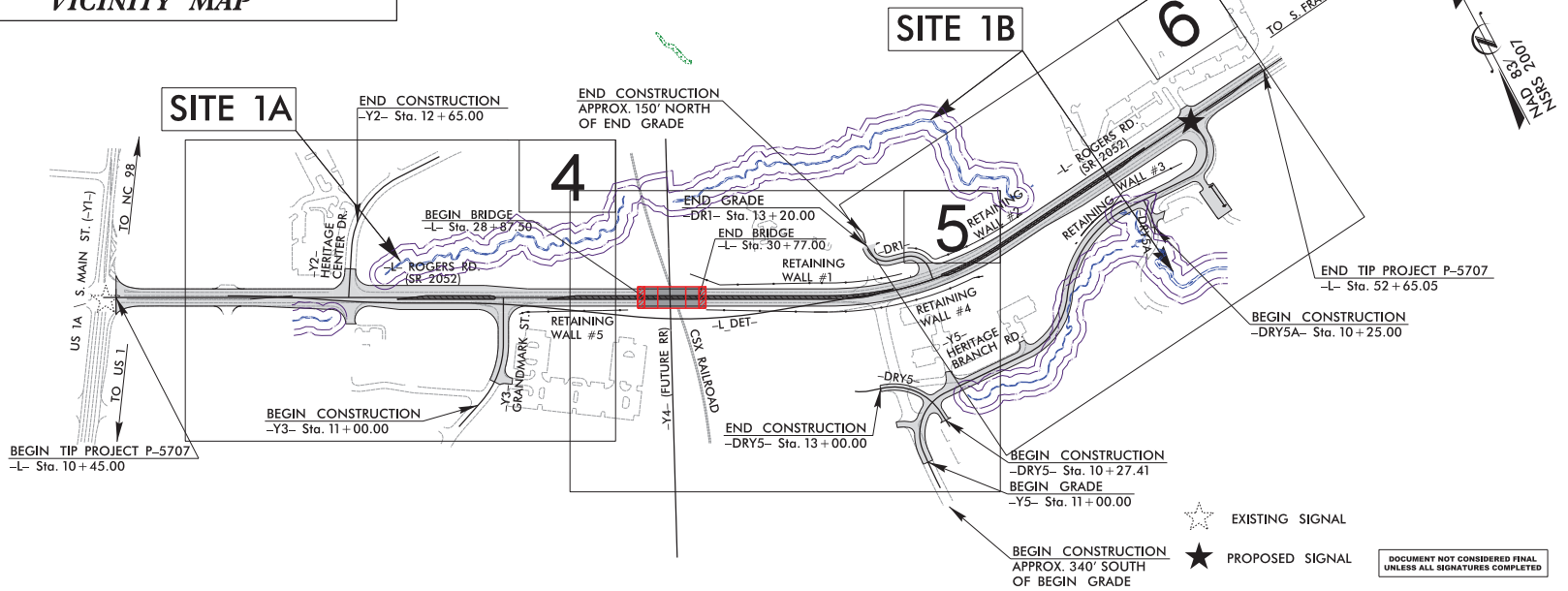
ENGLISH



LOCATION: ROGERS ROAD (SR 2052) GRADE SEPARATION OVER CSX RAILROAD (CROSSING NO. 633905Y) AT MILE POST S 142.53

TYPE OF WORK: DRAINAGE, GRADING, PAVING, SIGNALS, STRUCTURE, WIDENING & RETAINING WALLS

UTILITY BUFFER IMPACTS



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2025 = 27,905
ADT 2045 = 38,166
D = 55%
K = 8%
T = 3% *
V = 50 MPH

*TTST 1.0% / DUAL 2.0%
FUNC CLASS = URBAN MAJOR COLLECTOR

SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT P-5707..... 0.763 miles
LENGTH STRUCTURE TIP PROJECT P-5707..... 0.036 miles
TOTAL LENGTH OF PROJECT P-5707..... 0.799 miles

PLANS PREPARED BY:

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1,Suite 700
Raleigh, North Carolina 27615-3960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

RIGHT OF WAY DATE: June 12, 2018
LETTING DATE: August 19, 2025

Brandon McInnis, P.E. — PROJECT ENGINEER
Jillian Huskey, P.E. — PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

NC DEPARTMENT OF TRANSPORTATION
RAIL DIVISION
ENGINEERING COORDINATION AND SAFETY

2024 STANDARD SPECIFICATIONS

NCDOT RAIL DIVISION
CONTACT: Brian Gackstetter, E.I.

5/7/2025
R:\Hydraulics\PERMITS_Environmental\Drawings\Utility Impacts\P5707_Hyd_buf_tsh.dgn
chortman

09/08/98

P-47

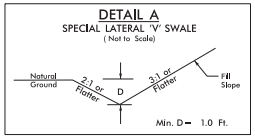
DRAINAGE DITCH DETAILS

PROJECT REFERENCE NO.	SHEET NO.
P-5707	2D-1
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

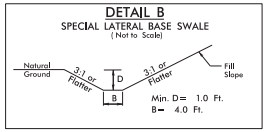
UTILITY BUFFER DRAWING SHEET 2 OF 5

DETAIL A
SPECIAL LATERAL 'V' SWALE
(Not to Scale)



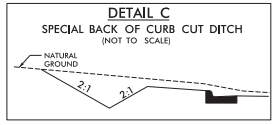
–DRY5– STA. 11+44 TO STA. 12+00 LT
–Y5– STA. 11+50 TO STA. 12+07 LT

DETAIL B
SPECIAL LATERAL BASE SWALE
(Not to Scale)



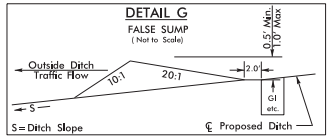
–Y5– STA. 12+50 TO STA. 13+00 LT (DDE = [134] CY)

DETAIL C
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



–L– STA. 19+00 TO STA. 21+50 RT

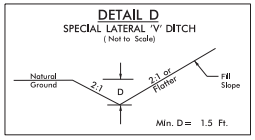
DETAIL G
FALSE SUMP
(Not to Scale)



–L– STA. 27+86 RT
–L– STA. 28+14 RT
–Y5– 18+90 RT

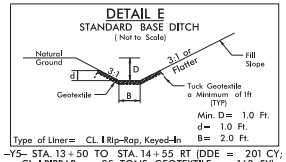
ENGLISH

DETAIL D
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



–L– STA. 21+50 TO STA. 23+00 RT

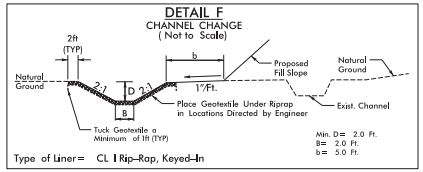
DETAIL E
STANDARD BASE DITCH
(Not to Scale)



Type of Liner= CL I Rip–Rap, Keyed–In

–Y5– STA. 13+50 TO STA. 14+55 RT (DDE = 201 CY;
CL I RIPRAP = 85 TONS; GEOTEXTILE = 163 SY)

