STATE OF NORTH CAROLINA C204633
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

CONTRACT AND
CONTRACT BONDS

FOR CONTRACT NO. C204633

WBS	34839.3.GV5 NHPIM-0040(68)
T.I.P NO.	U-2579AB
COUNTY OF	FORSYTH
THIS IS THE	ROADWAY & STRUCTURE CONTRACT
ROUTE NUMBER	I 74 LENGTH 2.727 MILES
LOCATION	FUTURE I-74 (WINSTON-SALEM NORTHERN BELTWAY) FROM I-40 TO I-40 BUS/US 421.
CONTRACTOR	WEBBER, LLC
ADDRESS	1725 HUGHES LANDING BLVD SUITE 200 THE WOODLANDS, TX 77380
BIDS OPENED	DECEMBER 21, 2021
CONTRACT EXECUTION	01/20/2022

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

PROPOSAL

INCLUDES ADDENDUM No.3 DATED 12-15-2021

DATE AND TIME OF BID OPENING: **DECEMBER 21, 2021 AT 2:00 PM**

CONTRACT ID	C204633
WBS	34839.3.GV5

FEDERAL-AID NO.	NHPIM-0040(68)
COUNTY	FORSYTH
T.I.P. NO.	U-2579AB
MILES	2.727
ROUTE NO.	I 74
LOCATION	FUTURE I-74 (WINSTON-SALEM NORTHERN BELTWAY) FROM I-40 TO I-40 BUS/US 421.
TYPE OF WORK	GRADING, DRAINAGE, PAVING, AND STRUCTURE.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A ROADWAY & STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C204633 IN FORSYTH COUNTY, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C204633** has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2018 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **C204633** in **Forsyth County**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2018* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

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

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

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

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

State Contract Officer

DocuSigned by:
Ronald E. Davenport, Jr.
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Dec 14, 2021

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GENERAL

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

The date of availability for this contract is **February 1, 2022, except Area #1 is July 1, 2023 and Areas #2 & #3 are July 1, 2024**, 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 **April 30, 2027**.

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

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

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

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

The date of availability for this intermediate contract time is **February 1, 2022, except Area #1 is July 1, 2023 and Areas #2 & #3 are July 1, 2024**.

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

The liquidated damages for this intermediate contract time are **Seven Thousand Dollars ($7,000.00)** per calendar day.

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

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **I-40 (-Y15- / -Y15REV-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 5:00 A.M. to 9:00 P.M.
Saturday, 7:00 A.M. to 7:00 P.M.
Sunday, 9:00 A.M. to 8:00 P.M.

In addition, the Contractor shall not close or narrow a lane of traffic on **I-40 (-Y15- / -Y15REV-)**, 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 **5:00 A.M.** December 31st to **9:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 P.M.** the following Tuesday.

3. For **Easter**, between the hours of **5:00 A.M.** Thursday and **9:00 P.M.** Monday.

4. For **Memorial Day**, between the hours of **5:00 A.M.** Friday and **9:00 P.M.** Tuesday.

5. For **Independence Day**, between the hours of **5:00 A.M.** the day before Independence Day and **9:00 P.M.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **5:00 A.M.** the Thursday before Independence Day and **9:00 P.M.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **5:00 A.M.** Friday and **9:00 P.M.** Tuesday.

7. For **Thanksgiving**, between the hours of **5:00 A.M.** Tuesday and **9:00 P.M.** Monday.

8. For **Christmas**, between the hours of **5:00 A.M.** the Friday before the week of Christmas Day and **9:00 P.M.** the following Tuesday after the week of Christmas Day.

9. For **Wake Forest University Events**, occurring at **Truist Field at Wake Forest** between **four (4)** hours before the start and **four (4)** hours after the end of **each event**.

10. For **Carolina Classic Fair**, between the hours of **7:00 A.M.** the day before the start of the fair and **7:00 P.M.** the following day after the end of the fair.

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

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 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 **Kernersville Road (-Y4-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 A.M. to 7:00 P.M.

In addition, the Contractor shall not close or narrow a lane of traffic on **Kernersville Road (-Y4-)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

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

2. For **New Year's Day**, between the hours of **6:00 A.M.** December 31st to **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.

9. For **Wake Forest University Events**, occurring at **Truist Field at Wake Forest** between **four (4)** hours before the start and **four (4)** hours after the end of **each event**.

10. For **Carolina Classic Fair**, between the hours of **7:00 A.M.** the day before the start of the fair and **7:00 P.M.** the following day after the end of the fair.

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

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

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

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

INTERMEDIATE CONTRACT TIME NUMBERS 4 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 C

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **Sedge Garden Road (-Y1- / -Y1B-), Linville Road (-Y4A-) and/or Glenn Hi Road (-Y16-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 A.M. to 9:00 A.M. and 3:00 P.M. to 6:00 P.M.

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

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

The liquidated damages are **Two Hundred Fifty Dollars ($ 250.00)** per thirty **(30)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBERS 5 AND 6 AND LIQUIDATED DAMAGES:

(2-20-07) (Rev. 10-15-13) 108 SP1 G14 E

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

DAY AND TIME RESTRICTIONS

ICT #5 - I-40 (-Y15-/-Y15REV-)
Monday thru Sunday, 5:00 A.M. to 12:00 A.M. (Midnight)

The liquidated damages are **Five Thousand Dollars ($ 5,000.00)** per fifteen **(15)** minute time period.

ICT #6 - Kernersville Road (-Y4-)
Monday thru Sunday, 6:00 A.M. to 12:00 A.M. (Midnight)

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per fifteen **(15)** minute time period.

The maximum allowable time for Overhead Sign Installation, Signal Mast Arms, and/or Overhead Bridge Work is **thirty (30)** minutes for **I-40 (-Y15- / -Y15REV-) and/or Kernersville Road (-Y4-)**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

INTERMEDIATE CONTRACT TIME NUMBER 7 AND LIQUIDATED DAMAGES:

(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4 - Phase 1, Step #2A** 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 **thirty (30)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Eight Hundred Dollars ($ 1,800.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 8 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4 - Phase 4, Step #1A** 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 **forty-five (45)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Eight Hundred Dollars ($ 1,800.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 9 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 3 - Phase 3, Steps #1 thru #2** as shown on Sheet **TMP-3B** 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 **two hundred forty (240)** consecutive calendar days after and including the date the Contractor begins this work.

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

PERMANENT VEGETATION ESTABLISHMENT:
(2-16-12) (Rev. 10-15-13) 104 SP1 G16

Establish a permanent stand of the vegetation mixture shown in the contract. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish permanent vegetation on all erodible areas within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the applicable section of the *2018 Standard Specifications*. All work required for initial vegetation planting shall be performed as a part of the work necessary for the completion and acceptance of the Intermediate Contract Time (ICT). Between the time of ICT and Final Project acceptance,

or otherwise referred to as the vegetation establishment period, the Department will be responsible for preparing the required National Pollutant Discharge Elimination System (NPDES) inspection records.

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

Payment for *Response for Erosion Control*, *Seeding and Mulching, Repair Seeding*, *Supplemental Seeding, Mowing, Fertilizer Topdressing, Silt Excavation,* and *Stone for Erosion Control* will be made at contract unit prices for the affected items. Work required that is not represented by contract line items will be paid in accordance with Articles 104-7 or 104-3 of the *2018 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

MANDATORY PRE-BID CONFERENCE (Prequalifying To Bid):
(7-18-06) (Rev. 3-25-13) SPD 01-300

In order for all prospective bidders to have an extensive knowledge of the project, all prospective bidders shall attend a mandatory pre-bid conference on November 16, 2021 beginning at 9:00 AM. Due to COVID-19 we will be holding the conference via Microsoft Teams. Please contact Robyn Warner at rcwarner@ncdot.gov (for a link to the meeting). If you do not have access to Microsoft Teams the following Call in Number is available to participate in the conference: 1-984-204-1487, Access Number: 96091470#.

For any questions pertaining to the pre-bid conference please contact Robyn Warner at 336-747-7800.

The pre-bid conference will include a thorough discussion of the plans, contract pay items, special provisions, etc. Only bidders who have attended and properly registered at the above scheduled pre-bid conference and who have met all other prequalification requirements will be considered prequalified to bid on this project. A bid received from a bidder who has not attended and properly registered at the above scheduled pre-bid conference will not be accepted and considered for award.

Attendance at the pre-bid conference will not meet the requirements of proper registration unless the individual attending has registered at the pre-bid conference in accordance with the following:

(A) The Division staff will take the name, company, e-mail address and phone number of the companies attending the virtual conference. The name of the companies and their representative will be read aloud, and the meeting will be recorded.

(B) The company representative shall make sure their name is added to the roster no more than ten (10) minutes after the above noted time from the beginning of the conference.

(C) Only one company will be shown as being represented by the individual attending.

(D) The individual attending is an officer or permanent employee of the company they are representing.

Attendance at any prior pre-bid conference will not meet the requirement of this provision.

AWARD OF CONTRACT:

Revise the 2018 *Standard Specifications* as follows:

Page 1-23, Subarticle 103-4 (A) General, first paragraph, replace the 3rd and 4th sentences with the following:

Where award is to be made, the notice of award will be issued within 60 days after the opening of bids or upon issuance of any necessary debt instrument, whichever is later, but not to exceed 120 days; except with the consent of the lowest responsible bidder the decision to award the contract to such bidder may be delayed for as long a time as may be agreed upon by the Department and such bidder. In the absence of such agreement, the lowest responsible bidder may withdraw his bid at the expiration of 120 days without penalty if no notice of award has been issued.

DELAY IN RIGHT OF ENTRY:

(7-1-95) 108 SP1 G22 B

The Contractor will not be allowed right of entry to the following parcels prior to the listed dates unless otherwise permitted by the Engineer.

Parcel No.	Property Owner	Date
046A	Jennyfer Mendoza Salgado	5-30-2022
150	Aulton L Bostick	12-31-2021
164	Michael Scott Shields	12-31-2021
288	Conrex Residential Property	12-31-2021
314	Pricilla Ford	11-1-2021
321	Annie Laura Arant, et. al	12-31-2021
321A	Annie Laura Arant, et. al	12-31-2021
375	Leonard Calloway, Jr	12-31-2021
633	Corey Lee Stroud, et. al	3-15-2022
094	Carmen M. Joyce	3-31-2022
366Z	Clarice Gowens	12-31-2021
446	Michael Sinnet	7-31-2022
447	Keith Brown	7-31-2022
001Z	Hilda B. Moore	7-31-2022
003Z	Robert W. Brown, et al	7-31-2022
005	William C. Ramey	12-31-2021
007	James W. Baker	12-31-2022
009	Robert L. Oglesby	7-31-2022
012	Francis L. Manuel	7-31-2022
014	Gregory Hedrick	12-31-2022
015	Forsyth Co. Board of Ed	12-31-2022
015A	Forsyth Co. Board of Ed	12-31-2022
017	Danny & Omana L. Smith	12-31-2022
018	Hosford	12-31-2022
019	Old White Oak, LLC	12-31-2022
020	Francis L. Manuel	12-31-2022
038	Gregory Hedrick	12-31-2022
039Z	Paul & Margaret Harrell	12-31-2022
051	Pegram Oil	12-31-2022
054	Tenant: Frankie G. Piner	7-31-2022
056	Forsyth Co. Board of Ed	12-31-2022
057	Erica Lawrence & Chris Sheets	12-31-2022
332	Southern Bell Telephone Co	7-31-2022
337	Tenant: Mark Paskuly	7-31-2022
337	Tenant: Jose & Louanna Molina	12-31-2022
344	Mark & Robyn Pegram	12-31-2022
350	Michael J. Sapp	12-31-2022
351	Kim & Ann Clark	12-31-2022
354	Sedgemont HOA, Inc	7-31-2022
355	Carolyn R. Voss	7-31-2022
356	Carolyn R. Voss	7-31-2022
358	Jane Page Personal Prop., LLC	12-31-2022
359	Donald W. Manual & Jeffrey	7-31-2022
406	Donald Manual	7-31-2022
407	Erica Jackson	7-31-2022

411	Estelle S. Pope Heirs	7-31-2022
440	Stephanie D. Wilson	12-31-2021
442	Vincent & Kristen Mann	7-31-2022
445	Sheena D Hazel	7-31-2022

MAJOR CONTRACT ITEMS:

(2-19-02) 104 SP1 G28

The following listed items are the major contract items for this contract (see Article 104-5 of the *2018 Standard Specifications*):

Line #	Description
5	Unclassified Excavation
96	12” Port Cem Conc Pavement, Through Lanes (With Dowels)
532	Reinforced Concrete Deck Slab

SPECIALTY ITEMS:

(7-1-95)(Rev. 7-20-21) 108-6 SP1 G37

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

Line #	Description
159-174	Guardrail
175-179	Fencing
187-237	Signing
266-271, 288-292	Long-Life Pavement Markings
272-273, 280-281	Removable Tape
293-294	Permanent Pavement Markers
295-321	Lighting
323-364	Utility Construction
365-404, 406-407	Erosion Control
405	Reforestation
408-477	Signals/ITS System
522-527, 529-531	Drilled Piers
569-572	Micropiles

FUEL PRICE ADJUSTMENT:
(11-15-05) (Rev. 7-20-21) 109-8 SP1 G43

Revise the *2018 Standard Specifications* as follows:

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

The base index price for DIESEL #2 FUEL is **$ 2.3102** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

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

Description	Units	Fuel Usage Factor Diesel
Unclassified Excavation	Gal/CY	0.29
Borrow Excavation	Gal/CY	0.29
Class IV Subgrade Stabilization	Gal/Ton	0.55
Aggregate Base Course	Gal/Ton	0.55
Sub-Ballast	Gal/Ton	0.55
Asphalt Concrete Base Course, Type ____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	0.90 or 2.90
Open-Graded Asphalt Friction Course	Gal/Ton	0.90 or 2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	0.90 or 2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	0.90 or 2.90
Aggregate for Cement Treated Base Course	Gal/Ton	0.55
Portland Cement for Cement Treated Base Course	Gal/Ton	0.55
__" Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to __" Pavement	Gal/SY	0.245

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

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

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

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

PAYOUT SCHEDULE:

(1-19-10) (Rev. 1-17-12) 108 SP1 G57

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

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-13-19) 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)**
2022	(7/01/21 - 6/30/22)	**15**% of Total Amount Bid
2023	(7/01/22 - 6/30/23)	**28**% of Total Amount Bid
2024	(7/01/23 - 6/30/24)	**26**% of Total Amount Bid
2025	(7/01/24 - 6/30/25)	**16**% of Total Amount Bid
2026	(7/01/25 - 6/30/26)	**12**% of Total Amount Bid
2027	(7/01/26 - 6/30/27)	**3**% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2018 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

DISADVANTAGED BUSINESS ENTERPRISE:

(10-16-07)(Rev. 8-17-21) 102-15(J) SP1 G61

Description

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

Definitions

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

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

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

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

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

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

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

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

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

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

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

Forms and Websites Referenced in this Provision

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

DBE-IS *Subcontractor Payment Information* - Form for reporting the payments made to all DBE firms working on the project. This form is for paper bid projects only. https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf

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

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

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

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

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

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

DBE Goal

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

Disadvantaged Business Enterprises **8.0** %

(A) *If the DBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the contract as set forth above as the DBE goal.

(B) *If the DBE goal is zero*, the Contractor shall make an effort to recruit and use DBEs during the performance of the contract. Any DBE participation obtained shall be reported to the Department.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as DBE certified shall be used to meet the DBE goal. The Directory can be found at the following link. https:// www.ebs.nc.gov/VendorDirectory/default.html

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

Listing of DBE Subcontractors

At the time of bid, bidders shall submit all DBE participation that they anticipate to use during the life of the contract. Only those identified to meet the DBE goal will be considered committed, even though the listing shall include both committed DBE subcontractors and additional DBE subcontractors. Additional DBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goal. Only those firms with current DBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of DBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of DBE participation in the appropriate section of the electronic submittal file.

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

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

(3) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the DBE goal.

(B) Paper Bids

(1) *If the DBE goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of *DBE* participation, including the names and addresses on *Listing of DBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the DBE participation for the contract.

(b) If bidders have no DBE participation, they shall indicate this on the *Listing of DBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation**. Bids submitted that do not have DBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.

(c) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the corresponding goal.

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

DBE Prime Contractor

When a certified DBE firm bids on a contract that contains a DBE goal, the DBE firm is responsible for meeting the goal or making good faith efforts to meet the goal, just like any other bidder. In most cases, a DBE bidder on a contract will meet the DBE goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the DBE bidder and any other DBE subcontractors will count toward the DBE goal. The DBE bidder shall list itself along with any DBE subcontractors, if any, in order to receive credit toward the DBE goal.

For example, if the DBE goal is 45% and the DBE bidder will only perform 40% of the contract work, the prime will list itself at 40%, and the additional 5% shall be obtained through additional DBE participation with DBE subcontractors or documented through a good faith effort.

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

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each DBE that will be used to meet the DBE goal of the contract, indicating the bidder's commitment to use the DBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed DBE to be used toward the DBE goal, or if the form is incomplete (i.e. both signatures are not present), the DBE participation will not count toward meeting the DBE goal. If the lack of this participation drops the commitment below the DBE goal, the Contractor shall submit evidence of good faith efforts, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 10:00 a.m. on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the DBE goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach the DBE goal.

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. on the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day. If the contractor cannot send the information electronically, then one complete set and 5 copies of this information shall be received under the same time constraints above.

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

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

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient DBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought DBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goal and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

(A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.

(2) Negotiate with subcontractors to assume part of the responsibility to meet the contract DBE goal when the work to be sublet includes potential for DBE participation (2^{nd} and 3^{rd} tier subcontractors).

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

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

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

contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

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

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

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

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

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

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

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

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

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

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

Non-Good Faith Appeal

The State Prequalification Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the State Prequalification Engineer or at DBE@ncdot.gov. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting DBE Participation Toward Meeting DBE Goal

(A) Participation

The total dollar value of the participation by a committed DBE will be counted toward the contract goal requirement. The total dollar value of participation by a committed DBE will be based upon the value of work actually performed by the DBE and the actual payments to DBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting DBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 *(Joint Check Notification Form)* and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

(C) Subcontracts (Non-Trucking)

A DBE may enter into subcontracts. Work that a DBE subcontracts to another DBE firm may be counted toward the contract goal requirement. Work that a DBE subcontracts to a non-DBE firm does <u>not</u> count toward the contract goal requirement. If a DBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the DBE is not performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption is subject to review by the Federal Highway Administration but is not administratively appealable to USDOT.

(D) Joint Venture

When a DBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the DBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the DBE performs with its forces.

(E) Suppliers

A contractor may count toward its DBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a DBE regular dealer and 100 percent of such expenditures from a DBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its DBE requirement the following expenditures to DBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a DBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.

(2) With respect to materials or supplies purchased from a DBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) DBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to DBEs that perform a commercially useful function in the work of a contract. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a DBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and any other relevant factors.

(B) DBE Utilization in Trucking

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

(1) The DBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting DBE goals.

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

(3) The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

(4) The DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.

(5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the DBE and the Contractor will not count towards the DBE contract requirement.

(6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the DBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

DBE Replacement

When a Contractor has relied on a commitment to a DBE subcontractor (or an approved substitute DBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE subcontractor for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another DBE subcontractor, a non-DBE subcontractor, or with the Contractor's own forces or those of an affiliate.

The Contractor must give notice in writing both by certified mail and email to the DBE subcontractor, with a copy to the Engineer of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the DBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the DBE subcontractor objects to the intended termination/substitution, the DBE, within five (5) business days must advise the Contractor and the Department of the reasons why the action should

not be approved. The five-day notice period shall begin on the next business day after written notice is provided to the DBE subcontractor.

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

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

The Contractor shall comply with the following for replacement of a committed DBE:

(A) Performance Related Replacement

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

If a replacement DBE is not found that can perform at least the same amount of work as the terminated DBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

(1) Copies of written notification to DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.

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

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

(3) A list of reasons why DBE quotes were not accepted.

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

(B) Decertification Replacement

(1) When a committed DBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.

(2) When a committed DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Contractor shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the DBE goal requirement. If a DBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

(3) Exception: If the DBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement and overall goal.

All requests for replacement of a committed DBE firm shall be submitted to the Engineer for approval on Form RF-1 *(DBE Replacement Request)*. If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed DBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a DBE based upon the Contractor's commitment, the DBE shall participate in additional work to the same extent as the DBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by DBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed DBE, the Contractor shall seek participation by DBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a DBE, the Contractor shall seek additional participation by DBEs equal to the reduced DBE participation caused by the changes.

Reports and Documentation

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a DBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving DBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a DBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for DBE credit.

Reporting Disadvantaged Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all DBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

(A) Withholding of money due in the next partial pay estimate; or

(B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to DBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future DOT projects until the required information is submitted.

Contractors reporting transportation services provided by non-DBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

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

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2018 Standard Specifications* may be cause to disqualify the Contractor.

CERTIFICATION FOR FEDERAL-AID CONTRACTS:

(3-21-90) SP1 G85

The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(A) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(B) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by *Section 1352, Title 31, U.S. Code*. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such subrecipients shall certify and disclose accordingly.

CONTRACTOR'S LICENSE REQUIREMENTS:
(7-1-95) 102-14 SP1 G88

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

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:
(11-17-20) SP01 G090

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

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):
(8-20-19) SP1 G092

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

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

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

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

EQUIPMENT IDLING GUIDELINES:
(1-19-21) 107 SP1 G096

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

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

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

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

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:

(11-22-94) 108-5 SP1 G100

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

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

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

CARGO PREFERENCE ACT:
(2-16-16)

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

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

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

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

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

SUBSURFACE INFORMATION:
(7-1-95) 450 SP1 G112 C

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

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

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of portable concrete barrier, provided that these materials have been delivered on the project and stored in an acceptable manner, and further provided the documents listed in Subarticle 109-5(C) of the *2018 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2018 Standard Specifications* will apply to the portable concrete barrier.

REMOVABLE PAVEMENT MARKINGS - (Partial Payments for Materials):
(7-1-95) (Rev. 8-16-11) 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 *2018 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 *2018 Standard Specifications* will not apply to removable pavement marking materials.

MAINTENANCE OF THE PROJECT:

(11-20-07) (Rev. 1-17-12) 104-10 SP1 G125

Revise the *2018 Standard Specifications* as follows:

Page 1-39, Article 104-10 Maintenance of the Project, line 25, add the following after the first sentence of the first paragraph:

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

Page 1-39, Article 104-10 Maintenance of the Project, line 30, add the following as the last sentence of the first paragraph:

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

Page 1-39, Article 104-10 Maintenance of the Project, lines 42-44, replace the last sentence of the last paragraph with the following:

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

COOPERATION BETWEEN CONTRACTORS:

(7-1-95) 105-7 SP1 G133

The Contractor's attention is directed to Article 105-7 of the *2018 Standard Specifications*.

I-5795 (C203978) is located within the project limits and is currently under construction. I-5795 is not anticipated to be complete prior to the letting of this project.

U-2579BA (C204533) is located adjacent to this project and is currently under construction. U-2579BA is not anticipated to be complete prior to the letting of this project.

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

ELECTRONIC BIDDING:

(2-19-19) 101, 102, 103 SP1 G140

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

BID DOCUMENTATION:

(1-1-02) (Rev.8-18-15) 103 SP1 G142

General

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

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

Terms

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

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

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

Escrow Agreement Information

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

Failure to Provide Bid Documentation

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

Submittal of Bid Documentation

(A) Appointment – Email specs@ncdot.gov or call 919.707.6900 to schedule an appointment.

(B) Delivery - A representative of the Bidder shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within 10 days after the notice of award is received.

(C) Packaging – The container shall be no larger than 15.5 inches in length by 12 inches wide by 11 inches high and shall be water resistant. The container shall be clearly marked on the face and the back of the container with the following information: Bid Documentation, Bidder's Name, Bidder's Address, Date of Escrow Submittal, Contract Number, TIP Number if applicable, and County.

Affidavit

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

Verification

Upon delivery of the bid documentation, the Department's Contract Officer and the Bidder's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Bidder's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Bidder's representative, immediately place the complete bid documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to the Escrow Agent for placement in a safety deposit box, vault, or other secure accommodation.

Confidentiality of Bid Documentation

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

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

Duration and Use

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

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

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

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

Release of Bid Documentation to the Contractor

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

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

Payment

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

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

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

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

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

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

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

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev 12-15-20) 105-16, 225-2, 16 SP1 G180

General

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

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

(A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control/Stormwater Supervisor to manage the Contractor and subcontractor operations, insure compliance with

Federal, State and Local ordinances and regulations, and manage the Quality Control Program.

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

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

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

Roles and Responsibilities

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

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

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

(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.

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

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

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

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

(b) Inspect erosion and sediment control/stormwater devices and stormwater discharge outfalls at least once every 7 calendar days and within 24 hours after a rainfall event equal to or greater than 1.0 inch that occurs within a 24 hour period. Additional monitoring may be required at the discretion of Division of Water Resources personnel if the receiving stream is 303(d) listed for turbidity and the project has had documented problems managing turbidity.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Preconstruction Meeting

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

Ethical Responsibility

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

Revocation or Suspension of Certification

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

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

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

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

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

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

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

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

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

Measurement and Payment

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

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 4-5-19) 105-16, 230, 801 SP1 G181

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

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

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

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

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

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

During the Environmental Assessment required by Article 230-4 of the *2018 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

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

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

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix,* available at https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/TurbidityReductionOptionSheet.pdf to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may

be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

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

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

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING - METHOD III:

(4-6-06) (Rev.8-18-15) 200 SP2 R02B

Perform clearing on this project to the limits established by Method "III" shown on Standard Drawing No. 200.03 of the *2018 Roadway Standard Drawings*. Conventional clearing methods may be used except where permit drawings or conditions have been included in the proposal which require certain areas to be cleared by hand methods.

BURNING RESTRICTIONS:

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

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

TEMPORARY DETOURS:

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

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

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

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

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

SHOULDER AND FILL SLOPE MATERIAL:

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

Description

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *2018 Standard Specifications*.

Measurement and Payment

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

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

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

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *2018 Standard Specifications*.

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12) 300, 340, 1000, 1530, 1540, 1550 SP3 R30

Description

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

Materials

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

Item	Section
Flowable Fill	1000-6

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Flowable Fill	Cubic Yard

CORRUGATED ALUMINUM ALLOY CULVERT PIPE:

(9-21-21) 305, 310 SP3 R34

Revise the *Standard Specifications* as follows:

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

Item	Section
Waterborne Paint	1080-9
Hot Bitumen	1081-3

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

Coating must be applied to the aluminum when in contact with concrete. Immediately prior to coating, aluminum surfaces to be coated shall be cleaned by a method that will remove all dirt, oil, grease, chips, and other foreign substances. Aluminum to be coated shall be given one coat of suitable quality coating such as:

Approved waterborne paint (Section 1080-9)
Approved Hot Bitumen (Section 1081-3)

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

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

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

POLYPROPYLENE CULVERT PIPE:

(8-20-19) 305,310 SP3 R35

Revise the *2018 Standard Specifications* as follows:

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

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

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

Item	**Section**
Polypropylene Pipe	1032-9

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

Item	**Section**
Polypropylene Pipe	1032-9

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

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

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

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

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

Pay Item	**Pay Unit**
__″ Polypropylene Pipe	Linear Foot

Page 10-60, add Article 1032-9:

(A) General

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

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

(B) End Treatments, Pipe Tees and Elbows

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

(C) Marking

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

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

When polypropylene pipe, end sections, tees and elbows have been inspected and accepted a sticker will be applied to the inside of the pipe. Do no use pipe sections, flared end sections, tees or elbows which do not have this seal of approval.

RIP RAP ENERGY DISSIPATOR:

Description

This work consists of the construction and maintenance of an armored outlet structure located at culvert outlets or ditch termini.

Materials

Refer to Division 10 of the *Standard Specifications:*

Item	Section
Class II Riprap	Section 1042
Geotextile for Drainage, Type 2	Section 1056

Construction Methods

Rip Rap Energy Dissipators shall be constructed in accordance with the detail shown in the plans or as directed. From the outlet invert of a culvert or bottom of a ditch excavation will drop to a specified depth. Excavation will continue to widen through the dissipator. Rip rap will be placed along the banks and bottom of the dissipator and along the apron.

Excavate ditch in accordance with Section 240 of the *Standard Specifications.*

The quantity of energy dissipator material may be affected by site conditions during construction of the project. The quantity of materials may be increased, decreased, or eliminated at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Measurement and Payment

Class II Riprap will be measured and paid for in accordance with Section 876 of the *Standard Specifications.*

Geotextile for Drainage will be measured and paid for in accordance with Section 876 of the *Standard Specifications.*

Drainage Ditch Excavation will be measured and paid for in accordance with Section 240 of the *Standard Specifications.*

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 construct the riprap energy dissipator.

OUTLET CONTROL STRUCTURE:

Description

Installation of outlet control structure components required for stormwater basin construction. The work covered in this special provision consists of elements of work covered by Section 300, 305, 310 and 840.

General

Install drawdown structure components to the elevations, dimensions, and details as shown in the plans. Coordinate all work covered by this section with the grading, walls, drainage system, and excavation and maintain in a satisfactory condition so that adequate drainage is provided at all times. Maintain all drainage structures until the final acceptance of the project.

Measurement and Payment

Outlet Control Structure installation will be measured and paid for as per each and conform to the details shown in the construction plans. Work includes, but is not limited to the following items:

- Removable Orifice Trash Rack and associated hardware
- Steps
- 8” Sluice Gate
- Masonry, Precast or Cast in Place Drainage Structure

Installation of other drainage elements, including reinforced concrete drainage pipes, will be paid for separately. All other necessary construction will be incidental to this pay item.

Payment will be made under:

Pay Item	Pay Unit
Outlet Control Structure	Each

DRAINING PONDS:

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

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

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

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

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

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-16-18) 422 SP4 R02A

Description

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

Define bridge approach fill types as follows:

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

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

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

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

Materials

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

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

Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for standard and modified approach fills. For an approach fill behind a bridge end bent with an MSE abutment wall, backfill the reinforced approach fill with the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal. For MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

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

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

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent separation geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with separation geotextiles or MSE wall reinforcement.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with 2018 Roadway Standard Drawing Nos. 422.01 or 422.02. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the *2018 Standard Specifications* and place outlet pads in

accordance with 2018 Roadway Standard Drawing No. 815.03.

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

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

Measurement and Payment

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

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

Payment will be made under:

Pay Item	**Pay Unit**
Type I Standard Approach Fill, Station ____	Lump Sum
Type II Modified Approach Fill, Station ____	Lump Sum
Type III Reinforced Approach Fill, Station ____	Lump Sum

ALTERNATE BRIDGE APPROACH FILLS FOR INTEGRAL ABUTMENTS:

(1-16-18) 422 SP4 R02B

Description

At the Contractors option, use Type A Alternate Bridge Approach Fills instead of Type I or II

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

Materials

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

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

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

Construction Methods

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

Install geotextiles as shown in 2018 Roadway Standard Drawing No. 422.03. Attach separation geotextiles to end bent cap backwalls and wing walls as needed with adhesives, tapes or other approved methods. Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geotextiles.

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

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain

pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

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

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

Place select material in 8" to 10" thick lifts and compact select material with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geotextiles or drains when placing and compacting select material. End dumping directly on geotextiles is not permitted. Do not operate heavy equipment on geotextiles or drain pipes until they are covered with at least 8" of select material. Replace any damaged geotextiles or drains to the satisfaction of the Engineer. When alternate approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material as shown in 2018 Roadway Standard Drawing No. 422.03.

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

Measurement and Payment

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

AUTOMATED FINE GRADING:

(1-16-96) 610 SP5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2018 Standard Specifications* except use an automatically controlled fine grading machine using string lines, laser controls or other approved methods to produce final subgrade and base surfaces meeting the lines, grades and cross sections required by the plans or established by the Engineer.

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

AGGREGATE SUBGRADE:

(5-15-18) 505 SP5 R8

Revise the *2018 Standard Specifications* as follows:

Page 5-8, Article 505-1 DESCRIPTION, lines 4-6, replace the paragraph with the following:

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

Undercut natural soil materials if necessary to construct aggregate subgrades. Define "subbase" as the portion of the roadbed below the Class IV subgrade stabilization. For Type 2 aggregate subgrades, undercut subbases as needed. The types of aggregate subgrade with thickness and compaction requirements for each are as shown below.

Type 1 – A 6 to 24 inch thick aggregate subgrade with Class IV subgrade stabilization compacted to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

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

Page 5-8, Article 505-3 CONSTRUCTION METHODS, line 12, insert the following after the first sentence of the first paragraph:

For Type 2 aggregate subgrades, proof roll subbases in accordance with Section 260 before installing geotextile for soil stabilization.

Page 5-8, Article 505-3 CONSTRUCTION METHODS, lines 16-17, replace the last sentence of the first paragraph with the following:

Compact ABC as required for the type of aggregate subgrade constructed.

Page 5-8, Article 505-4 MEASUREMENT AND PAYMENT, line 26, insert the following after the last sentence of the first paragraph:

Undercut Excavation of natural soil materials from subbases for Type 2 aggregate subgrades will

be measured and paid in accordance with Article 225-7 or 226-3. No measurement will be made for any undercut excavation of fill materials from subbases.

STABILIZATION OF COASTAL PLAIN SANDS:

(11-18-14) 510 SP5 R12

Description

As directed by the Engineer, stabilize sandy subgrade material with Class IV aggregate to prevent rutting of the subgrade prior to paving directly on the subgrade. Remove material as needed in cut areas prior to placing the Class IV aggregate.

Materials

Refer to Division 10.

Item	Section
Select Material, Class IV	1016

Use Class IV Select Material for Class IV Aggregate Stabilization.

Construction Methods

Class IV Aggregate Stabilization

As directed by the Engineer, place aggregate by end dumping aggregate on approved subgrade soils to provide a working platform and reduce wheel rutting of subgrade material. Place the Class IV aggregate stabilization to a thickness of 2 to 3 inches.

Maintenance

Maintain aggregate stabilization in an acceptable condition and minimize the use of heavy equipment on aggregate in order to avoid damaging the subgrade. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate stabilization.

Measurement and Payment

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

The work to excavate material to place Class IV Aggregate Stabilization below subgrade is considered incidental to the work of placing the aggregate and no separate payment will be made.

Payment will be made under:

Pay Item	Pay Unit
Class IV Aggregate Stabilization	Ton

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

(11-21-00) 620 SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2018 Standard Specifications.*

The base price index for asphalt binder for plant mix is **$ 502.73** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **October 1, 2021**.

DIAMOND GRINDING CONCRETE PAVEMENT:

(4-15-08) (Rev 11-16-21) SPI 7-9A(Revised)

Description

Perform the work covered by this provision including but not limited to diamond grinding and regrinding concrete pavement to meet final surface acceptable smoothness requirements detailed in Article 710-7, selecting diamond tipped saw blades and configuration of cutting head; continual removal of residual slurry from pavement and disposal; furnishing all labor, materials, supplies, tools, equipment and incidentals as necessary. Perform this work on all new concrete pavement or as directed by the Engineer.

Prior to beginning any diamond grinding operations, schedule a pre-grind meeting with grinding subcontractor, Division Construction Engineer, Project Engineer, Area Roadway Engineer, State Pavement Construction Engineer, representatives from the Roadside Environmental Unit and the Materials and Tests Unit.

Equipment

Use equipment with diamond tipped saw blades gang mounted on a power driven self-propelled machine with a minimum wheel base length of 15 feet that is specifically designed to smooth and texture Portland Cement Concrete pavement. Utilize equipment that does not cause ravels; aggregate fracture; spalls or disturbance to the longitudinal or transverse joints; or damage and/or strain to the underlying surface of the pavement. Should any of the above problems occur immediately suspend operations.

Provide a minimum 3 feet wide grinding head with 50 to 60 evenly spaced grooves per foot. Prior to designing the grinding head, evaluate the aggregate hardness of the concrete pavement and select the appropriate diamond size, diamond concentration and bond hardness for the individual saw blades.

Provide vacuuming equipment to continuously remove slurry residue and excess water from the pavement as part of the grinding operation. Transport slurry material off-site and dispose of this material appropriately. Do not allow the slurry material to flow into a travel lane occupied by traffic or into any drainage facility.

Method of Construction

Grind the pavement surface to a uniform appearance with a high skid resistant longitudinal corduroy type texture. Provide grooves between 0.09 and 0.15 inches wide with the land area between the grooves between 0.06 and 0.13 inches wide. Ensure a ridge peak of approximately 0.0625 inches higher than the bottom of the grooves.

Begin and end diamond grinding at lines normal to the pavement centerline. Grind only in the longitudinal direction. All grooves and adjacent passes shall be parallel to each other with no variation. Completely lap adjacent passes with no unground surface remaining between passes and no overlap of more than 1½ inches. Adjacent passes shall be within 1/8 inch of the same height as measured with a 3 foot straightedge. Maintain positive cross-slope drainage for the duration of the grinding operation.

Grind all travel lanes to include auxiliary lanes, ramps and loops with not less than 98 percent of the specified surface being textured by grinding. Grinding of the bridge decks and concrete shoulders will not be required. Remove a minimum 0.0625 inches at all locations except dips. Extra grinding to eliminate minor depressions is not required. It is anticipated that extra grinding will be required on the high side of existing faults in the pavement. There shall be no ridge between lanes. In a separate operation, transition the grinding of any remaining ridges greater than 1/8 inch in height on the outside edge next to the shoulder or at a tie to an existing facility to the satisfaction of the Engineer.

Final surface testing is required on this project in accordance with Article 710-7 of the *2018 Standard Specifications.* All corrective actions must be approved by the Engineer.

Disposal of Residual Slurry

Diamond grinding slurry disposal shall be in accordance with the latest Permit No. WQ0035749. Submit a slurry disposal plan to the Engineer detailing method of handling and disposing of slurry from the diamond grinding operation a minimum of 60 days prior to beginning the diamond grinding operation. Engineer shall review the slurry disposal plan. Plan must be accepted prior to beginning the diamond grinding operation. DGS shall be transported beyond the project limits to an approved permitted site. No land application of residual slurry will be allowable in NCDOT Right of Way. No additional payment will be made for transporting this slurry material for disposal.

Disposal options are:

(A) Concrete grinding residues (CGR) that are not liquid and otherwise not hazardous may be disposed of in a municipal solid waste landfill or utilized as an alternate daily cover (ADC). The sanitary landfill operator that requests the use of this material as ADC shall contact the N.C. Department of Environmental Quality (DEQ) inspector for approval. The definition of a solid, for solid waste disposal purposes, is a material that passes a Paint Filter test. CGR's may be eligible for disposal or use as ADC in an unlined sanitary landfill or a construction and demolition debris landfill. If CGR is disposed in an unlined-landfill, the Contractor shall submit samples of the material to a certified laboratory to verify that the CGR does not exceed Resource Conservation and Recovery Act (RCRA) regulatory

limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

(B) Upon the Engineer's approval, dewatered CGR's may be beneficially reused within the DOT project boundary or areas under DOT control at agronomic rates suitable for the establishment of vegetation. Dewatered CGR's that meet the solid waste definition for inert debris, North Carolina General Statute 130A-290(a)(14), may also be used within the roadbed at rates approved by the Engineer for soil modification purposes. If CGR is disposed as beneficial reuse within DOT project boundaries, the Contractor shall submit samples of the material to a certified laboratory to verify that the CGR does not exceed RCRA regulatory limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

To prevent the migration of any direct discharge from the diamond grinding machine DGS from entering a drainage inlet or structure, the contractor shall install coir fiber wattles and silt fence at the direction of the Engineer. Silt Fence shall be installed in accordance with Section 1605 of the NCDOT *2018 Standard Specifications*

Measurement and Payment

The quantity of *Diamond Grinding PCC Pavement* to be paid for will be the actual number of square yards of pavement which has been satisfactorily diamond ground, measured along the final top surface of the pavement. No separate payment will be made for any overlapping, regrinding, or for extra grinding on the high side of existing faults.

Payment will be full compensation for the work, including but is not limited to grinding, disposal of slurry, final surface testing, furnishing all materials, equipment, labor and all incidentals necessary to satisfactorily complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Diamond Grinding PCC Pavement	Square Yard

ASPHALT CONCRETE PLANT MIX PAVEMENTS:
(2-20-18) (Rev.1-15-19) 610, 1012 SP6 R65

Revise the *2018 Standard Specifications* as follows:

Page 6-14, Table 609-3, LIMITS OF PRECISION FOR TEST RESULTS, replace with the following:

TABLE 609-3
LIMITS OF PRECISION FOR TEST RESULTS

Mix Property	Limits of Precision
25.0 mm sieve (Base Mix)	± 10.0%
19.0 mm sieve (Base Mix)	± 10.0%
12.5 mm sieve (Intermediate & Type P-57)	± 6.0%
9.5 mm sieve (Surface Mix)	± 5.0%

4.75 mm sieve (Surface Mix)	± 5.0%
2.36 mm sieve (All Mixes, except S4.75A)	± 5.0%
1.18 mm sieve (S4.75A)	± 5.0%
0.075 mm sieve (All Mixes)	± 2.0%
Asphalt Binder Content	± 0.5%
Maximum Specific Gravity (G_{mm})	± 0.020
Bulk Specific Gravity (G_{mb})	± 0.030
TSR	± 15.0%
QA retest of prepared QC Gyratory Compacted Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Density Gauge Comparison of QC Test	± 2.0% (% Compaction)
QA Density Gauge Verification Test	± 2.0% (% Compaction)

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

TABLE 610-1
MIXING TEMPERATURE AT THE ASPHALT PLANT

Binder Grade	JMF Temperature
PG 58-28; PG 64-22	250 - 290°F
PG 76-22	300 - 325°F

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

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

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

TABLE 610-3
MIX DESIGN CRITERIA

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

A. Based on 20 year design traffic.

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

C. Dust to Binder Ratio ($P_{0.075}$ / P_{be}) for Type S4.75A is 1.0 - 2.0.
D. NCDOT-T-283 (No Freeze-Thaw cycle required).
E. TSR for Type S4.75A & B25.0C mixes is 80% minimum.

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

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

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

A. If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.
B. Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22 binder.