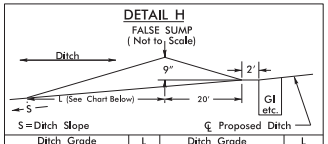
DETAIL F
CHANNEL CHANGE
(Not to Scale)



Type of Liner= CL I Rip–Rap, Keyed–In

–Y5– STA. 17+36.86 TO STA. 18+75 RT (DDE = 261 CY;
CL I RIPRAP = 144 TONS; GEOTEXTILE = 255 SY)
–Y5– STA. 20+00 TO STA. 21+24 RT (DDE = 298 CY;
CL I RIPRAP = 143 TONS; GEOTEXTILE = 253 SY)

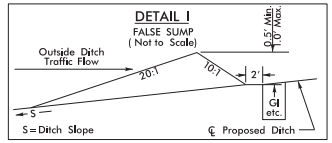
DETAIL H
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

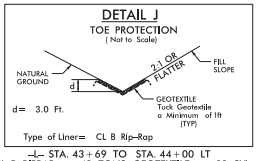
–L_DET– STA. 22+01 LT

DETAIL I
FALSE SUMP
(Not to Scale)



–DRY5– STA. 12+29 RT
–DRY5– STA. 12+63 RT
–L– STA. 19+65 RT
–L– STA. 20+88 RT

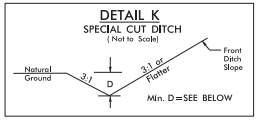
DETAIL J
TOE PROTECTION
(Not to Scale)



Type of Liner= CL B Rip–Rap

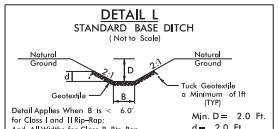
–L– STA. 43+69 TO STA. 44+00 LT
(CL B RIPRAP = 42 TONS; GEOTEXTILE = 92 SY)
–Y5– STA. 14+90 TO STA. 16+60 LT
(CL B RIPRAP = 105 TONS; GEOTEXTILE = 254 SY)
–Y5– STA. 17+50 TO STA. 20+00 LT
(CL B RIPRAP = 185 TONS; GEOTEXTILE = 425 SY)

DETAIL K
SPECIAL CUT DITCH
(Not to Scale)



–L_DET– STA. 17+66.44 TO STA. 19+16.47 RT, D/d=1.5'
–L_DET– STA. 20+16.62 TO STA. 20+66.79 RT, D/d=1.0'
–L_DET– STA. 20+66.79 TO STA. 22+67.79 RT, D/d=1.0' *
–L_DET– STA. 21+17.02 TO STA. 23+15.66 LT, D/d=1.0'
–L_DET– STA. 31+23.65 TO STA. 31+74.39 RT, D/d=1.0'

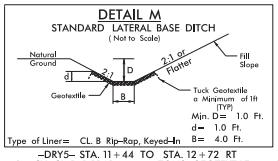
DETAIL L
STANDARD BASE DITCH
(Not to Scale)



Type of Liner= CL I Rip–Rap, Keyed–In

–Y2– STA. 11+11 RT, L=82', S=9.40%,
BEG ELEV=342.5, END ELEV=334.8
CL I RIPRAP = 75 TON
GEOTEXTILE = 163 SY
(DDE = 55 CY)

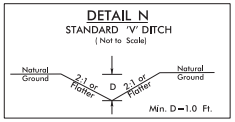
DETAIL M
STANDARD LATERAL BASE DITCH
(Not to Scale)



Type of Liner= CL B Rip–Rap, Keyed–In

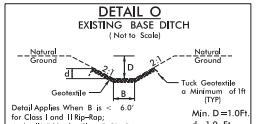
–DRY5– STA. 11+44 TO STA. 12+72 RT
(DDE = 125 CY; CL B RIPRAP = 75 TONS; GEOTEXTILE = 205 SY)

DETAIL N
STANDARD 'V' DITCH
(Not to Scale)



–L_DET– STA. 23+68.31 RT, L=189', S=2.33%, *
BEG ELEV=347.4, END ELEV=342.6
(DDE = 147 CY)
–L_DET– STA. 24+67.66 LT, L=24', S=3.45%,
BEG ELEV=346.8, END ELEV=346.0
(DDE = 44 CY)
–L_DET– STA. 24+91.41 LT, L=66', S=3.05%,
BEG ELEV=346.0, END ELEV=346.2
(DDE = 58 CY)
–L_DET– STA. 26+18.82 RT, L=100', S=6.94%, *
BEG ELEV=343.2, END ELEV=336.3
(DDE = 80 CY)
–L_DET– STA. 30+22.02 RT, L=102, S=3.15%, *
BEG ELEV=332.7, END ELEV=333.5
(DDE = 161 CY)

DETAIL O
EXISTING BASE DITCH
(Not to Scale)

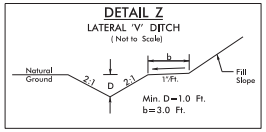


Type of Liner= CL B Rip–Rap, Keyed–In

–L– STA. 31+21 TO STA. 32+17 LT
(CL B RIPRAP = 50 TONS; GEOTEXTILE = 111 SY)

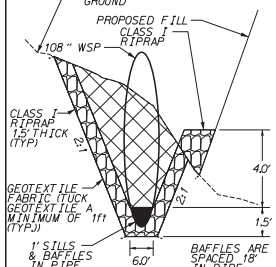
*DITCH TO BE CONSTRUCTED DURING DETOUR PHASE AND RETAINED THROUGH FINAL CONSTRUCTION

DETAIL Z
LATERAL 'V' DITCH
(Not to Scale)



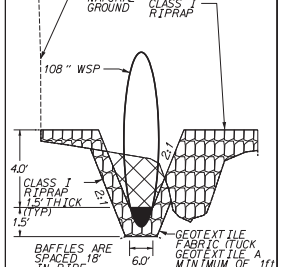
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT

DETAIL R
0658A
–L– STA. 42+43 LT



INLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=76'
–L– STA. 43+36 LT

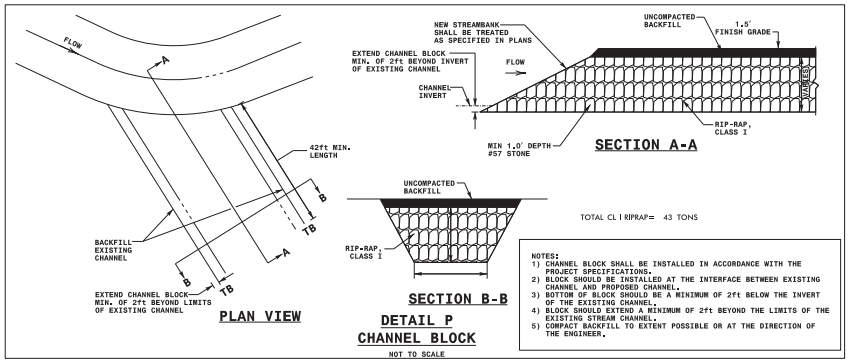
DETAIL S
0658B
–L– STA. 46+05 RT



OUTLET CHANNEL IMPROVEMENTS
LOOKING DOWNSTREAM (NTS)
LENGTH=116'
–Y5– STA. 23+02 RT

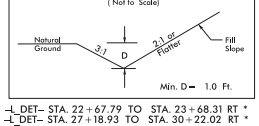
PERMANENT CHANNEL EXCAVATION

TOTAL CHANNEL EXCAVATION = 900 CY (360 CY INLET, 540 CY OUTLET)
TOTAL CL I RIP RAP = 1300 TONS (390 TONS INLET, 910 TONS OUTLET)
TOTAL GEOTEXTILE FAB. = 1200 SY (630 SY INLET, 570 SY OUTLET)