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

TABLE 610-6
PLACEMENT TEMPERATURES FOR ASPHALT

Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0C	35°F
I19.0C	35°F
S4.75A, S9.5B, S9.5C	40°F [A]
S9.5D	50°F

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

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 34-35, delete the second sentence and replace with the following:

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

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

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

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

TABLE 610-7
DENSITY REQUIREMENTS

Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0 [A]

S9.5B	90.0
S9.5C, S9.5D, I19.0C, B25.0C	92.0

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

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

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

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

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

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

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

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

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

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

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

TABLE 1012-1
AGGREGATE CONSENSUS PROPERTIES[A]

Mix Type	**Coarse Aggregate Angularity[B] % Minimum**	**Fine Aggregate Angularity % Minimum**	**Sand Equivalent % Minimum**	**Flat and Elongated 5 : 1 Ratio % Maximum**
Test Method	*ASTM D5821*	*AASHTO T 304*	*AASHTO T 176*	*ASTM D4791*
S4.75A; S9.5B	75 / -	40	40	-

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

A. Requirements apply to the design aggregate blend.
B. 95 / 90 denotes that 95% of the coarse aggregate has one fractured face and 90% has 2 or more fractured faces.

7" JOINTED CONCRETE TRUCK APRON:

Description

Construct 7" Jointed Concrete Truck Apron in accordance with the plans and as directed by the Engineer.

Materials

Concrete shall by Class AA Concrete meeting the requirements of Section 1000 of the *Standard Specifications.*

Wire mesh reinforcement shall be 4x4-W3.5xW3.5 welded wire fabric meeting the requirements of Section 1070 of the *Standard Specifications.* Macro-fibers for concrete reinforcement may be used in lieu of wire mesh reinforcement. See NCDOT Approved Products List for list of macro-fibers.

Construction Methods

Construct concrete apron in accordance with Section 700 of the *Standard Specifications.*

Joint spacing for the 22 foot 6 inch wide apron shall be constructed as directed by the Engineer.

Measurement and Payment

7" Jointed Concrete Truck Apron will be measured and paid for in square yards of 7" Jointed Concrete Truck Apron that have been completed and accepted. Such price and payment will be full compensation for all work of constructing the jointed concrete truck apron, including but not limited to excavating and backfilling, furnishing and placing concrete, constructing joints, and sealing the concrete.

Pay Item	**Pay Unit**
7" Jointed Concrete Truck Apron	Square Yard

AUTOMATED MACHINE GUIDANCE

(1-2-11) 801 SP8 R01

General

This Special Provision contains requirements to be followed if the Contractor elects to use Global Positioning System (GPS) machine control grading and shall be used in conjunction with Section 801 of the *Standard Specifications*. The use of this technology is referenced as Automated Machine Guidance (AMG).

All equipment using AMG shall be able to generate end results that meet the *Standard Specifications*. Perform test sections for each type of work to be completed with AMG to demonstrate that the system has the capability to achieve acceptable results. If acceptable results cannot be achieved, conform to the requirements for conventional stakeout.

The Contractor shall be responsible for all errors resulting from the use of AMG and shall correct deficiencies to the satisfaction of the Engineer at no cost to the Department.

Submittals

If the Contractor elects to use AMG, a Digital Terrain Model (DTM) of the design surface and all intermediate surfaces shall be developed and submitted to the Engineer for review.

At least 90 days prior to beginning grading operations, the Contractor shall submit to the Engineer an AMG work plan to include, but not limited to, proposed equipment, control software manufacturer and version, types of work to be completed using AMG, project site calibration report, repetitive calibration methods for construction equipment and rover units to be used for the duration of the project, and local GPS base station to be used for broadcasting differential correction data to rover units (this may include the NC Network RTK). All surveys must be tied to existing project control as established by NCDOT.

Inspection

The Engineer will perform quality assurance checks of all work associated with AMG. If it is determined that work is not being performed in a manner that will assure accurate results, the Engineer may require corrective action at no cost to the Department.

The Contractor shall provide the Engineer with one GPS rover unit for use during the duration of the contract. The rover will be loaded with the same model that is used with the AMG and have the same capability as rover units used by the Contractor. The rover will be kept in the possession of the Engineer and will be returned to the Contractor upon completion of the contract. Any maintenance or repairs required for the rover will be the responsibility of the Contractor. Formal training of at least 8 hours shall be provided to the Engineer by the Contractor on the use of the proposed AMG system.

Subgrade and Base Controls

If the Contractor elects to use AMG for fine grading and placement of base or other roadway materials, the GPS shall be supplemented with a laser or robotic total station. Include details of

the proposed system in the AMG work plan. In addition, the following requirements apply for the use of AMG for subgrade and base construction.

Provide control points at intervals along the project not to exceed 1,000 feet. The horizontal position of these points shall be determined by static GPS sessions or by traverse connection from the original base line control points. The elevation of these control points shall be established using differential leveling from project benchmarks, forming closed loops where practical. A copy of all new control point information shall be provided to the Engineer prior to construction activities.

Provide control points and conventional survey grade stakes at 500 foot intervals and at critical points such as, but not limited to, PCs, PTs, superelevation transition points, and other critical points as requested by the Engineer.

Provide hubs at the top of the finished subgrade at all hinge points on the cross section at 500 foot intervals. These hubs shall be established using conventional survey methods for use by the Engineer to check the accuracy of construction.

Measurement and Payment

No direct payment will be made for work required to utilize this provision. All work will be considered incidental to various grading operations.

SUPPLEMENTAL SURVEYING:

(4-20-21) 801 SP8 R03

Revise the *2018 Standard Specifications* as follows:

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

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

DDI BARRIER:

Description

Construct DDI Barrier in areas indicated in the plans, in accordance with the detail in the plans and as directed by the Engineer.

Construction

Construct DDI Barrier in accordance with the detail in the plans, the applicable requirements of Section 854 of *the Standard Specifications* and as directed by the Engineer.

Measurement and Payment

DDI Barrier will be measured and paid in linear feet of barrier that has been completed, placed and accepted. Measurement will be made along the top surface at the centerline of the barrier

with no deduction made for joints. Price includes, but is not limited to, furnishing and placing concrete and reinforcing steel, joint filler, constructing joints and all labor, materials and incidental necessary to satisfactorily complete the work.
Payment will be made under:

Pay Item	Pay Unit
DDI Barrier	Linear Foot

MODIFIED VALLEY GUTTER:
(04-27-20)

Description

The work covered by this provision consists of the construction of Modified Valley Gutter in accordance with the requirements shown on the plans, Detail 846.01 of the *2018 Standard Drawings* and the applicable requirements of Sections 846 of the *2018 Standard Specifications*.

Materials

In Accordance with Section 846-2.

Construction

Modified Valley Gutter shall be constructed in accordance with Section 846 of the *2018 Standard Specifications.*

Measurement and Payment

2'-0" Modified Valley Gutter will be measured and paid in linear feet, accepted in place. Measurement will be made along the surface of the top of the curb.

Work includes providing all materials, placing all concrete, excavating and backfilling, forming, finishing, constructing and sealing joints and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
2'-0" Modified Valley Gutter	Linear Foot

MEDIAN HAZARD PROTECTION:

Description

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

Measurement and Payment

Median Hazard Protection will be measured and paid for per each that are completed and accepted. Such price and payment will be full compensation for all labor, materials (including, but not

limited to concrete barrier, earth material, #57 stone, concrete cover, galvanized bar and grout) and all incidentals necessary construct the Median Hazard Protection.

Concrete barrier transition sections will be measured and paid for as provided elsewhere in the contract. No separate measurement or payment will be made for concrete cover at barrier transition sections as the cost of such shall be included in the unit price bid per each for *Concrete Barrier Transition Section*.

Payment will be made under:

Pay Item	**Pay Unit**
Median Hazard Protection	Each

FILL AND CAP BEHIND BARRIER:

Description

Construct areas to be backfilled and capped with concrete at locations identified in the plans in accordance with the detail in the plans and as directed by the engineer.

Measurement and Payment

Fill and Cap Behind Barrier will be measured and paid for per square yard that are completed and accepted. Such price and payment will be full compensation for all labor, materials (including, but not limited to, earth material, #57 stone, and concrete cover) and incidentals necessary to construct the Fill and Cap Behind Barrier.

Payment will be made under:

Pay Item	**Pay Unit**
Fill and Cap Behind Barrier	Square Yard

GUARDRAIL END UNITS, TYPE - TL-2:

(10-21-08) (Rev. 7-1-17) 862 SP8 R64

Description

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

Materials

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

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 2 in accordance with Article 106-2 of the *2018 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the *2018 Standard Specifications*.

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

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2018 Standard Specifications* and is incidental to the cost of the guardrail end unit.

Measurement and Payment

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

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail End Units, Type TL-2	Each

GUARDRAIL END UNITS, TYPE - TL-3:

(4-20-04) (Rev. 7-1-17) 862 SP8 R65

Description

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

Materials

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

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 3, in accordance with Article 106-2 of the *2018 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the *2018 Standard Specifications*.

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

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2018 Standard Specifications* and is incidental to the cost of the guardrail end unit.

Measurement and Payment

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

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail End Units, Type TL-3	Each

GUARDRAIL ANCHOR UNITS AND TEMPORARY GUARDRAIL ANCHOR UNITS:

(1-16-2018) 862 SP8 R70

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

Revise the *2018 Standard Specifications* as follows:

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

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

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail Anchor Units, Type ____	Each
Temporary Guardrail Anchor Units, Type ___	Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 1-16-18) 9, 14, 17 SP9 R05

Description

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

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

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing No. 1743.01.

Materials

Refer to the *2018 Standard Specifications*.

Item	Section
Conduit	1091-3
Grout, Type 2	1003
Polymer Slurry	411-2(B)(2)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the *2018 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

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

(A) Straight anchor rods,

(B) Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and

(C) Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2018 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

Construction Methods

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2018 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

(A) Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2018 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain the required slurry properties at all times except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required polymer slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the *2018 Standard Specifications* except for the following:

(1) Inspections for tip resistance and bottom cleanliness are not required,
(2) Temporary casings may remain in place if approved, and
(3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
(4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete until a concrete placement procedure is approved. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated concrete from exposed Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved.

Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the *2018 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2018 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2018 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2018 Standard Specifications*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation is required in accordance with Article 411-6 of the *2018 Standard Specifications*. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

(B) Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans, accepted submittals and Section 410 of the *2018 Standard Specifications*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *2018 Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam edges exposed above finished grade. Place concrete against undisturbed soil or backfill and fill in accordance with Article 410-8 of the *2018 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces.

(C) Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench

without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

(1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
(2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
(3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
(4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
(5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
(6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.
(7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.
(8) Repeat (7) for leveling nuts.
(9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).

(10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total turn that meets the following nut rotation requirements:

NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)	
Anchor Rod Diameter, inch	**Requirement**
≤ 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 *2018 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

(1-16-18) SP9 R07

Description

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported

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

Materials

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

Subsurface Conditions

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

(A) Unit weight (γ) = 120 pcf,
(B) Friction angle (ϕ) = 30°,
(C) Cohesion (c) = 0 psf and
(D) Groundwater 7 feet below finished grade.

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

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 feet of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.
Use the computer software gINT version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 psf for footings. Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 2016 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

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

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2018 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

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

Measurement and Payment

Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown in the accepted submittals. The contract unit price for *Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2018 Standard Specifications*.

Payment will be made under:

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

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY:

(9-15-20) 1000, 1014, 1024 SP10 R01

Revise the *2018 Standard Specifications* as follows:

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

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum Slump		Cement Content			
		Air-Entrained Concrete		Non-Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4500	0.381	0.426	---	---	3.5[A]	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 – 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5 [A]	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 2.5 [A] hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0 [A]	---	715	---	---	---
Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	658	---	---	---
Flowable Fill excavatable	150 max. (at 56 days)	as needed	as needed	as needed	as needed	---	Flowable	---	---	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	---	Flowable	---	---	100	as needed
Pavement	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---

Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

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

THERMOPLASTIC PAVEMENT MARKING MATERIAL – COLOR TESTING:

3-19-19 1087 SP10 R05

Revise the *2018 Standard Specifications* as follows:

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

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

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

3-19-19 1087 SP10 R06

Amend the *2018 Standard Specifications* as follows:

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

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

NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS:

10-19-21 (Rev. 11-16-21) 1086, 1250, 1253 SP10 R08

Revise the *2018 Standard Specifications* as follows:

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

(A) General

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

(B) Housings

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

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

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

(4) Identification
Mark the housing with the manufacturer's name and model number of marker.

(C) Reflectors

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

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

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

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

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

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

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

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

(A) General

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

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

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

(B) Reflector Replacement

In the event that a reflector is damaged, replace the damaged reflector by using adhesives and methods recommended by the manufacturer of the markers and approved by the Engineer. This work is considered incidental if damage occurs during the initial installation of the marker housings and maintenance of initial non-cast iron snowplowable markers specified in this section. This work will be paid for under the pay item for the type of reflector replacement if the damage occurred after the initial installation of the non-cast iron snowplowable pavement marker.

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

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

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

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

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

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

Payment will be made under:

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

TRAFFIC CONTROL DEVICES REMAINING FROM PREVIOUS PROJECT

Description

Remove the following traffic control devices, which are remaining from the previous project in accordance with the plans and specifications.

1-FIXED TUBULAR MARKERS

Basis of Payment

No separate payment will be made for the removal of the above mentioned devices. Such work will be considered as incidental to the other pavement marking items listed in the contract.

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MATERIALS FOR PORTLAND CEMENT CONCRETE:

(9-15-20) 1000, 1024 SP10 R24

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

MATERIAL AND EQUIPMENT STORAGE & PARKING OF PERSONAL VEHICLES:
(12-21-21) 1101 SP11 R03

Revise the *Standard Specifications* as follows:

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

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

TABLE 1101-1
MATERIAL AND EQUIPMENT STORAGE FROM ACTIVE TRAVEL LANES

Posted Speed Limit (mph)	Distance (ft)
40 or less	≥ 18
45-50	≥ 28
55	≥ 32
60 or higher	≥ 40

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

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

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

WORK ZONE INSTALLER:
(7-20-21) 1101, 1150 SP11 R04

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

The work zone installer shall be qualified by an NCDOT approved training agency in the safe and competent set up of temporary traffic control. For a complete listing of approved training agencies, see the Work Zone Safety Training webpage.

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

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

the traffic control.

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

EXTRUDED THERMOPLASTIC PAVEMENT MARKING THICKNESS:

3-19-19 1205 SP12 R05

Revise the *2018 Standard Specifications* as follows:

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

Use application equipment that provides multiple width settings ranging from 4 inches to 12 inches and multiple thickness settings to achieve a minimum pavement marking thickness of 0.090 inch above the surface of the pavement.

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

TABLE 1205-3
MINIMUM THICKNESS REQUIREMENTS FOR THERMOPLASTIC

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

ROADWAY LIGHTING FOUNDATIONS:

(1-16-18) SP14 R04

Description

Roadway lighting foundations include foundations for high mount and light standards. High mount foundations for high mount standards and standard foundations for light standards consist of drilled piers or footings with pedestals, conduit and anchor rod assemblies. Construct roadway lighting foundations in accordance with the contract, *2018 Roadway Standard Drawings* and accepted submittals. Define "high mount foundation" as a drilled pier including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1402.01. Define "standard foundation" as a drilled pier or footing with pedestal including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1405.01.

Materials

Use roadway lighting foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision. Provide metal shrouds for median mounted light standards in accordance with Subarticle 1400-4(I) of the *2018 Standard Specifications*.

Roadway Lighting Foundations

(A) High Mount Foundations

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

(E) Soil with unit weight (γ) $\geq$ 120 pcf and friction angle (ϕ) $\geq$ 30°,
(F) Groundwater at least 7 feet below finished grade and
(G) Slope of finished grade 6:1 (H:V) or flatter.

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

(B) Standard Foundations

Construct standard foundation types for the light standard types shown in the plans and the site conditions at each light standard location. When weathered or hard rock, boulders or obstructions conflict with standard foundations, submit an alternate standard foundation design for acceptance in accordance with Article 105-2 of the *2018 Standard Specifications*. No extension of completion date or time will be allowed for alternate standard foundations.

Subsurface Investigations

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

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

High Mount Foundation Designs

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

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges*. Use the computer software LPILE version 2016 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 0.5" at top of piers.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges.* Do not use an allowable bearing pressure of more than 3,000 psf for footings. Submit boring logs, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2018 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for high mount foundation design submittals. Have high mount foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Grade around roadway lighting locations with cut and fill slopes as shown on 2018 Roadway Standard Drawing No. 1402.01 or 1405.01. Construct drilled piers, footings and pedestals and install anchor rod assemblies for roadway lighting foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

For median mounted light standards, place concrete for median barriers and underlying pedestals in the same pour. Construct concrete barriers in accordance with the contract and make concrete median barriers continuous through standard foundations. Coordinate construction of median mounted light standards with sign structures, concrete barriers, drainage structures, etc. to avoid conflicts.

Measurement and Payment

High Mount Foundations will be measured and paid in cubic yards. High mount foundations will be measured as the cubic yards of concrete shown on 2018 Roadway Standard Drawing No. 1402.01 for the high mount height and wind zone shown in the plans. All other high mount

foundations will be measured as the cubic yards of foundation concrete for drilled piers, footings and pedestals shown in the accepted submittals. Subsurface investigations and high mount foundation designs required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2018 Standard Specifications*.

Standard Foundation ____ will be measured and paid in units of each. Standard foundations will be measured as the number of each standard foundation type. Alternate standard foundations will be measured as 1.5 times the number of each standard foundation type replaced.

The contract unit prices for *High Mount Foundations* and *Standard Foundation* ____ will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct roadway lighting foundations.

Payment will be made under:

Pay Item	**Pay Unit**
High Mount Foundations	Cubic Yard
Standard Foundation ____	Each

PERMANENT SEEDING AND MULCHING:

(7-1-95) 1660 SP16 R02

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

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660 in the *2018 Standard Specifications* and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

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

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

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08) Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(D) of the *2018 Standard Specifications*.

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

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

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

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, 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

(10-16-18) (Rev.2-16-21) Z-4

Revise the *2018 Standard Specifications* as follows:

Division 6

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

Division 7

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

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

Division 10

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

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

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

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

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

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

Division 17

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

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

Directional Drill (1)(1.25″) Linear Foot

STANDARD SPECIAL PROVISION

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

(3-18-03) (Rev. 5-21-19) Z-04a

Within Quarantined Area

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

Originating in a Quarantined County

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

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-707-3730, or *https://www.ncagr.gov/plantindustry/Plant/quaran/table2.htm* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

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

STANDARD SPECIAL PROVISION

TITLE VI AND NONDISCRIMINATION:

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

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

(a) Compliance with Regulations

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

(b) Nondiscrimination

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts,

Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:
In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:
(i) Withholding payments to the contractor under the contract until the contractor complies; and/or
(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

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

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**
The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:
1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:
"The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 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

MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS

Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations *in 41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

Area 023 29.7%
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%
Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%
Buncombe County
Madison County

Area 030 6.3%
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%
Currituck County

Area 9200 20.7%
Brunswick County
New Hanover County

Area 2560 24.2%
Cumberland County

Area 6640 22.8%
Durham County
Orange County
Wake County

Area 1300 16.2%
Alamance County

Area 3120 16.4%
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%
Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION

REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS

FHWA - 1273 Electronic Version - May 1, 2012 Z-8

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

ATTACHMENTS

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

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

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

II. NONDISCRIMINATION

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

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

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

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

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

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
   a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
   b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

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

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
   a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
   b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
   a. The records kept by the contractor shall document the following:
      (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
   b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

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

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

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

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

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

1. **Minimum wages**
   a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

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

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(ii) The classification is utilized in the area by the construction industry; and
(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. **Payrolls and basic records**

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/ wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. **Apprentices and trainees**

a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. **Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

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

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

VI. SUBLETTING OR ASSIGNING THE CONTRACT

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

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
   a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees

from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;
(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

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

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

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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2. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**
   a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
      (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
      (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
      (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
      (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
   b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **Instructions for Certification - Lower Tier Participants:**
   (Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)
   a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
   b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
   c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
   d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of

Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

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

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

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

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

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

Description

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

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

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

Minorities and Women

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

Assigning Training Goals

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

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC20210088 01/01/2021 NC88

Z-088

Date: January 1, 2021

General Decision Number: NC20210088 01/01/2021 NC88

Superseded General Decision Numbers: NC20200088

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

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

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

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract for calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR.5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2) – (60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

SUNC2014-003 11/14/2014

	Rates	Fringes
BLASTER	18.64	
CARPENTER	13.68	.05
CEMENT MASON/CONCRETE FINISHER	13.93	
ELECTRICIAN		
Electrician	18.79	2.72

	Rates	Fringes
Telecommunications Technician	15.19	1.25
IRONWORKER	13.30	
LABORER		
Asphalt Raker and Spreader	12.78	
Asphalt Screed/Jackman	14.50	
Carpenter Tender	12.51	.27
Cement Mason/Concrete Finisher Tender	11.04	
Common or General	10.40	.01
Guardrail/Fence Installer	13.22	
Pipelayer	12.43	
Traffic Signal/Lighting Installer	15.65	.24
PAINTER		
Bridge	23.77	
POWER EQUIPMENT OPERATORS		
Asphalt Broom Tractor	10.00	
Bulldozer Fine	16.13	
Bulldozer Rough	14.36	
Concrete Grinder/Groover	17.92	
Crane Boom Trucks	18.19	
Crane Other	19.83	
Crane Rough/All-Terrain	19.10	
Drill Operator Rock	14.28	
Drill Operator Structure	20.89	
Excavator Fine	16.95	
Excavator Rough	13.63	
Grader/Blade Fine	19.84	
Grader/Blade Rough	15.47	
Loader 2 Cubic Yards or Less	13.31	
Loader Greater Than 2 Cubic Yards	16.19	
Material Transfer Vehicle (Shuttle Buggy)	15.44	
Mechanic	17.51	
Milling Machine	15.22	
Off-Road Hauler/Water Tanker	11.83	
Oiler/Greaser	14.16	
Pavement Marking Equipment	12.05	
Paver Asphalt	15.97	
Paver Concrete	18.20	
Roller Asphalt Breakdown	12.79	
Roller Asphalt Finish	13.76	
Roller Other	12.08	
Scraper Finish	12.65	
Scraper Rough	11.50	
Slip Form Machine	19.60	
Tack Truck/Distributor Operator	14.82	
TRUCK DRIVER		
GVWR of 26,000 Lbs or Less	11.45	
GVWR of 26,001 Lbs or Greater	13.57	.03

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

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any

solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

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

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

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, D.C. 20210

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

END OF GENERAL DECISION

PROJECT SPECIAL PROVISIONS

GEOTECHNICAL

DocuSigned by:
Geotechnical Engineering Unit
E06538624A11498...