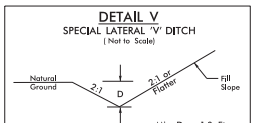
–L– STA. 43+21 LT
–Y5– STA. 23+53 RT

DETAIL U
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



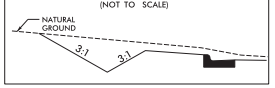
–L_DET– STA. 22+67.79 TO STA. 23+68.31 RT *
–L_DET– STA. 27+18.93 TO STA. 30+22.02 RT *

DETAIL V
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



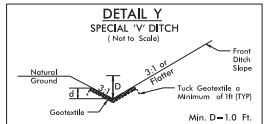
–Y5– STA. 20+00 TO STA. 21+00 LT

DETAIL X
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



–Y5– STA. 21+00 TO STA. 21+59 LT

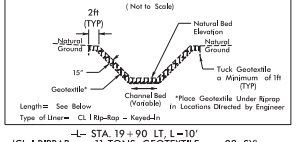
DETAIL Y
SPECIAL 'V' DITCH
(Not to Scale)



Type of Liner= B Rip–Rap, Keyed–In

–L– STA. 24+50 TO STA. 25+00 RT
CL B RIPRAP = 16 TONS; GEOTEXTILE = 36 SY

DETAIL T
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

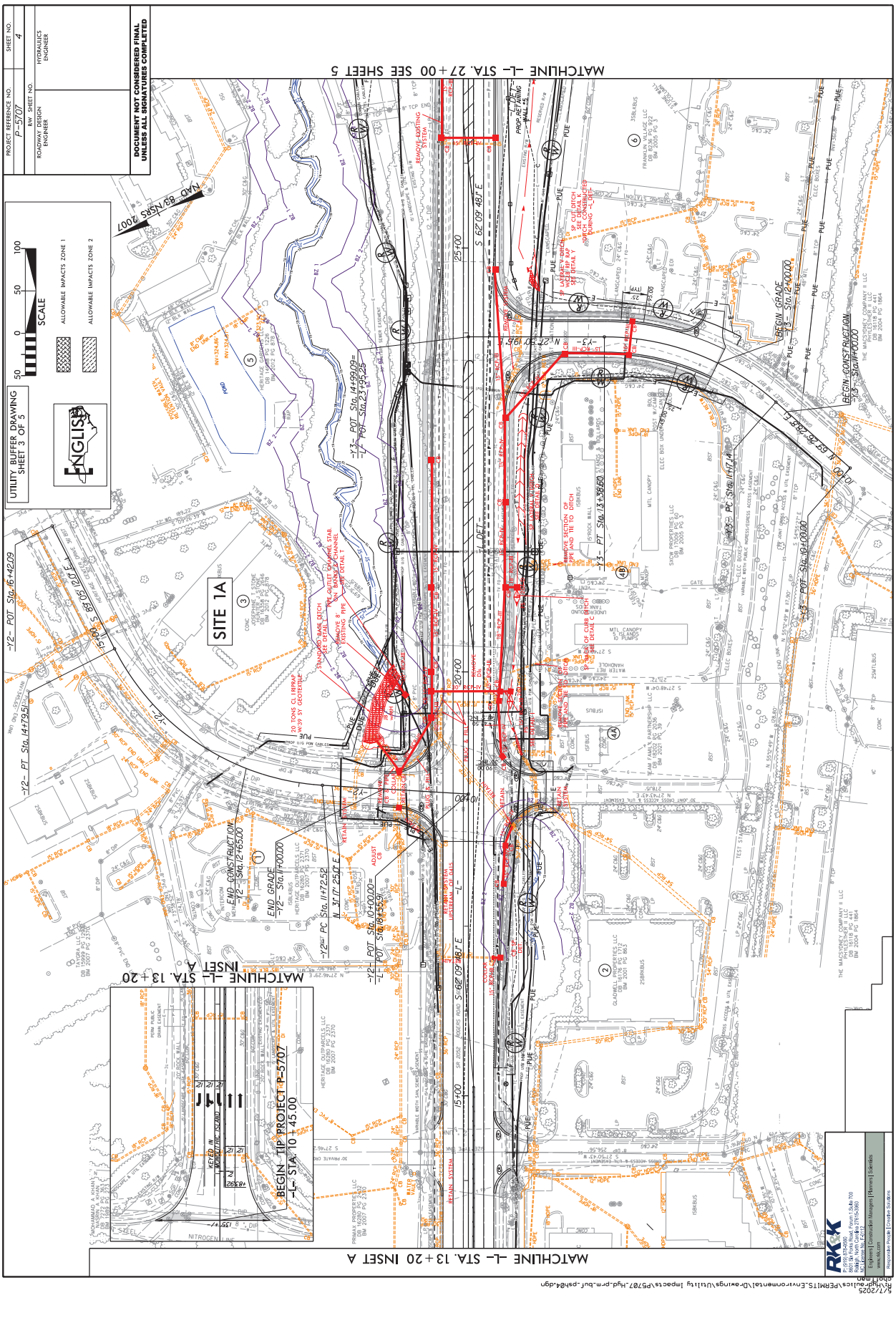


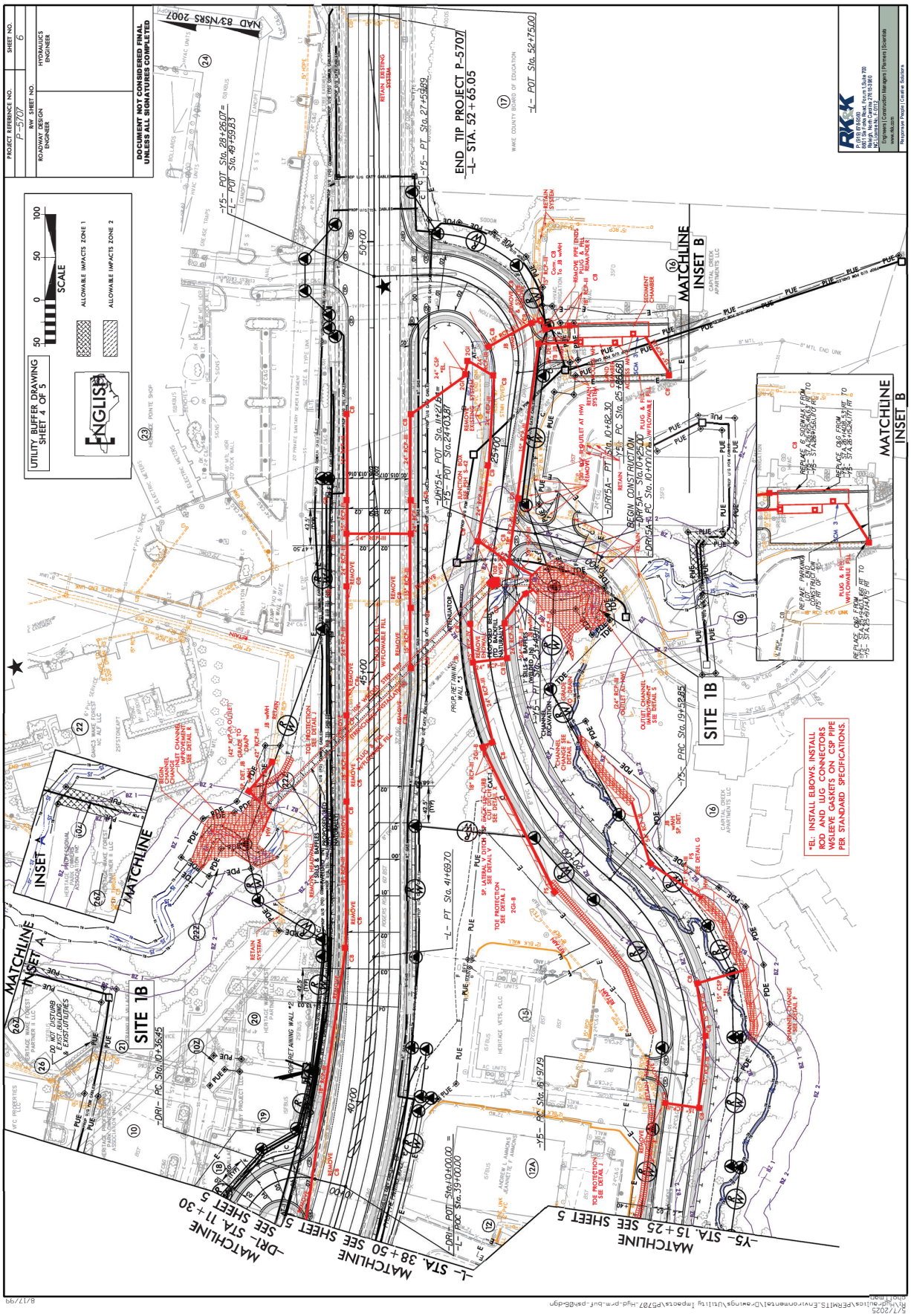
Type of Liner= CL I Rip–Rap – Keyed–In

–L– STA. 19+90 LT, L=10'
(CL I RIPRAP = 11 TONS; GEOTEXTILE = 22 SY)
–Y5– STA. 14+55 RT, L=16'
(CL I RIPRAP = 26 TONS; GEOTEXTILE = 50 SY)

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3060
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

5/7/2025
R:\Projects\PERMITS_Environmental\Drawings\Utility Impacts\P5707_Hyd_buf_Ditch Detail.dgn
choffman