10/12/2021

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

Description

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

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextiles	1056
Select Material, Class IV	1016

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

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

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

Construction Methods

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

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

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

Specifications. Place, compact and maintain Class IV subgrade stabilization in accordance with Article 505-3 of the *Standard Specifications* for a Type 2 aggregate subgrade. Do not operate heavy equipment on geotextiles any more than necessary to construct base courses or subgrades. Replace any damaged geotextiles to the satisfaction of the Engineer.

Measurement and Payment

Geotextile for Pavement Stabilization will be measured and paid in square yards. Geotextiles will be measured along subgrades or subbases as the square yards of exposed geotextiles installed before placing ABC or Class IV subgrade stabilization. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Pavement Stabilization* will be full compensation for providing, transporting and installing geotextiles, wire staples and anchor pins.

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

Payment will be made under:

Pay Item	**Pay Unit**
Geotextile for Pavement Stabilization	Square Yard

DocuSigned by:
Scott A. Hidden
F760CAEB96FC4D3...
12/8/2020

MICROPILES **(10-19-21)**

1.0 GENERAL

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

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Portland Cement	1024-1
Water	1024-4

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

A. Reinforcement

Provide Type 1 material certifications in accordance with Article 106-3 of the *Standard Specifications* for steel casings and bars. Store casings and bars on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store micropile materials so materials are kept clean and free of damage.

1. Reinforcing Casings

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

2. Center Reinforcing Bars

Use deformed steel bars that meet AASHTO M 275 or M 31, Grade 60 or 75 for center reinforcing bars. Splice bars in accordance with Article 1070-9 of the

Standard Specifications. Locate casing joints at least 2 ft from bar splices.

B. Centralizers

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

C. Corrosion Protection

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

3.0 PRECONSTRUCTION REQUIREMENTS

A. Micropile Designs

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

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

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

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

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

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

B. Micropile Construction Plan

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

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

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

C. Demonstration Micropiles

When shown in the plans or as directed, construct demonstration piles in accordance with the accepted submittals and this provision. The pile inclination, minimum reinforcement and locations of demonstration piles are shown in the plans. Install demonstration piles

to the depth of the longest pile on the project or the length required for verification load tests.

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

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

D. Preconstruction Meeting

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

4.0 CONSTRUCTION METHODS

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

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

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

A. Drilling and Reinforcement

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

Do not install casings or begin drilling within 6 pile diameters, center to center, or 5 ft,

whichever is greater, of completed piles until grout in piles reaches initial set. More clearance may be necessary if pile construction affects adjacent piles.

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

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

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

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

B. Grouting

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

Mix and place grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute/API Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

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

Monitor and record grout levels, pressures and volumes during placement. To monitor grout pressure, use pumps equipped with a pressure gauge and locate a second pressure

gauge at the point of injection into the drill hole. Use pressure gauges that can measure pressures of at least 150 psi or twice the actual grout pressures, whichever is greater.

C. Construction Records

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

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

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

5.0 LOAD TESTING

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

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

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

Design test piles so that applied loads do not exceed 80% of the pile's structural resistance including steel yielding or buckling or grout failing. It may be necessary to design test piles

with additional reinforcement to allow for higher applied loads. Use a center reinforcing bar for tension load tests when the reinforcement design for production piles does not include one.

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

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

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

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

6.0 MICROPILE ACCEPTANCE

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

1. Grout pressures, volumes, flow and densities are within acceptable ranges. Grout is properly placed and does not have any evidence of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing).
2. Pile is within maximum tolerances per Article 33.4.4 of the *AASHTO LRFD Bridge Construction Specifications*.
3. Reinforcement is properly placed and inclination and top of reinforcement is within tolerances for the pile. Tip of casing is no higher than that noted in the plans and casing penetrates rock at least 5 ft when noted in the plans.
4. Pile is satisfactory based on results of load testing, when applicable. Creep and failure acceptance criteria for verification and proof tests is per Articles 33.5.2 and 33.5.3, respectively, of the AASHTO LRFD specifications. Movement acceptance criteria for verification and proof tests is per Articles 33.5.2 and 33.5.3, respectively, of the AASHTO LRFD specifications when the permissible total vertical movement at top of pile is noted in the plans.

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

7.0 MEASUREMENT AND PAYMENT

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

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

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

Payment will be made under:

Pay Item	**Pay Unit**
____ Dia. Micropiles	Each
Demonstration Micropiles	Each
Micropile Verification Tests	Each
Micropile Proof Tests	Each

DocuSigned by:
Scott A. Hidden
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6/29/2021

MECHANICALLY STABILIZED EARTH RETAINING WALLS (10-19-21)

1.0 GENERAL

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

Define MSE wall terms as follows:
Geosynthetic Reinforcement – Polyester Type (PET), HDPE or Polypropylene (PP) geosynthetic grids, i.e., geogrid reinforcement or polymer straps, i.e., geostrip reinforcement,
Geogrid – PET, HDPE or PP geogrid,
Reinforcement – Steel or geosynthetic reinforcement,
Aggregate – Coarse or fine aggregate,
Panel – Precast concrete panel,
Coping – Precast or CIP concrete coping,
Design Height (H) – Wall height + wall embedment as shown in the plans,
MSE Wall – Mechanically stabilized earth retaining wall,
MSE Wall Vendor – Vendor supplying the chosen MSE wall system,
MSE Panel Wall – MSE wall with panels,
MSE Segmental Wall – MSE wall with segmental retaining wall (SRW) units and
Abutment Wall – MSE wall with bridge foundations in any portion of the reinforced zone or an MSE wall connected to an abutment wall (even if bridge foundations only penetrate a small part of the reinforced zone, the entire MSE wall is considered an abutment wall).

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

Use an approved MSE wall system in accordance with the plans and any NCDOT restrictions or exceptions for the chosen system. Value engineering proposals for other MSE wall systems will not be considered. Do not use MSE wall systems with an "approved for provisional use" status for MSE walls with design heights greater than 35 ft or walls supporting or adjacent to railroads or interstate highways. The list of approved MSE wall systems with approval status is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section

Aggregate	1014
Asphalt Concrete Base Course, Type B25.0C	620
Corrugated Steel Pipe	1032-3
Epoxy, Type 3A	1081
Geosynthetics	1056
Grout, Type 3	1003
Joint Materials	1028
Portland Cement Concrete, Class A	1000
Precast Retaining Wall Coping	1077
Reinforcing Steel	1070
Retaining Wall Panels	1077
Segmental Retaining Wall Units	1040-4
Select Material, Class V	1016
Shoulder Drain Materials	816-2
Steel Pipe	1036-4(A)

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

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

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

Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Handle and store geosynthetics in accordance with Article 1056-2 of the *Standard Specifications*. Load, transport, unload and store MSE wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

A. Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate and the following for fine aggregate:

1. Standard size No. 1S, 2S, 2MS or 4S that meets Table 1005-2 of the *Standard*

Specifications or

2. Gradation that meets Class III, Type 3 select material in accordance with Article 1016-3 of the *Standard Specifications*.

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

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

AGGREGATE ELECTROCHEMICAL REQUIREMENTS (Steel Reinforcement/Connector Materials Only)			
Aggregate Type (in reinforced zone)	**Resistivity**	**Chlorides**	**Sulfates**
Coarse	≥ 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 ($X_{j_{ave}}$) / 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)**
$A \leq 30$ sf	1/2"
30 sf $< A \leq 75$ sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip panel anchors and connectors. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide miscellaneous components approved for the chosen MSE wall system. The list of approved miscellaneous components for each MSE wall system is available from the website shown elsewhere in this provision.

3.0 PRECONSTRUCTION REQUIREMENTS

A. MSE Wall Surveys

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

B. MSE Wall Designs

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

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

Design MSE walls in accordance with the plans, *AASHTO LRFD Bridge Design Specifications* and any NCDOT restrictions for the chosen MSE wall system unless otherwise required. For abutment walls only, design MSE walls for seismic if wall sites meet either or both of the following:

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

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

wall of at least 0.7H or 6 ft, whichever is longer, unless noted otherwise in the plans. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate drains, the reinforced zone or leveling pads outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads and design parameters approved for the chosen MSE wall system or default values in accordance with the AASHTO LRFD specifications. Design steel components including reinforcement and connectors for the design life noted in the plans and aggregate type in the reinforced zone. If an MSE wall system with geosynthetic reinforcement includes any steel parts for obstructions, bin walls, connections or other components, design steel exposed to aggregate for the design life noted in the plans and aggregate type in the reinforced zone. Use "loss of galvanizing" metal loss rates for nonaggressive backfill in accordance with the AASHTO LRFD specifications for galvanized and aluminized steel and metal loss rates for carbon steel in accordance with the following:

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

For PET or HDPE geogrid and geostrip reinforcement and geosynthetic connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone. For geogrid reinforcement connected to end bent caps, embed reinforcement or connectors in caps as shown in the plans. For PP geogrid reinforcement connected to end bent caps, use the following design parameters for the aggregate type in the reinforced approach fill.

PP GEOGRID REINFORCEMENT DESIGN PARAMETERS				
Aggregate Type (in reinforced zone)	**T_{al} (MD)**	**F***	**α**	**ρ**
Coarse	400 lb/ft	0.70	0.8	32.0°
Fine	428 lb/ft	0.54	0.8	28.35°

Where,

T_{al} = long-term design strength (LTDS),
F* = pullout resistance factor,
α = scale effect correction factor and
ρ = soil-geogrid friction angle.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 psf in accordance with Figure C11.5.6-3(b) of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts or concrete barrier rail above MSE walls, analyze top 2 reinforcement layers for traffic impact loads in accordance with Section 7.2 of *FHWA Design and Construction of Mechanically Stabilized Earth Walls and*

Reinforced Soil Slopes – Volume I (Publication No. FHWA-NHI-10-024) except use the following for geosynthetic reinforcement rupture:

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

Where,

ϕ = resistance factor for tensile resistance in accordance with Section 7.2.1 of the FHWA MSE wall manual,

T_{al} = long-term geosynthetic design strength approved for chosen MSE wall system,

R_c = reinforcement coverage ratio = 1 for continuous geosynthetic reinforcement,

T_{max} = factored static load in accordance with Section 7.2 of the FHWA MSE wall manual,

T_I = factored impact load in accordance with Section 7.2 of the FHWA MSE wall manual and

RF_{CR} = creep reduction factor approved for chosen MSE wall system.

When shown in the plans for abutment walls, use pile sleeves to segregate piles from aggregate in the reinforced zone. If existing or future obstructions such as foundations, guardrail, fence or handrail posts, moment slabs, pavements, pipes, inlets or utilities will interfere with reinforcement, maintain a clearance of at least 3" between obstructions and reinforcement unless otherwise approved. Design reinforcement for obstructions and locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations. Modify PET geogrid reinforcement for obstructions as shown in the plans.

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

WALL EMBEDMENT REQUIREMENTS		
Front 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**
$A \leq 30$ sf	25 ft	2
	35 ft[1]	3
30 sf $< A \leq$ 75 sf	25 ft	3
	35 ft[1]	4

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

For MSE segmental walls, coarse aggregate is required in any SRW unit core spaces and between and behind SRW units for a horizontal distance of at least 18".

Separation geotextiles are required between the aggregate and overlying fill sections. When noted in the plans, separation geotextiles are also required at the back of the reinforced zone between the aggregate and backfill or natural ground. When placing pavement sections directly on the reinforced zone, cap aggregate with 4" of asphalt concrete base course. Unless required otherwise in the plans, use reinforced concrete coping at top of walls that meets the following requirements:

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

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

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

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

Submit working drawings and design calculations for acceptance in accordance with

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

C. Preconstruction Meeting

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

4.0 CORROSION MONITORING

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

5.0 SITE ASSISTANCE

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

6.0 CONSTRUCTION METHODS

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

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

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

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

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

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

Construct MSE walls with the following tolerances:

A. SRW units are level from front to back and between units when checked with a 4 ft long level,

B. Vertical joint widths are 1/4" maximum for SRW units and 3/4", ±1/4" for panels,

C. Final wall face is within 3/4" of horizontal and vertical alignment shown in the accepted submittals when measured along a 10 ft straightedge and

D. Final wall plumbness (batter) is not negative (wall face leaning forward) and within 0.5° of vertical unless otherwise approved.

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

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

Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. If a drain is required, install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. If pile sleeves are required, fill sleeves with loose uncompacted sand before constructing end bent caps.

Install dowels as necessary for SRW units and place and construct coping and leveling concrete as shown in the accepted submittals. Construct leveling concrete in accordance with Section 420 of the *Standard Specifications*. Construct CIP concrete coping in accordance with Subarticle 452-4(B) of the *Standard Specifications*. When single faced precast concrete barrier is required in front of and against MSE walls, stop coping just above barrier so coping does not interfere with placing barrier up against wall faces. If the gap between a single faced barrier and wall face is wider than 2", fill gap with Class V select material (standard size No. 78M stone). Otherwise, fill gap with backer rod and seal joint between barrier and MSE wall with silicone sealant.

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

7.0 MEASUREMENT AND PAYMENT

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

The contract unit price for *MSE Retaining Wall No. __* will be full compensation for providing designs, submittals, labor, tools, equipment and MSE wall materials, excavating, hauling and removing excavated materials, placing and compacting aggregate and backfill material and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, aggregate concrete base course, bearing pads, coping, miscellaneous components and any incidentals necessary to construct MSE walls. The contract unit price for *MSE Retaining Wall No. __* will also be full compensation for reinforcement and connector design for reinforcement connected to end

bent caps, wall modifications for obstructions, pile sleeves filled with sand, joints sealed with silicone sealant and gaps between barriers and MSE walls filled with backer rod or No. 78M stone, if required.

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

The contract unit price for *MSE Retaining Wall No. __* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract. The contract unit price for *MSE Retaining Wall No. __* also does not include the cost for constructing bridge approach fills behind end bents with MSE abutment walls. See *Bridge Approach Fills* provision for measurement and payment of Type III Reinforced Bridge Approach Fills.

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

Payment will be made under:

Pay Item	**Pay Unit**
MSE Retaining Wall No. __	Square Foot

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Scott A. Hidden
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10/12/2021

PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (7/6/2021)

The Contractor's attention is directed to the fact that soil contaminated with petroleum hydrocarbon compounds exist within the project area. The known areas of contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas, sample locations, and investigation reports will be available at the following web address by navigating to the correct letting year and month then selecting, "Plans and Proposals", "U-2579AB", "Individual Sheets/520 GeoEnvironmental":

http://dotw-xfer01.dot.state.nc.us/dsplan/

Petroleum contaminated soil may be encountered during any earthwork activities on the project. The Contractor shall only excavate those soils that the Engineer designates necessary to complete a particular task. The Engineer shall determine if soil is contaminated based on petroleum odors and unusual soil staining. Contaminated soil not required to be excavated is to remain in place and undisturbed. Undisturbed soil shall remain in place, whether contaminated or not. The Contractor shall transport all contaminated soil excavated from the project to a facility licensed to accept contaminated soil.

In the event that the Contractor chooses to stockpile the soil temporarily, the stockpile shall be created within the property boundaries of the source material and in accordance with the Diagram for Temporary Containment and Treatment of Petroleum-Contaminated Soil per North Carolina Department of Environmental Quality's Division of Waste Management UST Section GUIDELINES FOR EX SITU PETROLEUM CONTAMINATED SOIL REMEDIATION. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDEQ UST Section's Regional Office for off-site temporary storage. Stockpiling contaminated soil will be incidental to the project. The Contractor shall provide copies of disposal manifests completed per the disposal facilities requirements and weigh tickets to the Engineer.

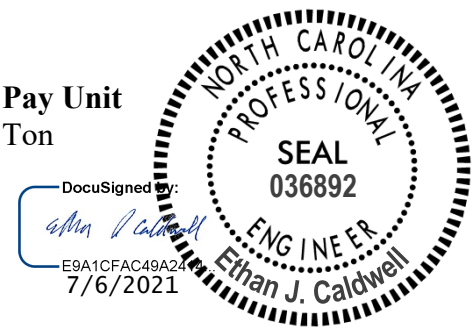
Measurement and Payment:

The quantity of petroleum contaminated soil hauled and disposed shall be the actual number of tons of material, which has been acceptably transported and weighed with certified scales as documented by disposal manifests and weigh tickets. The quantity of petroleum contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Hauling and Disposal of Petroleum Contaminated Soil".

The above price and payment shall be full compensation for all work covered by this section, including, but not limited to loading, transportation, weighing, laboratory testing, disposal, equipment, decontamination of equipment, labor, and personal protective equipment.

Payment shall be made under:

Pay Item	**Pay Unit**
Hauling and Disposal of Petroleum Contaminated Soil	Ton



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Matthew V. Springer
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8/27/2020

POLYUREA PAVEMENT MARKING MEDIA AND THICKNESS:
(08-27-20)

Amend the *NCDOT 2018 Standard Specifications* as follows:

Page 12-8, Subarticle 1205-5(B), lines 14-16, replace with the following:

Produce polyurea pavement marking lines that have a minimum dry thickness of 20 mils above the pavement surface when placed on concrete and asphalt pavements. Produce polyurea pavement marking lines that have a minimum dry thickness of 30 mils above the pavement surface on textured surfaces such as OGFC and on surfaces where the polyurea will be placed over a previously removed pavement marking.

Page 12-9, replace **Table 1205-4 Minimum Reflectometer Requirement for Polyurea** with the following:

TABLE 1205-4
MINIMUM REFLECTOMETER REQUIREMENTS
FOR POLYUREA

Item	Color	Reflectivity
Standard Glass Beads	White	375 mcd/lux/m^2
	Yellow	250 mcd/lux/m^2

The installer may choose to use an AASHTO Type 4/Type 1 or AASHTO Type 3/Type 1 double drop system, but no price adjustment will be made, and these systems will be incidental to the polyurea pavement marking.

Pay Item	Pay Unit
Polyurea Pavement Marking Lines,___",_____mils (Standard Glass Beads)	Linear Foot

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WORK ZONE TRAFFIC CONTROL
Project Special Provisions
Table of Contents

10/1/2021

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ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES:
(10/31/2017)

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.

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.

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.

Payment will be made under:

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

TEMPORARY GLARE SCREEN:
(02/06/2013)

Description

Furnish, installing, maintain, and remove Temporary Glare Screen in accordance with the plans and specifications.

Materials

Provide Temporary Glare Screen which are modular units consisting of vertical blades and a horizontal base rail. Provide blades and base rails manufactured from durable high impact resistant, non-warping, and non-metallic material.

Provide blades that have nominal widths between 6 inches and 9 inches. Provide blades which are a minimum of 24 inches high and capable of being locked down at an angle and spacing to provide a continuous cut-off angle of not less than 22 degrees. Provide modular units with a maximum length of 10 feet.

Anchor the modular units to the barrier using either a mechanical or adhesive system with a minimum pullout and shear strength of 3000 lbs. Use galvanized mounting hardware in accordance with Section 1076 of the 2018 Standard Specifications. An acceptable alternate may be used if approved by the Engineer. Do not place Modular units over barrier connector between adjoining barrier sections.

Install yellow or crystal encapsulated lens (high performance) retro-reflective sheeting or microprismatic retro-reflective sheeting on the surface of the leading blade of every section of concrete barrier. Provide sheeting that is a minimum of 2 inches x 12 inches and applied with a pressure sensitive adhesive. Have color of the retro-reflective sheeting match the color of the

adjacent pavement marking edgeline. Provide reflective sheeting which meets the requirements of Section 1092 of the 2018 Standard Specifications.

Construction Methods

Section 1105-3 of the 2018 Standard Specifications applies to this special provision.

Maintenance

Maintain Temporary Glare Screen in accordance with Section 1105-4 of the 2018 Standard Specifications.

Method of Measurement

The quantity of Temporary Glare Screen to be paid for will be the number of linear feet of Temporary Glare Screen installed during the life of the project in accordance with the plans and accepted.

Basis of Payment

The quantity of Temporary Glare Screen measured as provided above, will be paid for at the contract unit price per linear foot for "Temporary Glare Screen".

Payment will be made under:

Pay Item	Pay Unit
Temporary Glare Screen	Linear Foot

SEQUENTIAL FLASHING WARNING LIGHTS
(10/08/2016) (Rev. 5/10/2021)

Description

Furnish and install Sequential Flashing Warning Lights on drums used for the merging tapers of nightly lane closures on all multilane roadways with speed limits of 55 mph or greater.

Materials

The Sequential Flashing Warning Lights shall meet all of the requirements for warning lights within the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

Each light unit shall be capable of operating fully and continuously for a minimum of 200 hours when equipped with a standard battery set.