PROJECT REFERENCE NO.
P-5707
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
UTILITY BUFFER DRAWING SHEET 3 OF 5
ENGLISH
SCALE
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
NAD 83 NSRS 2007
MATCHLINE -L- STA. 27+00 SEE SHEET 5
MATCHLINE -L- STA. 13+20 INSET A
INSET A
MATCHLINE -L- STA. 13+20
BEGIN TIP PROJECT P-5707
-L- STA. 10+45.00
SITE 1A
BEGIN CONSTRUCTION
-L3- STA. 10+00.00
END CONSTRUCTION
-L3- STA. 24+00.00
-L3- PC Sta. 11+17.4
-L3- PT Sta. 13+39.20
-L3- POT Sta. 10+00.00
-L3- POT Sta. 14+99.09
-L3- POT Sta. 21+95.25
-L2- POT Sta. 16+42.09
-L2- PT Sta. 14+79.51
-L2- PC Sta. 12+65.00
-L2- Sta. 11+00.00
END GRADE
-L2- POT Sta. 10+00.00
-L- POT Sta. 18+55.59
-L- POT Sta. 15+00.00
-L- PC Sta. 11+72.52
N 31° 17' 25.0" E
S 62° 09' 48.7" E
N 27° 50' 19.5" E
S 27° 50' 19.5" E
N 62° 09' 48.7" W
S 62° 09' 48.7" E
PROP. RET. WALL #4
PROP. RET. WALL #3
PROP. RET. WALL #2
PROP. RET. WALL #1
REMOVE EXISTING STRUCTURE
REMOVE EXISTING RETAINING WALL
REMOVE DRIVE
REMOVE EXISTING PIPE
REMOVE EXISTING CURB
REMOVE EXISTING SIDEWALK
REMOVE EXISTING GUARDRAIL
REMOVE EXISTING FENCE
REMOVE EXISTING SIGN
REMOVE EXISTING TREE
REMOVE EXISTING SHRUB
REMOVE EXISTING MAILBOX
REMOVE EXISTING LIGHT POLE
REMOVE EXISTING UTILITY POLE
REMOVE EXISTING GUY WIRE
REMOVE EXISTING GAS METER
REMOVE EXISTING WATER METER
REMOVE EXISTING HYDRANT
REMOVE EXISTING VALVE
REMOVE EXISTING MANHOLE
REMOVE EXISTING CATCH BASIN
REMOVE EXISTING DROP INLET
REMOVE EXISTING JUNCTION BOX
REMOVE EXISTING TRANSFORMER
REMOVE EXISTING GENERATOR
REMOVE EXISTING AIR CONDITIONER
REMOVE EXISTING SATELLITE DISH
REMOVE EXISTING ANTENNA
REMOVE EXISTING FLAGPOLE
REMOVE EXISTING BENCH
REMOVE EXISTING TRASH CAN
REMOVE EXISTING RECYCLING BIN
REMOVE EXISTING PICNIC TABLE
REMOVE EXISTING GRILL
REMOVE EXISTING FIRE PIT
REMOVE EXISTING PLAYGROUND EQUIPMENT
REMOVE EXISTING SWING SET
REMOVE EXISTING SLIDE
REMOVE EXISTING SEESAW
REMOVE EXISTING MERRY-GO-ROUND
REMOVE EXISTING SPRING RIDER
REMOVE EXISTING SANDBOX
REMOVE EXISTING BASKETBALL HOOP
REMOVE EXISTING TENNIS COURT
REMOVE EXISTING SWIMMING POOL
REMOVE EXISTING POOL EQUIPMENT
REMOVE EXISTING POOL FENCE
REMOVE EXISTING POOL GATE
REMOVE EXISTING POOL LADDER
REMOVE EXISTING POOL DIVING BOARD
REMOVE EXISTING POOL SLIDE
REMOVE EXISTING POOL WATER FEATURE
REMOVE EXISTING POOL FOUNTAIN
REMOVE EXISTING POOL WATERFALL
REMOVE EXISTING POOL SPA
REMOVE EXISTING POOL HOT TUB
REMOVE EXISTING POOL SAUNA
REMOVE EXISTING POOL STEAM ROOM
REMOVE EXISTING POOL EXERCISE EQUIPMENT
REMOVE EXISTING POOL WEIGHT EQUIPMENT
REMOVE EXISTING POOL CARDIO EQUIPMENT
REMOVE EXISTING POOL STRENGTH EQUIPMENT
REMOVE EXISTING POOL FREE WEIGHTS
REMOVE EXISTING POOL MACHINES
REMOVE EXISTING POOL BENCHES
REMOVE EXISTING POOL MIRRORS
REMOVE EXISTING POOL LOCKERS
REMOVE EXISTING POOL SHOWERS
REMOVE EXISTING POOL RESTROOMS
REMOVE EXISTING POOL CHANGING ROOMS
REMOVE EXISTING POOL OFFICE
REMOVE EXISTING POOL STORAGE
REMOVE EXISTING POOL MECHANICAL ROOM
REMOVE EXISTING POOL ELECTRICAL ROOM
REMOVE EXISTING POOL PLUMBING ROOM
REMOVE EXISTING POOL HVAC ROOM
REMOVE EXISTING POOL FIRE PROTECTION ROOM
REMOVE EXISTING POOL SECURITY ROOM
REMOVE EXISTING POOL CAMERA
REMOVE EXISTING POOL ALARM
REMOVE EXISTING POOL SPEAKER
REMOVE EXISTING POOL MICROPHONE
REMOVE EXISTING POOL INTERCOM
REMOVE EXISTING POOL PHONE
REMOVE EXISTING POOL INTERNET
REMOVE EXISTING POOL WIFI
REMOVE EXISTING POOL ANTENNA
REMOVE EXISTING POOL SATELLITE DISH
REMOVE EXISTING POOL FLAGPOLE
REMOVE EXISTING POOL BENCH
REMOVE EXISTING POOL TRASH CAN
REMOVE EXISTING POOL RECYCLING BIN
REMOVE EXISTING POOL PICNIC TABLE
REMOVE EXISTING POOL GRILL
REMOVE EXISTING POOL FIRE PIT
REMOVE EXISTING POOL PLAYGROUND EQUIPMENT
REMOVE EXISTING POOL SWING SET
REMOVE EXISTING POOL SLIDE
REMOVE EXISTING POOL SEESAW
REMOVE EXISTING POOL MERRY-GO-ROUND
REMOVE EXISTING POOL SPRING RIDER
REMOVE EXISTING POOL SANDBOX
REMOVE EXISTING POOL BASKETBALL HOOP
REMOVE EXISTING POOL TENNIS COURT
REMOVE EXISTING POOL SWIMMING POOL
REMOVE EXISTING POOL POOL EQUIPMENT
REMOVE EXISTING POOL POOL FENCE
REMOVE EXISTING POOL POOL GATE
REMOVE EXISTING POOL POOL LADDER
REMOVE EXISTING POOL POOL DIVING BOARD
REMOVE EXISTING POOL POOL SLIDE
REMOVE EXISTING POOL POOL WATER FEATURE
REMOVE EXISTING POOL POOL FOUNTAIN
REMOVE EXISTING POOL POOL WATERFALL
REMOVE EXISTING POOL POOL SPA
REMOVE EXISTING POOL POOL HOT TUB
REMOVE EXISTING POOL POOL SAUNA
REMOVE EXISTING POOL POOL STEAM ROOM
REMOVE EXISTING POOL POOL EXERCISE EQUIPMENT
REMOVE EXISTING POOL POOL WEIGHT EQUIPMENT
REMOVE EXISTING POOL POOL CARDIO EQUIPMENT
REMOVE EXISTING POOL POOL STRENGTH EQUIPMENT
REMOVE EXISTING POOL POOL FREE WEIGHTS
REMOVE EXISTING POOL POOL MACHINES
REMOVE EXISTING POOL POOL BENCHES
REMOVE EXISTING POOL POOL MIRRORS
REMOVE EXISTING POOL POOL LOCKERS
REMOVE EXISTING POOL POOL SHOWERS
REMOVE EXISTING POOL POOL RESTROOMS
REMOVE EXISTING POOL POOL CHANGING ROOMS
REMOVE EXISTING POOL POOL OFFICE
REMOVE EXISTING POOL POOL STORAGE
REMOVE EXISTING POOL POOL MECHANICAL ROOM
REMOVE EXISTING POOL POOL ELECTRICAL ROOM
REMOVE EXISTING POOL POOL PLUMBING ROOM
REMOVE EXISTING POOL POOL HVAC ROOM
REMOVE EXISTING POOL POOL FIRE PROTECTION ROOM
REMOVE EXISTING POOL POOL SECURITY ROOM
REMOVE EXISTING POOL POOL CAMERA
REMOVE EXISTING POOL POOL ALARM
REMOVE EXISTING POOL POOL SPEAKER
REMOVE EXISTING POOL POOL MICROPHONE
REMOVE EXISTING POOL POOL INTERCOM
REMOVE EXISTING POOL POOL PHONE
REMOVE EXISTING POOL POOL INTERNET
REMOVE EXISTING POOL POOL WIFI
REMOVE EXISTING POOL POOL ANTENNA
REMOVE EXISTING POOL POOL SATELLITE DISH
REMOVE EXISTING POOL POOL FLAGPOLE
REMOVE EXISTING POOL POOL BENCH
REMOVE EXISTING POOL POOL TRASH CAN
REMOVE EXISTING POOL POOL RECYCLING BIN
REMOVE EXISTING POOL POOL PICNIC TABLE
REMOVE EXISTING POOL POOL GRILL
REMOVE EXISTING POOL POOL FIRE PIT
REMOVE EXISTING POOL POOL PLAYGROUND EQUIPMENT
REMOVE EXISTING POOL POOL SWING SET
REMOVE EXISTING POOL POOL SLIDE
REMOVE EXISTING POOL POOL SEESAW
REMOVE EXISTING POOL POOL MERRY-GO-ROUND
REMOVE EXISTING POOL POOL SPRING RIDER
REMOVE EXISTING POOL POOL SANDBOX
REMOVE EXISTING POOL POOL BASKETBALL HOOP
REMOVE EXISTING POOL POOL TENNIS COURT
REMOVE EXISTING POOL


PROJECT REFERENCE NO.
P-5707
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
6
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/NSRS 2007
UTILITY BUFFER DRAWING SHEET 4 OF 5
ENGLISH
SCALE
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
END TIP PROJECT P-5707
-L- STA. 52+65.05
-L- POT Sta. 52+75.00
-Y5- POT Sta. 28+26.07 = -L- POT Sta. 49+59.83
-Y5- PT Sta. 27+59.89
-DRY5A- POT Sta. 11+22.82
-DRY5A- PT Sta. 10+82.30
-DRY5A- PC Sta. 25+38.68
BEGIN CONSTRUCTION -DRY5A- Sta.10+25.00
-DRY5A- PC Sta. 10+00.00
-DRI- PC Sta. 10+36.45
-L- PT Sta. 41+69.70
-Y5- PRC Sta. 19+52.85
-Y5- PRC Sta. 6+97.19
-L- POT Sta. 39+00.00
-L- POC Sta. 39+00.00
SITE 1B
SITE 1B
INSET A
INSET A
INSET B
INSET B
MATCHLINE
MATCHLINE -DRI- STA. 11+30 SEE SHEET 5
MATCHLINE -L- STA. 38+50 SEE SHEET 5
MATCHLINE -Y5- STA. 15+25 SEE SHEET 5
*EL: INSTALL ELBOWS, INSTALL ROD AND LUG CONNECTORS W/SLEEVE GASKETS ON CSP PIPE PER STANDARD SPECIFICATIONS.
RK&K
Engineers | Construction Managers | Planners | Scientists
Responsive People | Creative Solutions

RIPARIAN BUFFER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	IMPACTS									BUFFER REPLACEMENT	
			TYPE			ALLOWABLE			MITIGABLE				
			CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
1A	-L- 16+65 to 22+70	Underground Power, SA	X			295	151	446					
1B	-L- 41+60 to 41+89 LT	Underground Power, SA	X			715	1207	1922					
	-Y5- 23+80 to 25+00 RT	Underground Power, SA	X			719	1152	1871					
TOTALS*:						**1729**	**2510**	**4239**	**0**	**0**	**0**	**0**	**0**

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
05/08/2025
WAKE
P-5707
44643.1.1
SHEET 5 OF 5