Each light in the sequence shall be flashed at a rate of not less than 55 times per minute and not more than 75 times per minute. The flash rate and flash duration shall be consistent throughout the sequence.

Supply a Type 3 Certification (Independent Test Lab results) documenting all actual test results for the specified parameters contained in the Institute of Transportation Engineer's (ITE's) *Purchase Specification for Flashing and Steady Burn Warning Lights*. The laboratory shall also identify all manufacturer codes and part numbers for the incandescent lamp or LED clusters, lenses, battery, and circuitry, and the total width of the light with the battery in place. The complete assembly shall be certified as crashworthy when firmly affixed to the channelizing device.

All Sequential Flashing Warning Lights shall be on the NCDOT Approved Products List.

Construction Methods

These lights shall flash sequentially beginning with the first light and continuing until the final light.

The Sequential Flashing Warning Lights shall automatically flash in sequence when placed on the drums that form the merging taper.

The number of lights used in the drum taper shall equal the number of drums used in the taper.

Drums are the only channelizing device allowed to mount sequential flashing warning lights.

The Sequential Flashing Warning Lights shall be weather independent and visual obstructions shall not interfere with the operation of the lights.

The Sequential Flashing Warning Lights shall automatically sequence when placed in line in an open area with a distance between lights of 10 to 100 feet. A 10-foot stagger in the line of lights shall have no adverse effect on the operation of the lights.

If one light fails, the flashing sequence shall continue. If more than 1 light fails, all of the lights are to be automatically turned to the "off" mode. Non-sequential flashing is prohibited.

When lane closures are not in effect, the Sequential Flashing Warning Lights shall be deactivated.

Measurement and Payment

Sequential Flashing Warning Lights will be measured and paid as the maximum number of sequential flashing warning lights satisfactorily installed and properly functioning at any one time during the life of the project.

This includes all materials and labor to install, maintain and remove all the Sequential Flashing Warning Lights.

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Pay Item	Pay Unit
Sequential Flashing Warning Lights	Each

WORK ZONE PRESENCE LIGHTING
(10/14/19) (Rev. 5/10/2021)

Description

Furnish and install Work Zone Presence Lighting during nightly lane closures on multilane roadways with speed limits of 55 mph or greater.

Materials

Anti-glare lighting systems are required. Work Zone Presence Lighting shall be installed in accordance with the attached detail and the Manufacturer's recommendations.

Supply a power source for each light to provide the light output as described in the chart below.

Each light unit shall be capable of providing a minimum of 14,000 lumens illuminating a minimum area of approximately 3,000 square feet. The light shall be capable of being elevated to a height of 14 feet above the pavement.

Each light unit support base or mounting stand shall have the capability of being leveled such that the light mast is plumb.

Provide Work Zone Presence Lighting listed on the NCDOT Approved Products List.

Construction Methods

Work Zone Presence Lighting is permitted to be prestaged (up to 1 hour prior for single lane closures and up to 2 hours prior for double or triple lane closures) along with other traffic control devices or installed within 1 hour after the necessary traffic control has been installed for the lane closure(s). At the end of the work night, the Work Zone Presence Lighting shall be removed within 1 hour before or after the lane closure(s) is removed.

Whenever possible, each light unit shall be placed on the outside paved shoulder, a minimum of 4 feet from the travel lane and spaced according to the chart below based on the amount of light output for each unit.

Work Zone Presence Lighting is permitted to supplement the Portable Construction Lighting inside the lane closure. At no time shall Work Zone Presence Lighting be used in lieu of Portable Construction Lighting when required.

If there is sufficient existing overhead lighting, Work Zone Presence Lighting may be eliminated as directed by the Engineer.

Lighting Unit Installation Requirements

The lighting units shall be installed in advance of the lane closure as shown on the attached detail and spaced according to the chart below:

		AREA 1		AREA 2	
Light Output (Lumens)	**Illuminated Fixture Area (Sq. Ft.)**	**# of Lights**	**Spacing***	**# of Lights**	**Spacing***
14,000 - 35,000	4	6	640’ (16 skips)	8	480’ (12 skips)
35,001 - 59,999	5	5	800’ (20 skips)	6	640’ (16 skips)
60,000+	6+	4	1,000’ (25 skips)	5	800’ (20 skips)

*Skips refer to traditional 10’ pavement marking lines with 30’ gaps.

Area 1: Begins 2,640’ downstream from CMS; Extends to just past 1st Lane Closure Sign

Area 2: Begins just past the 1st Lane Closure Sign; Extends to just past the last Lane Closure Sign

MEASUREMENT AND PAYMENT

Work Zone Presence Lighting will be measured and paid as the maximum number of lighting units satisfactorily placed, accepted by the Engineer, and in use at any one time during the life of the project.

Relocation, replacement, repair, removal, and maintenance of Work Zone Presence Lighting units will be incidental to the work of this section. No measurement or separate payment will be made for power generators, batteries, or other power supply devices.

Pay Item	**Pay Unit**
Work Zone Presence Lighting	Each

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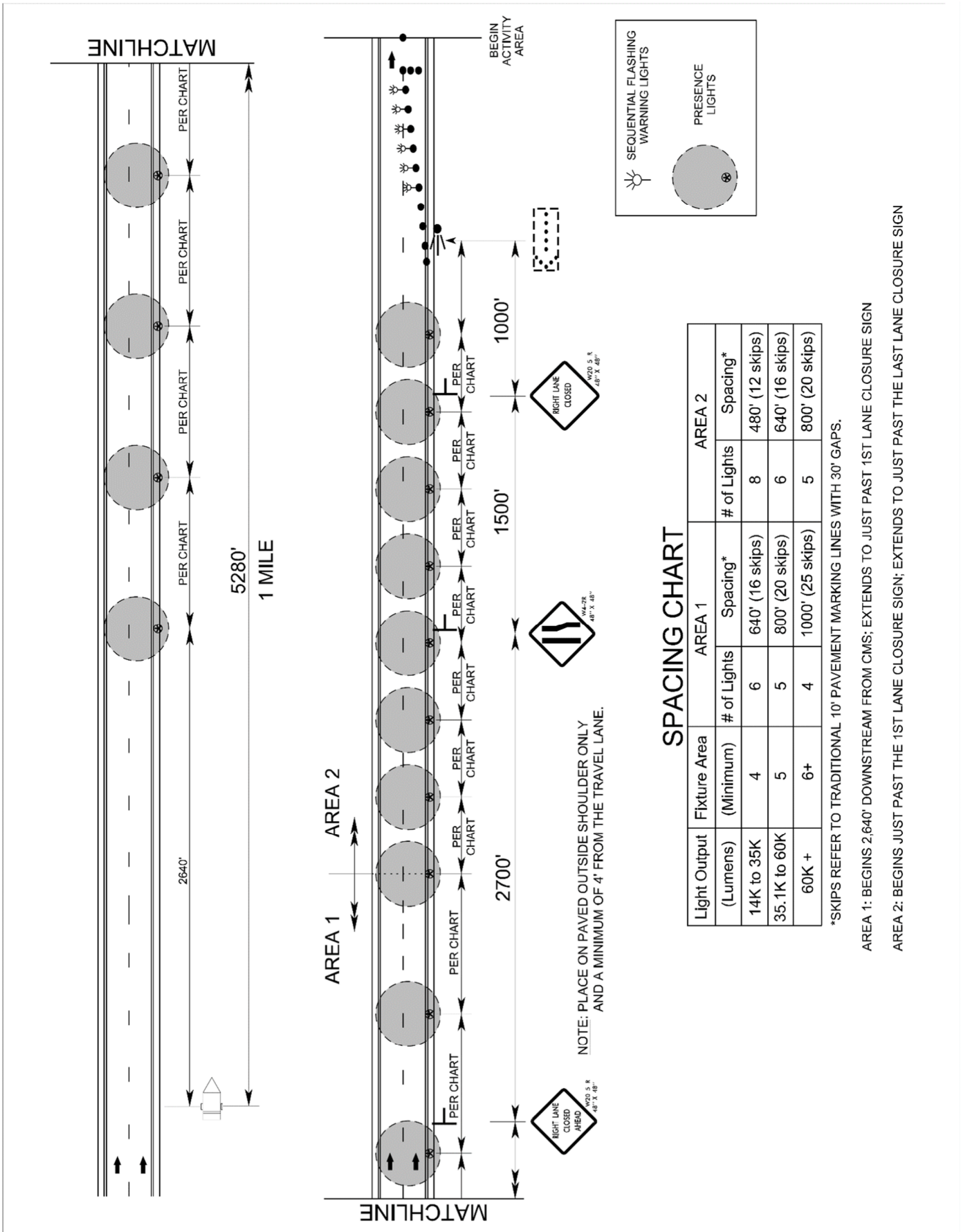

NOTE: PLACE ON PAVED OUTSIDE SHOULDER ONLY AND A MINIMUM OF 4' FROM THE TRAVEL LANE.

SPACING CHART

Light Output	Fixture Area	AREA 1		AREA 2	
(Lumens)	(Minimum)	# of Lights	Spacing*	# of Lights	Spacing*
14K to 35K	4	6	640' (16 skips)	8	480' (12 skips)
35.1K to 60K	5	5	800' (20 skips)	6	640' (16 skips)
60K +	6+	4	1000' (25 skips)	5	800' (20 skips)

*SKIPS REFER TO TRADITIONAL 10' PAVEMENT MARKING LINES WITH 30' GAPS.

AREA 1: BEGINS 2,640' DOWNSTREAM FROM CMS; EXTENDS TO JUST PAST 1ST LANE CLOSURE SIGN

AREA 2: BEGINS JUST PAST THE 1ST LANE CLOSURE SIGN; EXTENDS TO JUST PAST THE LAST LANE CLOSURE SIGN

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WORK ZONE DIGITAL SPEED LIMIT SIGNS
(5/10/2021)

Description

Furnish and install Work Zone Digital Speed Limit Signs on interstates and freeways with speed limits of 55 mph or greater. These signs are regulatory speed limit signs with LED displays for the speed limit numbers.

Materials

Digital Speed Limit Signs shall be a minimum 36" wide x 48" high. The speed limit sign (R2-1) shall be black on white with high intensity white prismatic sheeting.

The Digital Speed Limit Sign shall be mounted such that the bottom of the sign is 7' above roadway.

The LED panel shall be a minimum of 28" wide x 18" high. The display on the LED panel shall be amber or white.

The LED numbers shall have a minimum 5 wide by 7 high pixel array with a minimum height of 18".

The LED panel shall have auto brightness/dimming capability.

The black on orange "WORK ZONE" sign shall be mounted above the speed limit sign. It shall be 36" wide x 24" high with high intensity prismatic orange sheeting.

The black on white "$250 FINE" sign shall be mounted below the speed limit sign. It shall be 36" wide x 24" high with high intensity prismatic white sheeting.

All digital speed limit systems shall have operational software and wireless communications that allows for remote operation and data monitoring. It shall be configured to allow access by the Engineer or their designee to change each sign independently or change the speed limit on all signs at once from a PC, tablet or cellular phone application.

Radar equipment to detect approaching speeds on the digital speed limit systems is optional. However, if the systems have radar, they will be equipped to store the detected speed data, this information should be available in a spreadsheet format and accessed remotely from a secure cloud location.

The Work Zone Digital Speed Limit systems shall have flashing beacons. The beacons are to be a minimum of 8" diameter LED circular yellow. They shall be mounted above and below the sign assemblies and are to be centered. The beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.

In addition, the flashing beacons shall be mounted in such a manner that the $250 FINE sign is not obscured when in operation.

Digital Speed Limit Signs may be trailer mounted or stationary mounted. The unit shall be solar powered and have the ability to operate continuously. It shall be supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

All Work Zone Digital Speed Limit Sign equipment shall be on the NCDOT Approved Products List.

Digital Speed Limit Displays

The speed limit shall be continuously displayed on the signs. All other stationary speed limit signs shall be covered when Digital Speed Limit systems are in operation.

Reduced Speed Limit Displays

The Digital Speed Limit systems shall have beacons activated when the work zone speed limit is reduced. Otherwise, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The Digital Speed Limit Signs shall display the reduced work zone speed limit without flashing the LED speed limit number unless approaching speeds are detected to be 6 MPH or higher than the displayed speed limit. If speeds are detected 6 MPH or above the displayed Speed Limit, then the LED shall flash the speed limit until the speeds are within the 6 MPH tolerance.

Existing Speed Limit Displays

When the existing speed limit is displayed on the Digital Speed Limit Signs, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The speed limit number is not to flash unless the approaching speeds are detected to be 6 MPH or higher than the displayed speed limit.

Other Construction Methods

The speed limits are the sole authority of the NCDOT. An ordinance by the State Traffic Engineer is required for all speed limits in order to have a lawfully enforceable speed limit.

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The Regional Traffic Engineering Office and the Division Construction Engineer in coordination with the Work Zone Traffic Control Section will provide all work zone speed limit recommendations based on activities and conditions.

The Contractor will be responsible for coordinating with the Engineer when the work zone speed limits are to be changed and will have to seek approval by the Engineer or their designee before the speed limit is changed.

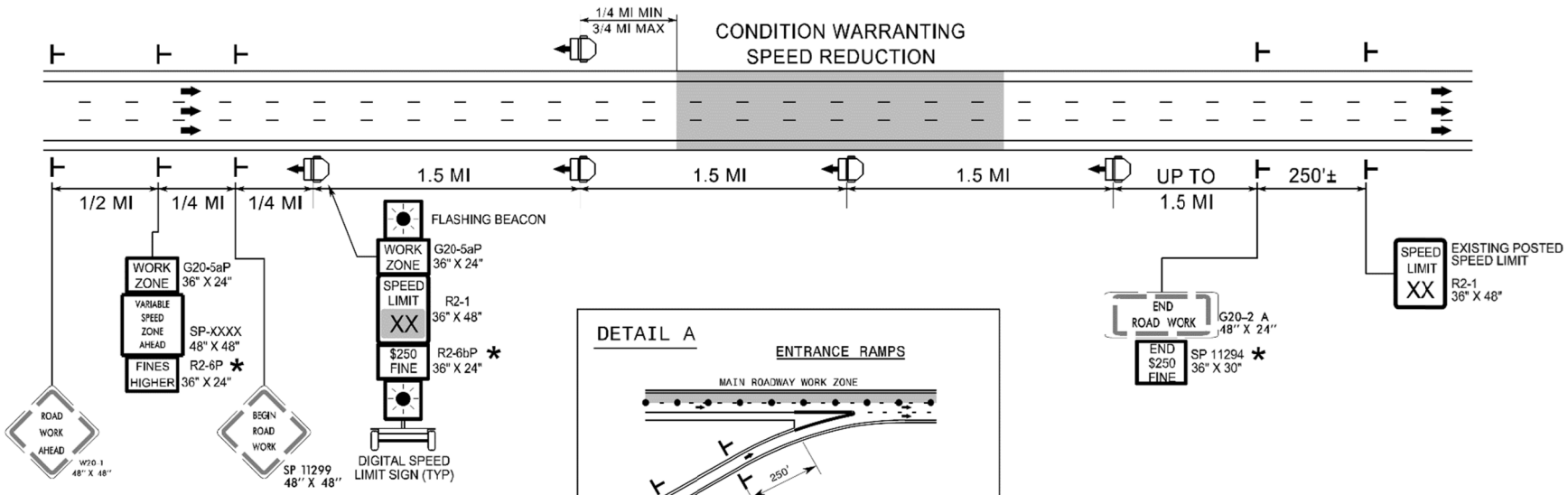
Whenever possible, each trailer mounted unit shall be placed on the paved shoulder and shall have the capability of being leveled.

Measurement and Payment

Work Zone Digital Speed Limit Signs will be measured and paid as the maximum number of Work Zone Digital Speed Limit Signs satisfactorily installed according to the attached detail and properly functioning at any one time during the life of the project.

This includes all materials and labor to install, maintain and remove all the Work Zone Digital Speed Limit Signs.

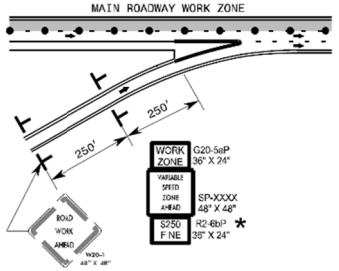
Pay Item	**Pay Unit**
Work Zone Digital Speed Limit Signs	Each



* USE ONLY IF ORDINANCED. SEE NOTE 5 BELOW.

DETAIL A

ENTRANCE RAMPS



NOTES

1. THE DIGITAL SPEED LIMITS SIGNS WILL BE INSTALLED (TRAILER MOUNTED OR STATIONARY MOUNTED) IN ADVANCE OF AND SPACED APPROXIMATELY 1.5 MILES THROUGHOUT THE THE PROJECT LIMITS, UNLESS DIRECTED OTHERWISE.
2. WITHIN ¼ TO ¾ MILE UPSTREAM OF CONDITION WARRANTING A SPEED REDUCTION, PLACE A DIGITAL SPEED LIMIT SIGN ON BOTH THE INSIDE AND OUTSIDE SHOULDERS, UNLESS DIRECTED OTHERWISE BY THE ENGINEER. AT ALL OTHER LOCATIONS DOWNSTREAM, PLACE A SINGLE DIGITAL SPEED LIMIT SIGN ON THE OUTSIDE SHOULDER.

   IF SIGNS ARE NOT HIGHLY VISIBLE TO ALL MOTORISTS, SUPPLEMENTAL DIGITAL SPEED LIMIT SIGNS ARE PERMITTED ON THE MEDIAN SHOULDER.
3. THE DIGITAL SPEED LIMIT SIGNS TAKE PRECEDENCE OVER EXISTING SPEED LIMIT SIGNS AND SHOULD REMAIN UPRIGHT AND VISIBLE AT ALL TIMES. ALL EXISTING SPEED LIMIT SIGNS SHALL BE COVERED OR REMOVED FOR DURATION OF THE PROJECT.
4. NCDOT HAS SOLE AUTHORITY OF THE SPEED LIMITS DISPLAYED ON THE DIGITAL SPEED LIMIT SIGNS.
5. THE WORK ZONE VARIABLE SPEED LIMIT AND THE $250 SPEEDING PENALTY ARE SEPARATE ORDINANCES THAT MUST BE SIGNED BY THE STATE TRAFFIC ENGINEER TO BE VALID AND ENFORCEABLE. WITHOUT SIGNED ORDINANCES, THE SPEED LIMIT ON A FACILITY SHALL REMAIN UNCHANGED AND/OR HIGHER FINES SIGNS SHALL NOT BE USED.
6. THE REDUCED SPEED SHALL BE DISPLAYED A MINIMUM OF ¼ MILE AND A MAXIMUM OF ¾ MILE IN ADVANCE OF AND THROUGHOUT THE AREA MEETING CONDITIONS LISTED IN THE CHART. THE EXISTING SPEED LIMIT SHALL BE DISPLAYED ON ALL OTHER DIGITAL SPEED LIMIT SIGNS.
7. THE SPEED DISPLAYED SHALL BE THE LOWER OF THE EXISTING SPEED LIMIT OR THE SPEED IN THE WORK ZONE CONDITION CHART.
8. THE BEACONS ON THE DIGITAL SPEED LIMIT SIGNS SHALL ONLY FLASH DURING TIMES THE SPEED IS REDUCED, AND REMAIN OFF AT ALL OTHER TIMES.

	WORK ZONE CONDITIONS	SPEED TO DISPLAY (SEE NOTE 6 & 7)
LANE CLOSURES	2 LANES REDUCED TO 1 LANE	55
	3 LANES REDUCED TO 1 LANE	55
	3 LANES REDUCED TO 2 LANES	60
	4 LANES REDUCED TO 1 LANE	55
	4 LANES REDUCED TO 2 LANES	60
	4 LANES REDUCED TO 3 LANES	65
CONTINUOUS BARRIER (LENGTH OF BARRIER GREATER THAN 1 MILE)	1 OPEN LANE WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	55
	1 OPEN LANE WITH CONTINUOUS BARRIER ON 1 SHOULDER	60
	3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	60
	3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON 1 SHOULDER	65
	4 OPEN LANES WITH BARRIER CONTINUOUS ON BOTH SHOULDERS	65
	4 OPEN LANES WITH BARRIER CONTINUOUS ON 1 SHOULDER	EXISTING
	UNEVEN LANES	60

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 4′-0″
HEIGHT: 4′-0″
TOTAL AREA: 16.0 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0.47″
WIDTH: 0.63″
RADII: 1.5″

NO. Z BARS: 2
LENGTH: 40.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT′L: 0.080″ (2.0 mm) ALUMINUM

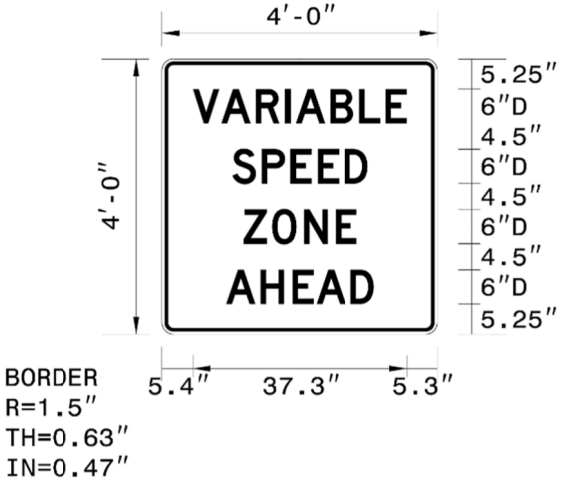
USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.

DESIGN BY: J.Navarrete
PROJECT ID:

CHECKED BY:
LOCATION:

May 13, 2019
DIV: DIV



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																									Series/Size Text Length
	V	A	R	I	A	B	L	E																	D 2000
5.4	4.9	6	5.1	1.9	6	5.1	4.6	3.7	5.3																37.3
	S	P	E	E	D																				D 2000
12.2	5.1	5	4.7	4.7	4.1	12.1																			23.6
	Z	O	N	E																					D 2000
14.2	5	5.6	5.5	3.7	14																				19.8
	A	H	E	A	D																				D 2000
11.2	6	5.5	4.2	6	4.1	11																			25.8

FILENAME: Special Signs 7

NORTH CAROLINA D.O.T. SIGN DETAIL

TC-14

U-2579AB Forsyth County

WORK ZONE PERFORMANCE PAVEMENT MARKINGS:
(10/08/2016)
(Rev. 10/9/18)

Description

Furnish and install Work Zone Performance pavement markings that delineate the travel way for work zone traffic patterns on interstates and freeways along with the ramps and loops. They may also be used on roadways with significant alterations of traffic patterns. The purpose of Work Zone Performance pavement marking is to provide a more durable work zone pavement marking that lasts the full duration of a traffic pattern without requiring replacement or reapplication for a period of up to 12 months. Work Zone Performance pavement markings shall also provide a higher performance level in terms of retroreflectivity throughout the required 12 month duration than standard traffic paints to improve nighttime work zone visibility.

Materials

A) General

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and a minimum retroreflectivity as described elsewhere in this RFP for a period of at least 12 months.

The Work Zone Performance pavement markings shall be manufactured to bond successfully to both concrete and asphalt pavements. The following are approved materials to be used for Work Zone Performance pavement markings:

- Polyurea
- Thermoplastic (Extruded and Sprayed)
- Epoxy
- Polymer (Single System)
- Cold Applied Plastic (Type IV)

Cold Applied Plastic (Type IV) shall be used for all concrete bridge surfaces.

B) Material Qualifications/Certifications

Use Work Zone Performance pavement marking materials, as listed above, which are on the NCDOT Approved Products List at the time of installation.
In accordance with Article 106-3, and Section 1087-4 of the 2018 NCDOT Standard Specifications for Roads and Structures, provide a Type 3 Material Certification for all materials and a Type 3 and Type 4 certification for all reflective media.

(C) Performance

Poor performance of a Work Zone Performance pavement marking material at any site, whether or not related to a specific contract, may be grounds for removing the material from any project under contract and the NCDOT Approved Products List.

Construction Methods

Do not use hand applied methods or any other non-truck mounted application equipment /device to install Work Zone Performance pavement markings for applications longer than 1000 feet.

All Work Zone Performance pavement markings are to be installed in a single application. Multiple passes are not allowed.

"No track" dry times shall be 10 minutes or less. Traffic shall not be placed on any material until it's sufficiently dry/cured to eliminate wheel tracking.

A) Testing Procedures

All Work Zone Performance pavement marking installations will be tested by the Department through an independent Mobile Retroreflective Contractor. The Work Zone Performance pavement markings will be scanned to ensure the retroreflectivity requirements in Section C below are met.

B) Application Equipment

Application equipment shall be in accordance with Section 1205 of the 2018 NCDOT Standard Specifications for Roads and Structures.

C) Material Application

The Work Zone Performance pavement marking material shall be applied at the following minimum thicknesses:

Polyurea =	20 mils wet
Epoxy =	20 mils wet
Thermoplastic =	50 mils (Extruded or Sprayed)
Polymer =	20 mils wet
Cold Applied Plastic (IV) =	Manufacturer's recommendation

The Work Zone Performance pavement marking line widths for interstates and freeways shall be as follows:

Edge lines, Solid Lane Lines, Skip and Mini-Skip Lines = 6”
Gorelines = 12”

All other facilities shall utilize 4” line widths.

D) Retroreflectivity Requirements

Retroreflectivity Requirements for Work Zone Performance Pavement Markings

Color	Initial	6 Months	12 Months
White	375 mcd/lux/m2	275 mcd/lux/m2	150 mcd/lux/m2
Yellow	250 mcd/lux/m2	150 mcd/lux/m2	100 mcd/lux/m2

The minimum level of retroreflectivity for any Work Zone Performance pavement marking system selected shall meet the initial requirements in the chart above. In addition, the Work Zone Performance pavement markings shall maintain the corresponding retroreflectivity requirements for a period of up to 12 months.

The Contractor shall notify the Engineer a minimum of 7-10 days prior to the installation of Work Zone Performance pavement markings.

The Department will measure initial retroreflectivity within 30 days after placement to ensure compliance with the initial retroreflectivity levels in the chart above.

If the markings appear to be non-performing, the Engineer may request additional retroreflectivity readings. If measured and found to be noncompliant, the Contractor shall replace the Work Zone Performance pavement markings at no cost to the Department. Non-compliant retroreflectivity occurs when the average readings for the project are more than 15% below the requirements in the chart. Pay deductions are appropriate for deficiencies up to the 15% level.

If the Work Zone Performance pavement markings need to remain in place longer than 12 months, the markings are to be scanned by the Mobile Retroreflective Contractor to determine if they are meeting the minimum retroreflectivity levels. If they remain at or above these levels, the Work Zone Performance pavement markings may remain in place. If not, they shall be replaced by the Contractor within 15 days of the 12 month duration and compensation will be made at the contract unit price.

If and when this becomes necessary, the same notification procedure as described above shall be used to have the Work Zone Performance pavement markings scanned for the required retroreflectivity.

E) Snowplow Damage

All Work Zone Performance pavement markings shall be durable enough to withstand a single snow event requiring snow plowing without showing excessive fatigue in either bonding or retroreflectivity.

The Contractor shall replace the Work Zone Performance pavement markings if a single snowplow occurrence results in more than 25% of the pavement marking edgelines or skips being physically removed and/or the Work Zone Performance pavement markings do not meet the following minimum retroreflectivity values:

Retroreflective Requirements for Work Zone Performance Pavement Markings after a Single Snowplow Occurrence

Color	MINIMUM
White	150 mcd/lux/m2
Yellow	100 mcd/lux/m2

Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all non-compliant Work Zone Performance pavement markings within 30 days of determining they are non-compliant.

If the work zone experiences more than one snow event requiring snow plowing, the retroreflectivity values in the chart above will no longer apply. The Engineer will determine if the pavement markings are performing adequately and/or if replacement is necessary due to excessive damage caused solely by snowplow activities.

If the Work Zone Performance pavement markings are found to be deficient, they shall be replaced. In such case, compensation will be made at the contract unit price. Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all Work Zone Performance pavement markings damaged due to multiple snowplow events within 30 days.

F) Surface Preparation

Prior to installation, all pavement surfaces to receive Work Zone Performance pavement markings shall be swept clean and prepared in accordance with the Manufacturer's recommendation.

G) Temperature and Weather Limitations

Work Zone Performance pavement markings shall only be applied unless the ambient air temperature and the pavement temperature is 50°F or higher for thermoplastic and is 40°F or higher for all other materials. Do not install unless the pavement surface is completely dry and

not within 4 hours of a heavy rain event such as a thunderstorm with rainfall intensities greater than 1 inch/per hour.

In the event a traffic shift has to take place when the air and pavement temperatures are below the required minimums or if a rain event occurs prior to or during a planned traffic shift, upon approval by the Engineer, an acceptable alternative is to install temporary pavement markings. Use 1 application of standard traffic paint to produce a 4" line at 15 mils (wet). Beads shall also be applied to provide proper retroreflectivity until the performance material can be installed. NCDOT will provide compensation for the 4",15 mil temporary paint. The Work Zone Performance pavement markings shall be applied within 90 days of installation of the temporary pavement markings.

Maintenance

Replace any Work Zone Performance pavement material that prematurely fails due to debonding or excessive wearing where it doesn't maintain its retroreflectivity for the required 12 month duration. Any traffic control and Work Zone Performance pavement marking costs due to replacement is at no cost to the Department unless it's due to excessive damage caused by snowplow damage.

Measurement and Payment

Work Zone Performance pavement marking lines will be measured and paid by the linear foot that's satisfactorily placed and accepted by the Engineer. The quantity of Work Zone Performance pavement marking-solid lines, will be the summation of the linear feet of solid line measured end-to-end of the line. The quantity of skip or broken lines will be the summation of the linear feet derived by multiplying the nominal length of a line by the number of broken lines satisfactorily placed.

Work Zone Performance Pavement Marking *Symbols* will be measured as the actual number of pavement marking symbols satisfactorily placed and accepted by the Engineer. Payment for Work Zone Performance Pavement Marking *Symbols* will be made at the same contract unit price used for the Pavement Marking Symbol pay items used on the final wearing surface.

Work Zone Performance Pavement Marking *Characters* will be measured as the actual number of pavement marking characters satisfactorily placed and accepted by the Engineer. A character is considered to be one letter or one number of a word message. Payment for Work Zone Performance Pavement Marking *Characters* will be made at the same contract unit price used for the Pavement Marking Character pay item used on the final wearing surface.

Payment will be made under:

TC-19

U-2579AB Forsyth County

Pay Item	Pay Unit
Work Zone Performance Pavement Marking Lines, 4”	Linear Foot
Work Zone Performance Pavement Marking Lines, 6”	Linear Foot
Work Zone Performance Pavement Marking Lines, 12”	Linear Foot

HIGH VISIBILITY DEVICES

(10/25/2019) (Rev. 5/10/2021)

Description

Furnish and install High Visibility Devices for projects on interstates and freeways. High Visibility Devices include drums, skinny drums, stationary work zone signs and rigid portable work zone signs. All of these devices shall be new. Used devices are not acceptable.

Materials

A) General

Use materials in accordance with the Manufacturer’s recommendations that will retain both durability and retroreflectivity as described elsewhere in this specification for a period of at least 36 months.

The following are required High Visibility Devices to be used for work zone performance applications.

- Drums
- Skinny Drums (Daytime use only)
- Stationary Work Zone Signs
- Rigid Portable Work Zone Signs

All drums and skinny drums shall be new and meet the existing requirements of Section 1089-5 of the NCDOT Standard Specifications for Roads and Structures and shall have Grade B flexible, fluorescent orange sheeting that meets the retroreflective requirements of Section 1092-2 of the NCDOT Standard Specifications for Roads and Structures.

All stationary work zone signs shall be new and meet the existing requirements of Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures. Legend overlays are prohibited and shall not be accepted on the interstate/freeway or associated intersecting roadways. Vertical sign post reflector strips shall be added to all stationary sign supports. Use Grade B fluorescent orange for work zone signs and Grade B fluorescent yellow for exit sign supports. Install strips a minimum of 6’ in length on sign supports with one sign mounted and a minimum of 4.5’ in length for sign supports with two or more signs mounted vertically.

All portable work zone signs shall be new and have composite substrates as described in Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures. Roll-up signs do not

meet the requirements of this provision. The remainder of the existing requirements of Section 1089-1 of the NCDOT Standard Specifications for Roads and Structures remain. Used sign stands are acceptable.

B) Material Qualifications/Certifications

Only use materials as listed above that are on the NCDOT Approved Products List. In addition, provide a Type 3 Material Certification for all materials in accordance with Section 106-3 and Section 1087-4.

(C) Performance

Poor performance of any device or sign at any site, whether or not related to a specific contract may be grounds for removing the material from the NCDOT Approved Products List and/or removing from any project under contract.

Construction Methods

All requirements of Section 1110-3 and Section 1130-3 of the NCDOT Standard Specifications for Roads and Structures shall apply except roll up signs are not permitted for use.

The use of skinny drums is prohibited for any nighttime lane closures on interstates/freeways.

Maintenance

Replace any sign or drum that prematurely fails due to any damage or defect that causes it to perform unsatisfactorily with an “in kind” device of similar quality and age according to the guidelines set forth in the American Traffic Safety Service Association’s (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices. An “in kind” replacement sign or drum is not required to be new, however, it shall be less than 1 year old and have 100% of its original sheeting area and at least 85% of the retroreflective qualities of a new device, so that it is undetectable adjacent to the original devices and signs placed on the project.

Measurement and Payment

High Visibility Drums will be measured and paid as the maximum number of drums placed and in use at any one time during the life of the project.

High Visibility Skinny Drums will be measured and paid as the maximum number of skinny drums placed and in use at any one time during the life of the project.

High Visibility Stationary Signs will be measured as the actual number of square feet satisfactorily installed at each location and accepted by the Engineer. Where a particular sign is used at more than one location, measurement will be made at each location.

High Visibility Portable Signs will be measured and paid as the actual number of square feet satisfactorily installed and accepted by the Engineer. Payment will be made for the initial installation only. Relocation of signs will be incidental to the measurement of the quantity of High Visibility Portable Signs.

No direct payment will be made for stationary work zone sign supports or portable work zone sign stands. All stationary work zone sign support or portable work zone sign stands will be incidental to the work of providing work zone signs.

Payment will be made under:

Pay Item:	**Pay Unit**
High Visibility Drums	Each
High Visibility Skinny Drums	Each
High Visibility Stationary Signs	Square Foot
High Visibility Portable Signs	Square Foot

CONNECTED LANE CLOSURE DEVICES:
(10/29/2018)

Description

Furnish, install, operate, maintain, relocate, and remove connected lane closure devices for use on Interstate and Freeway lane closures. The connected lane closure devices shall transmit the location of the lane closure to navigational companies such as WAZE, Google Maps, Inrix, Here, TrafficCast, TomTom, Apple Maps, Panasonic, the Statewide Transportation Operations Center, (STOC), and any other navigational companies that requests it. A connected lane closure device shall be installed on the flashing arrow board identifying the beginning of a lane closure, and another connected lane closure device shall be installed on a crashworthy traffic control device (such as a drum) at the end of the same lane closure.

Materials

The connected lane closure devices shall be designed and built to transmit the location of the lane closure to the navigational companies as well as the STOC. The format of the information received by each of these shall be approved by each entity, and at minimum, consist of an XML file. The connected lane closure devices shall be capable of obtaining wireless communication by either cellular or satellite technology.

The initial connected device shall be designed and attached to the flashing arrow board in such a manner that it is only activated when either the left or right arrows are displayed, not when the flashing arrow board is operated in caution mode. When the lane closure is removed, and the flashing arrow board turned off or changed to caution mode, the connected device shall automatically turn off simultaneously.

The second connected device in a lane closure shall be installed on a crashworthy traffic control device. It shall have an easily accessible power switch and a small status indicator light mounted such that it is visible when passing by in a vehicle at operating speed. When switched to the ON position, the light shall indicate that device has established communication and is transmitting. The light may be either steady burn or flashing and shall not exceed one (1) inch in diameter.

The devices shall have battery life sufficient to maintain operation for the duration of the lane closure, or have the ability to be recharged without deactivating the device.

Construction Methods

Connected lane closure devices shall be used on all lane closures on freeways and interstates throughout the project.

Two connected lane closure devices shall be installed per grouping of lane closures (single, double, or triple); one attached and wired into the flashing arrow board at the beginning of the first taper, and the other at the last traffic control device at the end of the lane closure(s). Supplemental flashing arrow boards in advance of the first lane closure taper or flashing arrow boards in subsequent lane closures (for double and triple lane closures) shall not have connected devices. Subsequent lane closures occurring downstream of where all lanes have been reopened and lane closures in the opposite direction of travel will require additional connected devices.

The second connected lane closure device shall be manually turned ON and OFF by crews installing and removing the lane closure, unless the device can be controlled by the initial connected device. The unit shall be turned on immediately upon installation of the lane closure and turned off immediately upon removal of the lane closure.

Once installed, the Contractor shall verify that the connected lane closure devices are transmitting information prior to leaving the device unattended and re-verify transmission every 72 hours for long-term installations.

Technical Requirements

The connected devices shall be run continuously during any active lane closures for the length of the contract.

The GPS within the connected devices shall have a horizontal accuracy of 50 feet, 95% of the time.

The connected device information, including the location, transmission status, and battery status shall be transmitted within five (5) minutes of initiation and updated every fifteen (15) minutes. In addition to transmitting information to the Department, the Contractor shall keep the retain device information for one (1) year after the contract ends. Information shall include timestamps, device name, and GPS location. This information shall be made available to the Department upon request.

The battery voltage shall be collected at least once an hour. The information shall be stored and available for troubleshooting. The system shall transmit an alert if the battery voltage of a device is under a specified threshold.

The connected devices shall emit an audible an alert if a device is not transmitting its position for a period of 1 hour.

The outputs from the connected device on the arrow board and the downstream connected device at the end of the lane closure shall be easily identifiable as a single pair, either by sequential device IDs, identical project names, or other method as approved by the Engineer. Additional pairs on the project shall have unique identifiable information such that it is not confused with another project pair.

Measurement and Payment

Connected Lane Closure Devices will be measured and paid as the maximum number of connected devices acceptably placed and in use at any one time during the life of the project. Each group of lane closures will require two (2) connected lane closure devices; one connected to the flashing arrow board and the other on a crashworthy device at the downstream end of the lane closure. No payment will be made for either device unless both devices are satisfactorily installed.

The price for each connected lane closure device will cover all material, labor, maintenance, relocation, removal, and communication costs required for the duration of the project.

Flashing Arrow Boards will be measured and paid in accordance with Section 1115.

Crashworthy devices (such as drums) used to mount the downstream connected lane closure device shall be considered be incidental.

Pay Item	**Pay Unit**
Connected Lane Closure Device	Each

TYPICAL MEDIAN ACCESS AREAS:
(1/23/19)

Description

Perform the work covered by this section including, but not limited to, constructing, maintaining, and removing Typical Median Access Areas for construction vehicle ingress to and egress from the median to/from active travel lanes on controlled access facilities.

Typical Median Access Areas are not required when construction vehicle ingress and egress is conducted using lane closures as shown on detail 1101.05, Sheet 2 of 2 of the *2018 Roadway Standard Drawings*.

Materials

Refer to Divisions 6, 10, 11, 12, and 17 in the *2018 Standard Specifications for Roads and Structures.*

Provide temporary traffic control devices listed on the NCDOT Approved Products List (APL).

Provide Work Zone Performance Pavement Markings for Design-Build Projects (See Project Special Provision)

Provide High Visibility Devices (See Project Special Provision)

Flashing Beacon and Detection System:

(A) General

Provide flashing beacon and detection system components listed on the NCDOT ITS and Signals Qualified Products List (QPL).

Provide a trailer mounted flashing beacon and warning sign assembly that meets or exceeds the physical and operational requirements of the MUTCD, or other mounting method approved by the Department. The following specifications supplement those basic requirements. The warning sign height shall comply with detail 1110.01, sheet 1 of 3, of the *2018 Roadway Standard Drawings* when raised in the upright position.

Provide a totally mobile complete unit capable of being located as traffic conditions demand.

The flashing beacon housing assembly shall be of weather resistant construction.

(B) Power System

Provide a unit that is solar powered and supplemented with a battery backup system that includes a 110/120 VAC powered on-board charging system. The unit shall also be capable of being powered by standard 110/120 VAC power source.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power. Store the battery bank and charging system in a lockable, weather, and vandal resistant box.

(C) Controller

Provide automatic brightness/dimming of the display and a manual override dimming switch. The controller shall provide a battery-charge status indicator. Mobile radio or any other radio transmissions shall not affect the controller. Store the controller in a lockable, weather and vandal resistant box.

(D) Trailer

Finish all exterior metal surfaces with Federal orange enamel per Federal Standard 595a, color chip ID# 13538 or 12473 respectively. The trailer shall be able to support a 100 mph wind load with the display fully extended.

The trailer shall be equipped with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

The trailer shall be properly equipped in compliance with North Carolina Law governing motor vehicles.

Provide a minimum 4 inch wide strip of fluorescent orange retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The retroreflective sheeting shall be Grade B that conforms to Article 1092-2 in the *2018 Standard Specifications for Roads and Structures.* Drums may be supplemented around the unit in place of the sheeting.

(E) Reliability

Provide a sign unit, flashing beacons, and detection system with all components rated to operate at temperatures ranging from -30°F to 165°F.

Construction Methods

See Typical Median Access Detail in the Transportation Management Plan.

Temporary Acceleration Lane

Construct a temporary acceleration lane with a minimum length of 1720’ and a minimum clear width of 12’ for the full length of the Temporary Acceleration Lane. At least 920’ of parallel merge/diverge area is required adjacent to the active travel lanes. The detection zone will be located from the beginning of the paved area to within 100’ of the end of the PCB. It shall have positive protection separating it from the active travel lanes for the first 500’.

The Temporary Acceleration Lane shall use either existing or proposed pavement, where available. If existing or proposed pavement is not available, construct temporary pavement. For truck volumes that do not exceed 100 trucks per day for a duration that does not exceed 1 year, use the following temporary pavement design: 1.25” S9.5B, 2.5” I19.0C, and 8” ABC. For truck volumes/durations that exceed the parameters stated above, contact the State Work Zone Engineer at 919-814-5037. Install and maintain pavement in accordance with Division 9.

Using Work Zone Performance Pavement Markings, install 12" yellow diagonals lines (2:1 slope) at 100' intervals throughout the upstream half of the parallel merge/diverge area, and at 55' intervals throughout the downstream half of the parallel merge/diverge area. Remove any conflicting markings in accordance with Section 1205.