County: WAKE

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	0000720000-N	SP	FIELD OFFICE	30 MO		
0004	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0005	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	1 ACR		
0006	0022000000-E	225	UNCLASSIFIED EXCAVATION	5,970 CY		
0007	0036000000-E	225	UNDERCUT EXCAVATION	4,920 CY		
0008	0106000000-E	230	BORROW EXCAVATION	297,320 CY		
0009	0134000000-E	240	DRAINAGE DITCH EXCAVATION	2,790 CY		
0010	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	6,180 SY		
0011	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	16,740 SY		
0012	0195000000-E	265	SELECT GRANULAR MATERIAL	4,620 CY		
0013	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	5,520 SY		
0014	0199000000-E	SP	TEMPORARY SHORING	39,552 SF		
0015	0248000000-N	SP	GENERIC GRADING ITEM TYPE 1 BRIDGE APPROACH FILL, STATION 29+90.36 -L-	Lump Sum	L.S.	
0016	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	780 TON		
0017	0321000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	2,440 SY		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	0335300000-E	305	18" DRAINAGE PIPE	180 LF		
0019	0350000000-E	SP	***" RC PIPE CULVERTS, CONTRACTOR DESIGN (15")	64 LF		
0020	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	2,004 LF		
0021	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	1,248 LF		
0022	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	1,652 LF		
0023	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	328 LF		
0024	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	40 LF		
0025	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	164 LF		
0026	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	12 LF		
0027	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	148 LF		
0028	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	80 LF		
0029	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	888 LF		
0030	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	60 LF		
0031	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	136 LF		
0032	0449000000-E	310	**" RC PIPE CULVERTS, CLASS V (36")	40 LF		
0033	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (48", 0.109")	24 LF		
0034	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	304 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0035	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	8 EA		
0036	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (48", 0.109")	2 EA		
0037	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (108", 1.000")	202 LF		
0038	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (24", 0.500")	226 LF		
0039	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (108", 1.000")	202 LF		
0040	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (24", 0.500")	226 LF		
0041	0992000000-E	SP	GENERIC PIPE ITEM WELDED STEEL PIPE SILLS AND BAFFLES	24 EA		
0042	0995000000-E	340	PIPE REMOVAL	4,209 LF		
0043	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0044	1121000000-E	520	AGGREGATE BASE COURSE	1,700 TON		
0045	1220000000-E	545	INCIDENTAL STONE BASE	100 TON		
0046	1275000000-E	600	PRIME COAT	595 GAL		
0047	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (1-1/2")	10,280 SY		
0048	1330000000-E	607	INCIDENTAL MILLING	870 SY		
0049	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	7,900 TON		
0050	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	6,780 TON		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0051	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	7,035 TON		
0052	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	1,140 TON		
0053	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	260 TON		
0054	1880000000-E	SP	GENERIC PAVING ITEM AGGREGATE BASE COURSE MODIFIED	2,050 TON		
0055	2000000000-N	806	RIGHT-OF-WAY MARKERS	102 EA		
0056	2022000000-E	815	SUBDRAIN EXCAVATION	44.8 CY		
0057	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	200 SY		
0058	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	33.6 CY		
0059	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	200 LF		
0060	2070000000-N	815	SUBDRAIN PIPE OUTLET	1 EA		
0061	2077000000-E	815	6" OUTLET PIPE	6 LF		
0062	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	1 EA		
0063	2209000000-E	838	ENDWALLS	3.4 CY		
0064	2220000000-E	838	REINFORCED ENDWALLS	5 CY		
0065	2253000000-E	840	PIPE COLLARS	1.16 CY		
0066	2275000000-E	SP	FLOWABLE FILL	57 CY		
0067	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	113 EA		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0068	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	7.2 CY		
0069	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	170.78 LF		
0070	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	3 EA		
0071	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	23 EA		
0072	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	10 EA		
0073	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	33 EA		
0074	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	30 EA		
0075	2396000000-N	840	FRAME WITH COVER, STD 840.54	16 EA		
0076	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	11,190 LF		
0077	2591000000-E	848	4" CONCRETE SIDEWALK	5,640 SY		
0078	2605000000-N	848	CONCRETE CURB RAMPS	31 EA		
0079	2612500000-N	848	REMOVE AND REPLACE CONCRETE CURB RAMPS	2 EA		
0080	2619000000-E	850	4" CONCRETE PAVED DITCH	410 SY		
0081	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	100 SY		
0082	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	170 LF		
0083	2800000000-N	858	ADJUSTMENT OF CATCH BASINS	2 EA		
0084	2893000000-N	859	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX WITH MANHOLE	1 EA		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0085	3001000000-N	SP	IMPACT ATTENUATOR UNITS, TYPE TL-3	1 EA		
0086	3030000000-E	862	STEEL BEAM GUARDRAIL	5,700 LF		
0087	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	487.5 LF		
0088	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA		
0089	3195000000-N	862	GUARDRAIL END UNITS, TYPE AT-1	6 EA		
0090	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	1 EA		
0091	3215000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE III	4 EA		
0092	3288000000-N	862	GUARDRAIL END UNITS, TYPE TL-2	1 EA		
0093	3360000000-E	863	REMOVE EXISTING GUARDRAIL	1,640 LF		
0094	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	137.5 LF		
0095	3435000000-N	SP	GENERIC GUARDRAIL ITEM REMOVE TEMPORARY IMPACT ATTENUATOR UNITS, TYPE TL-3	1 EA		
0096	3435000000-N	SP	GENERIC GUARDRAIL ITEM TEMPORARY IMPACT ATTENUATOR UNITS, TYPE TL-3	4 EA		
0097	3579000000-N	866	GENERIC FENCING ITEM VINYL COATED METAL LINE POSTS FOR 60" CHAIN LINK FENCE	260 EA		
0098	3579000000-N	866	GENERIC FENCING ITEM VINYL COATED METAL TERMINAL POSTS FOR 60" CHAIN LINK FENCE	20 EA		
0099	3580000000-E	866	GENERIC FENCING ITEM VINYL COATED CHAIN LINK FENCE, 60" FABRIC	3,030 LF		
0100	3628000000-E	876	RIP RAP, CLASS I	1,870 TON		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0101	3649000000-E	876	RIP RAP, CLASS B	500 TON		
0102	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	3,910 SY		
0103	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	615 LF		
0104	4102000000-N	904	SIGN ERECTION, TYPE E	39 EA		
0105	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	16 EA		
0106	4238000000-N	907	DISPOSAL OF SIGN, D, E OR F	4 EA		
0107	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	682 SF		
0108	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	473 SF		
0109	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	229 SF		
0110	4415000000-N	1115	FLASHING ARROW BOARD	2 EA		
0111	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	2 EA		
0112	4430000000-N	1130	DRUMS	171 EA		
0113	4435000000-N	1135	CONES	175 EA		
0114	4445000000-E	1145	BARRICADES (TYPE III)	360 LF		
0115	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	240 LF		
0116	4455000000-N	1150	FLAGGER	360 DAY		
0117	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	7 EA		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0118	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	3 EA		
0119	4480000000-N	1165	TMA	2 EA		
0120	4485000000-E	1170	PORTABLE CONCRETE BARRIER	3,830 LF		
0121	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	1,370 LF		
0122	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	240 LF		
0123	4510000000-N	1190	LAW ENFORCEMENT	128 HR		
0124	4516000000-N	1180	SKINNY DRUM	100 EA		
0125	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	6 EA		
0126	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	764 EA		
0127	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	16,725 LF		
0128	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	1,251 LF		
0129	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	1,327 LF		
0130	4709000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	1,020 LF		
0131	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	14 EA		
0132	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	77 EA		
0133	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (IV)	1,517 LF		
0134	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	90,395 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0135	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	7,212 LF		
0136	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	218 LF		
0137	4830000000-E	1205	PAINT PAVEMENT MARKING LINES (16")	160 LF		
0138	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	1,536 LF		
0139	4840000000-N	1205	PAINT PAVEMENT MARKING CHARACTER	64 EA		
0140	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	258 EA		
0141	4846000000-E	1205	POLYUREA PAVEMENT MARKING LINES (**", *** MILS) (4", 20 MILS)	1,071 LF		
0142	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	28,512 LF		
0143	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	1,948 LF		
0144	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	110 LF		
0145	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	303 LF		
0146	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	90 EA		
0147	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM POLYCARBONATE H-SHAPED MARKERS	267 EA		
0148	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	12 EA		
0149	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	8,290 LF		
0150	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG25)	62 EA		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0151	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0152	5325600000-E	1510	6" WATER LINE	481 LF		
0153	5325800000-E	1510	8" WATER LINE	100 LF		
0154	5326200000-E	1510	12" WATER LINE	4,328 LF		
0155	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	15,445 LB		
0156	5540000000-E	1515	6" VALVE	4 EA		
0157	5546000000-E	1515	8" VALVE	1 EA		
0158	5558000000-E	1515	12" VALVE	11 EA		
0159	5572200000-E	1515	12" TAPPING SLEEVE & VALVE	2 EA		
0160	5589200000-E	1515	2" AIR RELEASE VALVE	3 EA		
0161	5643200000-E	1515	2" WATER METER	6 EA		
0162	5643800000-E	1515	8" WATER METER	1 EA		
0163	5653200000-E	1515	2" DCV BACKFLOW PREVENTION ASSEMBLY	1 EA		
0164	5653210000-E	1515	RELOCATE 2" DCV BACKFLOW PREVENTION ASSEMBLY	4 EA		
0165	5653800000-E	1515	8" DCV BACKFLOW PREVENTION ASSEMBLY	1 EA		
0166	5653810000-E	1515	RELOCATE 8" DCV BACKFLOW PREVENTION ASSEMBLY	1 EA		
0167	5666000000-N	1515	FIRE HYDRANT	1 EA		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0168	5672000000-N	1515	RELOCATE FIRE HYDRANT	1 EA		
0169	5673000000-E	1515	FIRE HYDRANT LEG	326 LF		
0170	5679000000-E	1515	12" LINE STOP	1 EA		
0171	5684400000-E	1515	6" LINE STOP WITH BYPASS	2 EA		
0172	5685000000-E	1515	12" LINE STOP WITH BYPASS	1 EA		
0173	5686500000-E	1515	WATER SERVICE LINE	359 LF		
0174	5691300000-E	1520	8" SANITARY GRAVITY SEWER	1,095 LF		
0175	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	2 EA		
0176	5768500000-E	1520	SEWER SERVICE LINE	119 LF		
0177	5775000000-E	1525	4' DIA UTILITY MANHOLE	1 EA		
0178	5776000000-E	1525	5' DIA UTILITY MANHOLE	9 EA		
0179	5777000000-E	1525	6' DIA UTILITY MANHOLE	3 EA		
0180	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	8.5 LF		
0181	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	91.17 LF		
0182	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	46.41 LF		
0183	5800000000-E	1530	ABANDON 6" UTILITY PIPE	385 LF		
0184	5801000000-E	1530	ABANDON 8" UTILITY PIPE	1,323 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0185	5804000000-E	1530	ABANDON 12" UTILITY PIPE	3,120 LF		
0186	5815000000-N	1530	REMOVE WATER METER	1 EA		
0187	5815500000-N	1530	REMOVE FIRE HYDRANT	4 EA		
0188	5828000000-N	1530	REMOVE UTILITY MANHOLE	4 EA		
0189	5835700000-E	1540	16" ENCASEMENT PIPE	246 LF		
0190	5836000000-E	1540	24" ENCASEMENT PIPE	80 LF		
0191	5872500000-E	1550	BORE AND JACK OF **" (16")	246 LF		
0192	5872500000-E	1550	BORE AND JACK OF **" (24")	80 LF		
0193	5882000000-N	SP	GENERIC UTILITY ITEM REMOVE BACKFLOW PREVENTION ASSEMBLY	2 EA		
0194	6000000000-E	1605	TEMPORARY SILT FENCE	25,875 LF		
0195	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	1,220 TON		
0196	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	3,330 TON		
0197	6012000000-E	1610	SEDIMENT CONTROL STONE	3,680 TON		
0198	6015000000-E	1615	TEMPORARY MULCHING	52 ACR		
0199	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	2,500 LB		
0200	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	12.5 TON		
0201	6024000000-E	1622	TEMPORARY SLOPE DRAINS	2,330 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0202	6029000000-E	SP	SAFETY FENCE	2,860 LF		
0203	6030000000-E	1630	SILT EXCAVATION	7,390 CY		
0204	6036000000-E	1631	MATTING FOR EROSION CONTROL	49,725 SY		
0205	6037000000-E	1629	COIR FIBER MAT	100 SY		
0206	6042000000-E	1632	1/4" HARDWARE CLOTH	7,020 LF		
0207	6045000000-E	SP	**" TEMPORARY PIPE (18")	25 LF		
0208	6045000000-E	SP	**" TEMPORARY PIPE (42")	75 LF		
0209	6070000000-N	1639	SPECIAL STILLING BASINS	2 EA		
0210	6071002000-E	1642	FLOCCULANT	1,140 LB		
0211	6071012000-E	1642	COIR FIBER WATTLE	1,600 LF		
0212	6071013000-E	1642	WATTLE BARRIER	1,231 LF		
0213	6071030000-E	1640	COIR FIBER BAFFLE	1,215 LF		
0214	6084000000-E	1660	SEEDING & MULCHING	51 ACR		
0215	6087000000-E	1660	MOWING	48 ACR		
0216	6090000000-E	1661	SEED FOR REPAIR SEEDING	550 LB		
0217	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	2.25 TON		
0218	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	1,275 LB		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0219	6108000000-E	1665	FERTILIZER TOPDRESSING	37.75 TON		
0220	6111000000-E	SP	IMPERVIOUS DIKE	510 LF		
0221	6114500000-N	1667	SPECIALIZED HAND MOWING	25 MHR		
0222	6117000000-N	1675	RESPONSE FOR EROSION CONTROL	100 EA		
0223	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	1 EA		
0224	6120000000-E	SP	CULVERT DIVERSION CHANNEL	518 CY		
0225	6123000000-E	1670	REFORESTATION	0.1 ACR		
0226	6132000000-N	SP	GENERIC EROSION CONTROL ITEM PREFABRICATED CONCRETE WASHOUT	3 EA		
0227	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	9 EA		
0228	7060000000-E	1705	SIGNAL CABLE	5,650 LF		
0229	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	24 EA		
0230	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	4 EA		
0231	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	1 EA		
0232	7180000000-N	1706	BACKPLATE	36 EA		
0233	7264000000-E	1710	MESSENGER CABLE (3/8")	925 LF		
0234	7279000000-E	1715	TRACER WIRE	6,083 LF		
0235	7288000000-E	1715	PAVED TRENCHING (**********) (1, 2")	125 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0236	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	800 LF		
0237	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	4,941 LF		
0238	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	1,183 LF		
0239	7312000000-N	1716	JUNCTION BOX (**********) (SPECIAL OVERSIZED, HEAVY DUTY, 36" X 24" X 24")	1 EA		
0240	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	8 EA		
0241	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	16 EA		
0242	7360000000-N	1720	WOOD POLE	4 EA		
0243	7372000000-N	1721	GUY ASSEMBLY	8 EA		
0244	7408000000-E	1722	1" RISER WITH WEATHERHEAD	1 EA		
0245	7420000000-E	1722	2" RISER WITH WEATHERHEAD	4 EA		
0246	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	1,725 LF		
0247	7456100000-E	1726	LEAD-IN CABLE (14-2)	5,200 LF		
0248	7481000000-N	SP	SITE SURVEY	2 EA		
0249	7481200000-N	SP	LUMINAIRE ARM FOR VIDEO SYSTEM	8 EA		
0250	7481240000-N	SP	CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT	10 EA		
0251	7481260000-N	SP	EXTERNAL LOOP EMULATOR PROCESSING UNIT	2 EA		
0252	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (24)	7,728 LF		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0253	7528000000-E	1730	DROP CABLE	75 LF		
0254	7540000000-N	1731	SPLICE ENCLOSURE	1 EA		
0255	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	2 EA		
0256	7552000000-N	1731	INTERCONNECT CENTER	1 EA		
0257	7566000000-N	1733	DELINEATOR MARKER	17 EA		
0258	7576000000-N	SP	METAL STRAIN SIGNAL POLE	4 EA		
0259	7613000000-N	SP	SOIL TEST	4 EA		
0260	7614100000-E	SP	DRILLED PIER FOUNDATION	32 CY		
0261	7636000000-N	1745	SIGN FOR SIGNALS	6 EA		
0262	7642200000-N	1743	TYPE II PEDESTAL WITH FOUNDATION	8 EA		
0263	7684000000-N	1750	SIGNAL CABINET FOUNDATION	1 EA		
0264	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (2070LX, BASE MOUNTED)	1 EA		
0265	7744000000-N	1751	DETECTOR CARD (TYPE 170)	6 EA		
0266	7901000000-N	1753	CABINET BASE EXTENDER	1 EA		
0267	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	1 EA		
			CULVERT ITEMS			
0268	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT (44+65.00 -L-)	128 TON		