Flashing Beacons and Detection System

Flashing Beacons and Detection System are required only at active median access locations and may be relocated to other median access locations as necessary.

Provide High Visibility advance warning signage as shown in the attached detail. Provide a flashing beacon system with two (2) flashing lights per sign to alert motorists in the active travel lanes of work vehicles entering from the median.

Provide a non-intrusive detection system capable of detecting vehicles in the work area in advance of the parallel merge/diverge area. The detection system shall be programmed such that passing public traffic in active travel lanes and vehicles in the work area not intending to use the parallel merge/diverge area are not detected.

Once detection occurs, the beacons on the advance warning sign(s) shall begin flashing immediately at a rate of not less than 50 or more than 60 times per minute. The beacons on the advance warning sign(s) shall flash continuously in an alternating pattern at all times that work vehicles are detected. The beacons shall continue flashing for thirty (30) seconds after detection ceases before turning off, and personnel on site shall have the ability to adjust this time based on field conditions. The flashing beacon system shall remain dark when idle.

Expedite repairs due to failure, malfunction or damage to the flashing beacons and/or detection system. Furnish another flashing beacon system or detection system approved by the Department during the repair time. Repair or replace flashing beacon system and/or detection systems immediately; otherwise, suspend all construction activities requiring the use of the Median Access Area until the flashing beacon system and/or detection system is restored to operation.

Perform all maintenance operations recommended by the manufacturer of the flashing beacon system and detection system.

Location, Placement, and Use

Typical Median Access Areas shall not be located within one-half (1/2) mile of any interchange acceleration or deceleration lanes, unless approved by the Department. All proposed locations for Typical Median Access Areas shall be reviewed and approved by the Department prior to installation.

Work vehicles using a particular Median Access Area shall not utilize any interchange ramp (on-ramp or off-ramp) within one (1) mile of the Median Access area.

Typical Median Access Areas installed in accordance with this section will not require the use of temporary lane closures for ingress/egress of work vehicles.

The Contractor shall comply with multiple and single vehicle hauling restrictions as shown in the TMP when performing hauling of equipment or materials to or from the project while using Typical Median Access Areas.

Measurement and Payment

Typical Median Access Area will be measured and paid as the actual number of *Flashing Beacon and Detection Systems* satisfactorily installed and accepted by the Engineer as described in this provision. Payment will be made for the initial installation only. Relocation of the system(s) will be incidental to the measurement of the quantity of systems.

Aggregate Base Course will be measured and paid in accordance with Article 520-11.

Asphalt Concrete Intermediate Course, Type I19.0C and Asphalt Concrete Surface Course , Type S9.5B will be measured and paid for in accordance with Article 610-16.

High Visibility Drums, Stationary Signs and Portable Signs will be measured and paid for in accordance with the High Visibility Devices Special Provision found elsewhere in the contract.

Portable Concrete Barrier will be measured and paid in accordance with Article 1170-4.

Temporary Crash Cushion will be measured and paid in accordance with Article 1160-4.

Work Zone Performance Pavement Marking Lines, 12” will be measured and paid for in accordance with the Work Zone Performance Pavement Markings Special Provision found elsewhere in the contract.

Payment will be made under:

Pay Item	**Pay Unit**
Flashing Beacon and Detection System	Each

PROJECT SPECIAL PROVISIONS
LIGHTING

1.00 DESCRIPTION

The work covered by this Section consists of furnishing, installing, connecting, and placing into satisfactory operating condition roadway lighting at locations shown on the plans. Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (*2018 Standard Specifications*).

Perform all work in conformance with Division 14 of the *2018 Standard Specifications* except as modified or added to by these Special Provisions. Install all bore pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

In addition to the requirements of Division 1400, other specific Sections of the *2018 Standard Specifications* applicable to the work on this project are listed below.

Section 1401	High Mount Standard and Portable Drive Unit
Section 1404	Light Standards
Section 1407	Electric Service Pole and Lateral
Section 1408	Light Control System
Section 1409	Electrical Duct
Section 1410	Feeder Circuits
Section 1411	Electrical Junction Boxes

2.00 LIGHT STANDARD LIGHT EMITTING DIODE (LED) LUMINAIRES

2.10 DESCRIPTION

Furnish, install and place into satisfactory operation luminaire, either on a bracket arm or directly mounted to the standard, complete with all light sources, drivers, wiring inside standard from circuit conductors to luminaire, in-line breakaway fuseholders and fuses and ground wiring at the pole on light standards less than 55 ft. in height.

Type	HPS Replacement Equivalent	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens
185W LED	250W	3500K ±500K	83%	15,500
285W LED	400W	3500K ±500K	83%	19,150

Third party certified photometric files in IES format are required to be submitted with the catalog cuts for the proposed LED roadway luminaire. Photometric files must show that proposed luminaire will meet or exceed the design shown in the plans.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

2.20 MATERIALS

2.21 LUMINAIRE REQUIREMENTS

A. General Requirements

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

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of a single piece die cast aluminum housing. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities.
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 3-0-3 and an IESNA distribution of Type II or Type III as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the plans. The same BUG rating and distribution type shall be used throughout the project.

- Minimum Ingress Protection (IP) dust and moisture ratings for the luminaire electrical components (driver and surge protection) and luminaire optical components shall be IP65 and IP66, respectively, as specified in ANSI C136.25.
- Luminaire shall have external and internal labels per ANSI C136.15 and ANSI C136.22, respectively. Internal label shall identify the manufacturer, year and month of manufacture and the manufacturer's part number.
- Luminaire shall have an internal bubble level.
- Luminaires shall start and operate in -20°C to +40°C ambient.
- Luminaires shall be rated for continuous service at an ambient temperature of 40°C (104°F)
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.4 square feet and 46 lbs.
- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31.
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Luminaire shall have a 1.25" to 2.0" adjustable tenon mount for connection to luminaire bracket arm assembly.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.
- Grommets shall be installed in cable entry holes. Cable entry holes shall be free from sharp edges which might cut conductors or an ungloved hand.
- All conductors inside the luminaire shall be neatly secured with tie-wraps as needed to prevent pinch points and assist in trouble shooting.

B. Driver
- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20°C to +40°C.
- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- Shall provide UL Class II output.

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

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

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

F. Finish
- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.
- Exterior surfaces shall be smooth and free of burrs.

G. Thermal management
- Mechanical design of protruding external surfaces (heat sink fins) on roadway luminaries shall facilitate hose-down cleaning and discourage debris accumulation.
- Liquids or moving parts will not be allowed for thermal management.

H. Color Quality
- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics
- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37
- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines. Terminal blocks shall be easily accessible to installers or repair personnel. Wire nuts are prohibited inside the luminaire housing.

K. Latching and hinging
- Refractor and housing door holders and hinges shall be designed to maintain positive control of door to the luminaire body so as not to allow the accidental disengagement of either door.

- Drivers shall be mounted to a housing door designed to be opened from the bottom of the luminaire. Housing door shall allow easy removal for troubleshooting/repair on the ground.

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

2.30 WARRANTY

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

Warranty period shall begin after project acceptance by the Department. Supplier shall furnish documentation of warranty procedures to the Contractor stating that warranty is for NCDOT.

2.40 CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

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

2.50 MEASUREMENT AND PAYMENT

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

Payment will be made under:

Light Standard Luminaires, Type _____……. Each

3.00 HIGH MAST LIGHT EMITTING DIODE (LED) LUMINAIRES

3.10 DESCRIPTION

Furnish, install and place into satisfactory operation, LED luminaires on high mount standards as detailed in these Special Provisions.

Any high mast luminaire submitted for approval must meet the minimum requirements in the table and sections below.
Any alternate luminaire submitted for approval must meet the minimum requirements in the table and sections below.

Mounting Height	Max. LED Fixture Wattage	Number & HPS Replacement Equivalent	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens (per fixture)
120’	560W	8 x 750W	3500K ±500K	87%	54,000
100’	560W	6 x 750W	3500K ±500K	87%	54,000
80’	335W	8 x 400W	3500K ±500K	87%	27,000
60’	335W	4 x 400W	3500K ±500K	87%	27,000

The Contractor shall supply the Department with current catalog cuts and 3rd party certified photometric data files in Illuminating Engineering Society (IES) format for any alternate high mount luminaire submitted for approval. The Department will thoroughly evaluate alternate luminaires to determine if proposed alternate high mount luminaire meets or exceeds design criteria.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

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

3.20 MATERIALS

3.21 LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:
  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy’s CALiPER program.
  - Report number
  - Date

- Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
- Description of luminaire, LED light source(s), and LED driver(s)
- Goniophotometry
- Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of aluminum. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities.
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 5-0-5 and an IESNA distribution of Type V as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the plans. The same BUG rating and distribution type shall be used throughout the project.
- Luminaire LED modules shall meet dust and moisture rating of IP-66, minimum.
- Luminaire shall have an external label per ANSI C136.15.
- Luminaires shall have an internal label per ANSI C136.22.
- Luminaires shall start and operate in -20°C to +40°C ambient.
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.3 square feet and 65 lbs.
- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31-2010
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.

B. Driver
- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20°C to +40°C.

- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.

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

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

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

F. Finish
- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.

G. Thermal management
- Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation.

H. Color Quality
- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics
- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37
- All internal components shall be assembled and pre-wired using modular electrical connections.

- Terminal blocks shall be used for incoming AC lines
- Latching and hinging

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

3.30 WARRANTY

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

Warranty period shall begin after project acceptance by the Department.

3.40 CONSTRUCTION METHODS

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

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

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

3.50 MEASUREMENT AND PAYMENT

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

Payment will be made under:

High Mount Luminaires _____ ……. Each

.

DocuSigned by:
Roger Kluckman
A47FB0E0B26E420...

7/13/2021

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UNLESS ALL SIGNATURES COMPLETED

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PROJECT SPECIAL PROVISIONS
Utility Construction

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12/8/2021

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General Note:

In these Project Special Provisions, where manufacturers are listed for certain products, the cited examples are used only to denote the quality standard of the products desired, and they do not restrict bidders to a specific brand, make, manufacturer or specific name; they are used only to set forth and convey to bidders the general style, type, character and quality of products desired; and equivalent products will be acceptable, subject to review and approval by the utility system owner.

Revise the 2018 Standard Specifications as follows:

Page 2-1, Subarticle 200-3, Construction Methods (D)
Delete the following:
Cut off and plug at the right-of-way or construction limits any private water or sewer line intercepted during the construction of the project.

Replace with the following:
Locate and do not damage any private water or sewer line intercepted during the construction of the project. Immediately repair any water or sewer line damaged during construction of the project.

Page 2-8, Article 220-3, Construction Methods
Add the following:
All blasting operations will be conducted in strict conformance with the existing ordinances of the City of Winston-Salem (or any other governing authority) and accepted safe practices relative to the storage and use of explosives.

Page 3-2, Article 300-4 Preparation of Pipe Foundation
Delete the last 2 sentences of the second paragraph.

Page 3-3, Article 300-7 Backfilling
Add the following to line 39:
Flowable fill, if approved, must not come in contact with the pipe.

Page 8-37, Article 858-3 Construction Methods
Add the following paragraph after the first paragraph:

The use of cast iron or steel fittings in the adjustment of manholes will not be permitted on this project except where it is considered by the Engineer to be in the best interest of the Department to allow rings to be used. When rings are permitted for the adjustment of manholes, the rings shall have satisfactory bearing on the existing manhole frames and 50 percent of the circumference shall be tack welded at four equally spaced locations as directed by the Engineer. If the existing covers do not fit the rings, furnish and install new covers at no additional expense to the Department.

Page 10-61, Article 1034-2, Plastic Pipe
Delete in its entirety. City does not allow PVC pipe in its gravity sewer system and there is no force main replacement included in this project.

Page 10-61, Article 1034-3, Concrete Pipe
Delete in its entirety. City does not allow new concrete pipe in its sewer system.

Page 10-61, Subarticle 1034-4 (A), Gravity Flow Sewer Pipe
Add the following sentences after the third paragraph:

Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). Pipe design laying condition will be Type 2, flat-bottom trench with backfill lightly consolidated to centerline of pipe. Pipe for sanitary sewer shall be minimum thickness Class 50.

The interior of ductile iron pipe for sanitary sewer will be lined with 40 mils of ceramic epoxy. All bells and spigots for ductile iron sanitary sewer pipe must be lined with a minimum of 8 mils of joint compound. The exterior of all ductile iron pipe shall be coated with a bituminous coating.

For fittings, all glands shall be ductile iron, not gray iron. Fittings shall have a minimum pressure rating of 250 psi. Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). “DI” or “Ductile” shall be cast on each fitting.

The interior of ductile iron fittings for sanitary sewer will be lined with 40 mils of ceramic epoxy. All bells and spigots for sanitary sewer ductile iron fittings must be lined with a minimum of 8 mils of joint compound. The exterior of all ductile iron fittings shall be coated with a bituminous coating. Ductile iron fittings coated on the interior and exterior with 8 mils of fusion-bonded epoxy in accordance with ANSI/AWWA C116 and ANSI/AWWA C550 are acceptable.

Restrained joint ductile iron pipe and fittings with a gripping gasket as the only means of restraint will not be allowed.

Page 10-61, Subarticle 1034-4 (B), Force Main Sewer Pipe
Delete in its entirety. There is no force main replacement in this project.

Page 10-62, Section 1034 Sanitary Sewer Pipe and Fittings
Add the following Article:

1034-5 Cast Iron Soil Pipe
All cast iron soil pipe and fittings will conform to ASTM A74 and be classified as SV (service weight). Single or double hub is acceptable. No-hub pipe shall not be used. All pipe and

fittings shall be uniformly coated with bituminous coating. Joints will be rubber gasket. Rubber gaskets shall conform to ASTM C564. 4" x 4" combination wye and eighth bends shall be short pattern -Fig. No. SV-32 by Charlotte Pipe and Foundry (or approved equal). 4" cleanouts shall consist of a 4" service weight cast iron ferrule (with 3" iron pipe size tap) and a 3" brass plug. The plug shall have a low raised square head (Southern Code). Cleanouts shall be Part Number 184 by Jumbo Manufacturing Company (or approved equal).

Page 10-62, Article 1036-2, Copper Pipe
In Paragraph 2, delete: "Use flared or"

Page 10-62, Article 1036-3, Plastic Pipe
Delete in its entirety.

Replace with: POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS (2 INCH ONLY): Pipe and fittings shall be manufactured and tested in the U.S.A. All two (2) inch PVC pipe shall have a hydrostatic minimum working pressure of 250 psi (SDR 17 or SDR 13.5) and pipe shall conform to ASTM D-2241 or the latest revision. PVC pipe shall have the National Sanitation Foundation (NSF) seal of approval. Pipe jointing shall be push on integral bell type with elastomeric joints and shall conform to ASTM D-3139. PVC pipe shall be furnished in standard lay lengths of twenty feet with one or both ends tapered for use with the integral bell. Any lubrication used shall conform to AWWA and the pipe manufacturer. Fittings shall be push on joint PVC with elastomeric joints and shall conform to ASTM D-3139. Fittings shall have a hydrostatic minimum working pressure of 200 psi (SDR 21). If, for any reason, the Engineer finds any or all PVC pipe unacceptable, the Contractor shall be responsible for obtaining acceptable pipe. The Engineer's acceptance or rejection of all pipe will be final.

Page 10-62, Article 1036-4, Steel Pipe
Delete Subarticle **(A) Water Pipe** in its entirety. City does not allow new steel pipe in its water system.

(B) Encasement Pipe
Add the following paragraph after the first paragraph:

Steel encasement pipe shall be smooth wall pipe with welded joints. The encasement pipe must be capable of withstanding highway loadings and must have an inside diameter which will allow the carrier pipe to be removed subsequently without disturbing the encasement pipe. Minimum wall thicknesses for steel encasement pipe are as follows: ENCASEMENT PIPE SIZE (Outside Diameter) WALL THICKNESS (NCDOT) 16" 0.250", 18" 0.250", 20" 0.250", 24" 0.250", 30" 0.312", 36" 0.375", 48" 0.500". Pipe diameter shall be as shown on the Engineer's drawings.

Page 10-63, Article 1036-5, Ductile Iron Pipe and Fittings
Add the following after the second paragraph:

Rubber gasket joints for pipe shall conform to ANSI A21.11 (AWWA C111). Pipe design laying condition will be Type 2, flat-bottom trench with backfill lightly consolidated to centerline of pipe. Ductile iron pipe for water shall be Pressure Class 350 for 3" – 16" and Pressure Class 250 for 18" and above.

The exterior of all ductile iron pipe and fittings shall be coated with a bituminous coating.

For fittings, all glands shall be ductile iron, not gray iron. Fittings shall have a minimum pressure rating of 250 psi. Rubber gasket joints shall conform to ANSI A21.11 (AWWA C111). “DI” or “Ductile” shall be cast on each fitting.

Page 10-63, Article 1036-5, Ductile Iron Pipe and Fittings
Add the following sentences to the third paragraph:

All retainer glands shall be wedge-action glands with torque-limiting twist off nuts. Glands shall be Megalug Series 1100 by EBAA Iron, Inc., Uni-Flange Series 1400 by Ford Meter Box Company, Inc., RomaGrip by Romac Industries, Inc., One-Lok Series SLDE by Sigma Corp., Stargrip Series 3000 by Star Pipe Products, Cam-Lock Series 111 by Smith-Blair, Inc., EZ Grip by SIP Industries, Tufgrip by Tyler Union, or approved equal.

Page 10-63, Article 1036-6, Fire Hydrants
Delete the following:
“Outlets shall have national standard fire hose coupling threads. Use fire hydrants with a minimum bury length of 36 inches.”

Add the following:
All fire hydrants shall be dry-barrel fire hydrants which comply with ANSI/AWWA C502. All hydrants will have a dry top with O-ring seals which permanently seal off the stem operating threads from water and keep the lubricant in. All hydrants shall be opened by turning the operating nut on top of the hydrant counterclockwise. The operating nut and cap nuts shall be pentagon-shaped, 1 ½” measured point to flat. The main valve shall be a compression type valve with a valve opening of 5 ¼”. Each hydrant will have two hose nozzles and one steamer nozzle. The 2 ½" hose nozzles shall have national standard threads. The steamer nozzle shall have a 5” integral Storz connection. The nozzle shall be fastened into the hydrant barrel by mechanical means, but shall not be leaded into the barrel. Nozzle caps shall be chained to the barrel. All hydrants will be furnished with a breakable traffic feature that will break upon impact. The feature shall consist of a breakable safety flange on the barrel and a breakable safety coupling in the main valve stem. Hydrants must have a bronze main valve seat ring that threads into a bronze drain ring. Each hydrant shall have at least two bronze drain outlets. All hydrants will have 6" mechanical joint base connections or the Alpha connection by American Flow Control unless otherwise specified by the Engineer. Hydrants shall be designed for a minimum working pressure of 250 psi. Assembled hydrants shall be subjected to hydrostatic tests of twice the rated working pressure in accordance with ANSI/AWWA C502. All exterior iron surfaces below ground level shall be covered with two coats of asphaltic varnish or fusion bonded epoxy. All exterior iron surfaces above ground level shall be painted yellow to the satisfaction of the Engineer. Yellow paint shall be Rust-Oleum 7446, Rust-Oleum V2148, Kimball Midwest 80-942, or manufacturer’s standard equivalent. All interior iron surfaces of the hydrant shoe which are in contact with water (including the lower valve plate and nut) shall be coated with a minimum of 8 mils of fusion bonded epoxy or liquid epoxy in accordance with ANSI/AWWA C550. All hydrants shall have a thrust or anti-friction washer in the operating area of the hydrant bonnet. A weather cap around the operating nut on top of the hydrant is required.

Hydrants accepted by the City of Winston- Salem are as follows:
(1) Super Centurion 250, manufactured by Mueller Company
(2) B-84-B-5, manufactured by American Flow Control
(3) K-81D Guardian, manufactured by Kennedy Valve Company
(4) Medallion, manufactured by Clow Valve Company

Page 10-63, Article 1036-7, Water Valves

(A) Gate Valves:
Delete in its entirety, and replace with the following:

All gate valves shall be resilient-seated gate valves which meet the specifications of ANSI/AWWA C509 or ANSI/AWWA C515. The valve body, bonnet and seal plate shall be coated on all exterior and interior surfaces with a minimum of 8-10 mils of fusion-bonded epoxy in accordance with ANSI/AWWA C550. The valve shall incorporate a guide system with guide lugs on the wedge or on the body. The wedge shall be gray or ductile iron, fully encapsulated with rubber (including guide lugs and stem nut holder). Non-rising stem valves shall have two O-ring seals above the stem thrust collar that can be replaced with the valve under pressure. Non-rising stem valves shall also have a thrust washer on the stem thrust collar. Valves used for buried service will have a non-rising stem, mechanical joint end connections, and a 2” square operating nut. The word “OPEN” and an arrow to indicate the direction of opening the valve shall be cast on the flanged base of the operating nut. Above ground valves, unless otherwise specified, will have an outside screw and yoke rising stem or a non-rising stem, flanged end connections, and a handwheel to operate the valve. The word "OPEN" and an arrow to indicate the direction of opening the valve shall be cast on the rim of the handwheel. All valves will open by turning the nut or handwheel counterclockwise. Valves installed in manholes will normally be considered to be buried service valves and valves installed in vaults will normally be considered to be above ground valves.

Resilient-seated gate valves shall be designed for a minimum working pressure of 250 psi. Each valve shall be seat tested at the rated working pressure and shell tested at twice the rated working pressure in accordance with ANSI/AWWA C509 - Section 5 or ANSI/AWWA C515 - Section 5. All valves shall be warranted for l0 years from date of purchase against defective materials and workmanship.