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0269	8196000000-E	420	CLASS A CONCRETE (CULVERT)	94.6 CY		
0270	8245000000-E	425	REINFORCING STEEL (CULVERT)	11,520 LB		
0271	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	200 SY		
			WALL ITEMS			
0272	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	23,700 SF		
0273	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	8,300 SF		
0274	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	27,100 SF		
0275	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	8,500 SF		
0276	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT	76,400 SF		
0277	8847000000-E	SP	GENERIC RETAINING WALL ITEM SMSE RETAINING WALL NO 3	8,800 SF		
			STRUCTURE ITEMS			
0278	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT NO ** AT STATION ********* (1, 29+90.36 -L-)	Lump Sum	L.S.	
0279	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT NO ** AT STATION ********* (2, 29+90.36 -L-)	Lump Sum	L.S.	
0280	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	14,573 SF		
0281	8161000000-E	420	GROOVING BRIDGE FLOORS	14,508 SF		
0282	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	423.7 CY		
0283	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (29+90.36 -L-)	Lump Sum	L.S.	

County: WAKE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0284	8217000000-E	425	REINFORCING STEEL (BRIDGE)	66,486 LB		
0285	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	6,508 LB		
0286	8265000000-E	430	54" PRESTRESSED CONCRETE GIRDERS	1,486.67 LF		
0287	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	84 EA		
0288	8364000000-E	450	HP 12 X 53 STEEL PILES	2,560 LF		
0289	8391000000-N	450	STEEL PILE POINTS	64 EA		
0290	8475000000-E	460	TWO BAR METAL RAIL	360.67 LF		
0291	8517000000-E	460	1'-**" X *****" CONCRETE PARAPET (1'-2" X 3'-3")	375.67 LF		
0292	8524000000-E	SP	**" CHAIN LINK FENCE (72")	373.33 LF		
0293	8531000000-E	462	4" SLOPE PROTECTION	2,230 SY		
0294	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0295	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA ********** (29+90.36 -L-)	Lump Sum	L.S.	

0948/Oct13/Q1098388.26/D1372069597000/E295 **Total Amount Of Bid For Entire Project :**