Gate valves furnished under these specifications must be manufactured by one of the following or approved equal:
(1) Clow Valve Company
(2) M & H Valve Company
(3) American Flow Control
(4) U.S. Pipe and Foundry Company
(5) Mueller Company
(6) Kennedy Valve Company

(B) Bronze Gate Valves:
Delete in its entirety, and replace with the following:

The use of bronze gate valves shall not be permitted.

(C) Tapping Valves:
Delete in its entirety and replace with the following:

Use tapping valves conforming to the special provision above for gate valves. The valve shall have an inlet flange (with centering ring) for connection to the flanged sleeve outlet.
Tapping valves furnished under these specifications must be manufactured by one of the following or approved equal:
(1) Clow Valve Company
(2) M & H Valve Company
(3) American Flow Control
(4) U.S. Pipe and Foundry Company
(5) Mueller Company
(6) Kennedy Valve Company

Page 10-63, Article 1036-8 Sleeves, Couplings and Miscellaneous
(A) Tapping Sleeves - Add the following after the first paragraph:

Tapping sleeves and valves shall be used for "wet" taps into existing water mains as indicated on the Engineer's drawings. The Contractor shall verify the type of material, size, etc., of the existing main prior to ordering the sleeve. The sleeve shall be a split sleeve with mechanical joint end connections and a flanged outlet.

All tapping sleeves and valves shall be water tested before the tap is made. Test pressure shall be 200 psi. All tapping sleeves and valves shall be installed level. The Engineer must be present during the entire tapping and testing process.

Tapping sleeves furnished under these specifications must be manufactured by one of the following or approved equal:
(1) Mueller Company
(2) American Flow Control
(3) Tyler Pipe Company
(4) U.S. Pipe and Foundry Company
(5) Kennedy Valve Company

Page 10-64, Article 1036-9, Service Line Valves and Fittings
Add the following to the first paragraph:

All corporation stops shall be made of brass. All brass fittings shall be manufactured in accordance with AWWA C800 and ASTM B-584. All brass components in contact with potable water must be made from CDA/UNS Brass Alloy C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. All fittings shall be UL classified to NSF/ANSI 61 and NSF/ANSI 372 standards and stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified. All corporation stops shall be of the ball valve type with AWWA inlet threads.

Page 10-64, Article 1036-9 Service Line Valves and Fittings
Add the following to the second paragraph:

Service saddles shall be used as follows:

Pipe Size	Maximum Size Direct Tap without Saddle
4"	3/4”
6”	1”
8”	1”
12”	1-1/2”

The saddle body shall be ductile iron with corrosion-resistant paint. The body shall have a CC threaded outlet. Attached to the body shall be double U-bolt straps. Straps, washers and nuts shall be Type 305 or Type 316 stainless steel. Saddles shall be F202-SSB by Ford, or 202SSU by Romac Industries, Inc.

Page 10-64, Article 1036-9 Service Line Valves and Fittings
Add the following paragraph after the third paragraph:

Use brass fittings manufactured in accordance with AWWA C800 and ASTM B-584. All brass components in contact with potable water must be made from CDA/UNS Brass Alloy C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. All fittings shall be UL classified to NSF/ANSI 61 and NSF/ANSI 372 standards and stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified.

Page 10-64, Section 1036 Water Pipe and Fittings
Add the following Articles:

1036-10 Retainer Glands
All retainer glands shall be wedge-action glands with torque-limiting twist off nuts. Glands shall be Megalug Series 1100 by EBAA Iron, Inc., Uni-Flange Series 1400 by Ford Meter Box Company, Inc., RomaGrip by Romac Industries, Inc., One-Lok Series SLDE by Sigma Corp., Stargrip Series 3000 by Star Pipe Products, Cam-Lock Series 111 by Smith-Blair, Inc., EZ Grip by SIP Industries, Tufgrip by Tyler Union, or approved equal.

1036-11 Casing Spacers
Casing spacers shall be made of Type 304 stainless steel (including risers and hardware). Each shell shall be PVC lined and shall have bolted flanges. Casing spacer runners shall be constructed of ultra-high molecular weight polymer (minimum 1-1/2” wide) with a friction coefficient of not more than 0.12. Risers shall be 10 gauge. Risers and runners for top and bottom shells shall be of equal height. With approval of the Engineer, unequal height risers and runners may be used to obtain proper grade for sanitary sewer mains. Casing spacers must be designed to ensure that only the runners of the spacer are in contact with the steel encasement pipe. The bell of the carrier pipe will not be allowed to be in contact with the encasement.

Casing spacers shall be manufactured by one of the following or approved equal:
(1) Cascade Waterworks Manufacturing Company

(2) Advance Products and Systems, Inc.
(3) BWM Company
(4) Black Widow by Spider Manufacturing, Inc.

Page 10-119, Article 1074-8 Steps
Replace with the following:

All manhole steps shall conform to current OSHA standards and ASTM C478. The approved step shall conform to the City of Winston-Salem detail drawing for "Polypropylene Manhole Step". All other steps must be approved by the Engineer prior to being installed.

Page 15-1, Article 1500-2 Cooperation with the Utility Owner
Add the following after the second paragraph:

The water and sewer utility owner is the City of Winston-Salem City/County Utilities Division (City). The contact person is Todd Lewis, PE, Senior Civil Engineer. He can be reached by phone at (336) 747-6842. All coordination with shutdowns and tie-ins to existing water and sewer facilities are to be coordinated through CCUC's main point of contact.

Page 15-2, Article 1500-7, Submittals and Records
Add the following after the third paragraph:

As a final measure required for acceptance, the Contractor shall clean and televise all sanitary sewer mains prior to requesting final inspection. The Contractor shall televise the entire sewer main and all service connections using standardized NASSCO (PACP, MACP, & LACP) practices, unless otherwise specified.

Two copies of the entire video inspection along with a properly formatted PACP standard exchange database shall be submitted to the Engineer on a data disc (DVD or flash drive).

Page 15-2, Article 1500-9 Placing Pipelines into Service
Add the following after the second paragraph:

Obtain approval from City prior to placing a new water line into service. Use backflow prevention assemblies for temporary connections to isolate new water lines from existing water line. A representative from City will witness all tests performed on their water facilities.

Obtain approval from City prior to placing a new sewer line into service. A representative from City will witness all tests performed on their sewer facilities.

Page 15-3, Article 1505-2 Materials:
Replace Line 12 with the following:

Use Class VI select material for foundation conditioning and bedding.

Page 15-4, Subarticle 1505-3 (C), Bedding:
Replace the first three (3) sentences with the following:

Stone bedding shall have a minimum thickness beneath the pipe of four inches (4") or one-eighth of the outside diameter of the pipe, whichever is greater. The required thickness shall be determined by the Engineer.

Page 15-4, Subarticle 1505-3 (E), Thrust Restraint:
Replace the fourth paragraph with the following:

Concrete thrust blocks shall be constructed as directed by the Engineer at all bends, tees, tapping sleeves, tapping saddles, reducers, plugs, etc. to provide restraint against thrust resulting from internal pressure. Any exceptions to this such as restrained joints or mechanical joints with retainer glands will be noted on the Engineer's drawings or otherwise specified. Thrust blocks will not be required for restrained joint pipe (exception - blocking will be required when connecting restrained pipe to existing pipe).

All thrust blocks will be constructed of a minimum of Class A concrete. Thrust blocks for bends, fire hydrants, tees and stub-outs shall be constructed in accordance with the City of Winston-Salem thrust block detail drawings.

Polyethylene shall be placed over all fittings before the concrete is poured. All nuts and bolts shall be clear of concrete so that the joint will be accessible. Plywood shall be used as forms for blocking. Concrete is to be poured only against stable undisturbed soil and should be allowed to set prior to any backfilling. Thrust blocks should be allowed to cure two days prior to pressure testing the water main. Higher strength concrete may be required when it is necessary to pressure test prior to the end of the two-day curing time.

Page 15-6, Subarticle 1510-3 (A), General
Replace the words "36" to 42" of cover" with "a minimum of 36" of cover".

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization
Add the following to second paragraph:

The backflow preventer must be approved by the City.

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization
Add the following to the fifth paragraph:

Prior to pressure testing and disinfection, the Contractor shall flush all water mains with a polyurethane foam pipe pig (minimum 5 pounds per cubic foot density) by Knapp Poly Pig, Inc. or approved equal. The pipe pig shall be propelled hydraulically through the mains at a rate sufficient to remove all foreign matter. Valves shall be operated in a manner which will direct the pipe pig toward the end of the main or a selected discharge point. The pig shall be removed through an open end of the main, a fitting, or through a fire hydrant which has the main valve seat ring removed. Flushing shall continue until the Engineer determines that the mains are free from all foreign matter. The Engineer must be present during the entire flushing process. Any work done without the Engineer's supervision will not be accepted.

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization
Add the following to the sixth paragraph:

The Engineer must be present during the entire sterilization process. Any work done without his supervision will not be accepted. Pounds of calcium hypochlorite for sterilization shall be as follows:

Pounds of Calcium Hypochlorite Required to Sterilize Water Mains with 100 Parts Per Million of Chlorine

Main Size	Pounds Per 1,000 Feet of Pipe
2”	0.2
4"	0.8
6”	1.8
8”	3.1
12”	7.0
16”	12.4
20”	19.4
24”	28.0
30”	43.9
36”	63.0

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization
Add the following to tenth paragraph:

The City must be notified prior to flushing. De-chlorination shall be accomplished using equipment by Pollard or approved equal. While the main is being flushed, all service connections shall be thoroughly flushed in order to disinfect each connection.

Page 15-6, Subarticle 1510-3 (B), Testing and Sterilization
Add the following before the last paragraph:

After final flushing and before the main is placed in service, a sample or samples shall be collected by City personnel from the line and tested for bacteriological quality. The City, upon 24 hours advance notice, will furnish the personnel and laboratory facilities to conduct the required bacteriological tests. No samples will be taken on Friday, the day before a holiday or on a holiday. The City will sample water from the pipes and test the water in their laboratory. Do not place the water lines into service until tests performed by the City are satisfactory.

Page 15-8, Subarticle 1515-3 (A), Valves
Add the following paragraph:

All existing valves larger than 12" that must be operated shall be operated by the City.

Page 15-8, Subarticle 1515-3 (B), Meters
Add the following paragraphs after the second paragraph:

For existing service connections being replaced:
Prior to connecting the dwelling or business to the new meter, the Contractor shall expose a portion of the water line from the dwelling or business to determine the material and have proper fittings for reconnection to the new meter box. After the new water line and connections have been pressure tested & disinfected & approved by the Engineer, the Contractor shall remove the existing meter and install it in the new yoke. The Contractor shall reconnect the dwelling or business side water line to the new meter box. This reconnection shall be directed by the Engineer and performed in a timely manner so that the dwelling or business is without water for a minimal time.

For relocated meters (with change to horizontal location):
The Contractor shall install a new meter box, angle valves, yoke, tee and ball valve as directed by the Engineer. The Contractor shall expose a portion of the water line from the dwelling or business to determine the material and have proper fittings for reconnection to the new meter box. At the approval of the Engineer, the Contractor shall remove the existing meter and install it in the new yoke. The Contractor shall reconnect the property side water line from the existing meter box to the new meter box. This reconnection shall be directed by the Engineer and performed in a timely manner so that the property is without water for a minimal amount of time. The Contractor shall remove and dispose of the existing meter box and yoke and backfill as shown on the plans or as directed by the Engineer.

For new and relocated 3/4” & 1” water connections, the Contractor shall install connection per the City of Winston-Salem detail drawing for “3/4” & 1” Water Connection (Without Curb & Gutter / Single Family)”.

Page 15-8, Article 1515-3 Construction Methods
Add the following Subarticle:

(H) Tapping Sleeves
Tapping sleeves and valves shall be used for "wet" taps into existing water mains as indicated on the Engineer's drawings. The Contractor shall verify the type of material, size, etc., of the existing main prior to ordering the sleeve. For taps on larger mains (24" and above), a saddle may be used in lieu of a sleeve, but only if the tap is less than or equal to half the size of the line to be tapped. All tapping sleeves and valves shall be water tested before the tap is made. Test pressure shall be 200 psi for 15 minutes without any drop in pressure. All tapping sleeves and valves shall be installed level. The Engineer must be present during the entire tapping and testing process.

Page 15-9, Article 1515-4, Measurement and Payment
Add the following after the first paragraph:

36”x6” tapping sleeves and valves, installed in accordance with the plans and provisions herein and accepted, will be measured and paid for at the contract unit price per each for “36”x6” Tapping Sleeve and Valve”. Such price and payments will be full compensation for all materials, labor, excavation, installation, sterilization, pressure testing, valve box installation with necessary extension pieces, backfilling, and incidentals necessary to complete the work as required.

Page 15-10, Article 1515-4, Measurement and Payment
Add the following pay item and pay unit to the Pay Item Table below Line 7:

Pay Item:	Pay Unit
36”x6” Tapping Sleeve and Valve	Each

Page 15-10, Article 1520-2, Materials
Delete the following sentence: “Use screw type plastic or brass cleanouts.”

Replace with the following: “Cleanouts shall be constructed of cast iron soil pipe with brass plug.”

Page 15-11, Article 1520-3, Construction Methods
Delete the third paragraph in its entirety. No PVC pipe is allowed on this project.

Add the following to the third sentence of the fifth paragraph: “or within fenced areas.”

Page 15-11, Article 1520-3, Construction Methods
Delete the following: “10%”

Replace with the following “18%-22%”

Page 15-11, Article 1520-3, Construction Methods
Delete the seventh paragraph in its entirety.

Replace with the following: The standard fall through manhole is 1” (0.08’) including 6” connections into a manhole.

Page 15-10, Article 1520-3 Construction Methods
Add the following:

Sewer connections shall be installed as shown on the appropriate City of Winston-Salem detail drawing. Wyes or taps will not be allowed within 5 feet of a manhole. Only one bend will be allowed for connecting the sewer connection to the sewer main. If more than one bend is needed (Ex: bored sewer connection), the road shall be open cut and the connection installed properly. Sewer connections shall be a maximum of 75 feet from the sewer main to the cleanout. Cleanouts shall be installed between property corners of the lot for which the connection is intended. Connections into manholes will require a flexible sleeve at the manhole. If approved by the Engineer, four-inch (4") connections will be allowed to spill into deep manholes. For connections which spill, the 4" pipe shall protrude a minimum of 4" and a maximum of 6" beyond the inside wall of the manhole. Connections into manholes must be at least 6" from the nearest manhole step. Six-inch (6") connections must connect into a manhole.

When installing new sewer connections intended to replace existing ones, the new sewer connection shall be of like size to the existing. Reconnection of the old connection to the new shall be performed by a qualified utility contractor or by a licensed plumbing contractor. The Contractor shall be responsible for all permits and inspections required for the reconnection.

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer
Add the following to the first paragraph:

"and City of Winston-Salem, North Carolina Department of Public Works Engineering Division."

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer
Under "(1) Pipe Installation", after the second paragraph, add the following:

Contractor shall provide labor, materials, and supervision to temporarily provide bypass pumping around the Contractor's work in accordance with the specific needs of the work. No interruption of sewage flow shall be permitted. Bypass operation shall be 24 hours per day during the period of Work. The bypassed flow shall be continuously monitored. The bypassing system shall not be shut down between shifts, on holidays or weekends, or during work stoppages.

Prior to the start of temporary bypass pumping, the Contractor will submit a Bypass Pumping Plan prepared, signed and sealed by a Professional Engineer licensed in the State of North Carolina that includes, at a minimum, the following:

- Staging areas for pumps.
- Sewer plugging method and types of plugs.
- Size and location of manholes or access points for suction and discharge hose or piping.
- Size of pipeline or conveyance system to be bypassed.
- Number, size, material, location and method of installation of suction and discharge piping.
- Bypass pump sizes, capacities, and number of each size to be provided on-site including all primary, secondary, and spare pumping units.
- Calculations of static lift, friction losses, and flow velocity (pump curves showing pump, operating range shall be submitted).
- System pressure for calculation of hydrostatic testing requirements.
- Downstream discharge plan.
- Method of protecting discharge manholes or structures from erosion and damage.
- Thrust and restraint block sizes and locations. Provide the details necessary to demonstrate the integrity of all suction and discharge piping including piping and fittings associated with all primary and secondary pumping units.
- Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
- Method of noise control for each pump and any additional equipment that is included in the Bypass Pumping Plan (pumps and generators shall keep the noise level below 70 dBA at 30 feet).
- Any temporary pipe supports and anchoring requirements.
- Access plans to all bypass pumping locations indicated on the drawings.
- Calculations for selection of bypass pumping pipe size.
- Schedule for installation of and maintenance of bypass pumping lines.
- Plan indicating location of bypass pumping pipe locations.
- Emergency plan for adverse weather and flooding for various phases of the Work.
- Contractor's plan for providing continuous monitoring of the bypass pumping operation as well as the monitoring persons' qualifications.

- Emergency Contact List: Provide list of three emergency contacts who are able to respond and be on site within two hours of contact. Provide name, cell phone, and email addresses. List shall be posted in a conspicuous location at the bypass pump location.

The Bypass Pumping Plan must be approved prior to the start of the work. The Contractor shall notify the City at least 48 hours prior to any bypassing or diverting of flow.
Contractor shall maintain on site, sufficient equipment and materials to ensure continuous and successful operation of the bypass systems. The Contractor shall maintain on site a sufficient number of valves, spare pumps, tees, elbows, connections, tools, sewer plugs, piping, fuel and/or back-up generator, and other parts or system hardware to ensure immediate repair or modification of any part of the system as necessary.

The Contractor shall be responsible for all bypass flows installed. The Contractor shall inspect the entire bypass pumping and piping system for leaks or spills on an hourly basis. No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in soil or groundwater contamination or any potential health hazards shall be permitted. In the event of any sewage spill, the Contractor shall notify Owner immediately and be responsible for the prompt cleanup and disinfecting of the spill per local and state requirements. The Contractor shall compensate the Owner for the cost of any fines levied as the result of a spill or unauthorized discharge.

Prior to operation, test each section of discharge piping with maximum pressure equal to 2.0 times the maximum operating pressure of system or 50 psi, whichever is greater. Notify Engineer at least 24 hours prior to testing. The line shall be sealed on the discharge end. The Contractor shall fill the line with water. The test shall run for a period of two hours. The line may be put in service if, after the two-hour period, the pressure has been maintained with no observable leaks.

The Contractor shall inspect the entire bypass pumping and piping system at a minimum of every hour. Keep written inspection log at each pumping location. The bypass system shall have a trained and qualified attendant on site 24 hours per day, 7 days per week to maintain the bypass pumping system from the start of bypass until the bypassing of the specific pipeline is no longer required. A float and dialer monitoring system is acceptable in place of a trained and qualified attendant. If used, the float and dialer system shall have a dual power source and a redundant system to send alarms. Bypass system shall be physically checked at least on a daily basis with float and dialer system. Contractor shall provide an on-site response from an alarm of less than two hours.

The bypass pumping system shall be cleaned and drained prior to being dismantled and moved to the next location. Upon completion of the bypass pumping operation, clean disturbed areas, restoring to original condition, including pavement restoration, at least equal to existing condition prior to start of work.

Page 15-11, Subarticle 1520-3 (A), Gravity Sanitary Sewer
Under "(2) Testing", delete in its entirety and replace with the following:

A low-pressure air test shall be performed by the Contractor after the pipeline is completely backfilled and before being placed into service. The Engineer must be present during the entire testing process. Any work done without their supervision will not be accepted.

(a) Low Pressure Air Testing Requirements:
The Contractor shall use an approved pressure gauge and perform the test in accordance with ASTM C-828. Each section of pipeline (including connections) between manholes will be tested by plugging the upstream manhole and the downstream manhole. By using mirrors, lights, etc., the Contractor must show the Engineer that the 2 plugs are at the proper location and that the line is clear between the plugs. Air is added to the line until the pressure is between 3.0 psi and 4.0 psi. If the pressure drops more than l.0 psi during the time shown on the chart below, the line is presumed to have failed the test. An obvious leak in any section will be corrected even if the section passes testing. The Contractor will be responsible for the complete removal of all plugs.

Air test time shall be as follows:

Minimum Air Test Time

Main Size	Time (minutes per l00 feet of pipe)
8”	1.5
10”	1.8
12”	2.1
15”	2.4
18”	2.7
21”	3.3
24”	3.9
27”	4.5
30”	5.1
36”	6.3
42”	7.6

No direct payment will be made for acceptance testing, as such work will be incidental to the installation of the pipe and/or service connections.

(b) Video Inspection:
As a final measure required for acceptance, the Contractor shall clean and televise all sanitary sewer mains prior to requesting final inspection. The Contractor shall televise the entire sewer main and all service connections using standardized NASSCO (PACP, MACP, & LACP) practices, unless otherwise specified below. The process shall begin at the upstream manhole for each segment, and proceed to the downstream manhole for that same segment. Connections shall be televised from the cleanout to the main. Video inspection may occur only after Record Drawings are accepted and approved by the City of Winston-Salem. Prior to beginning the process, a 24 hour notice must be given by the Contractor to the Engineer. Prior to video inspection in paved areas, structures must be raised to final grade and 2” of asphalt must be in place. The City will not accept video that is more than 180 days old unless approved by the Engineer.

The cameras used for inspection shall be ones specifically designed and constructed for sanitary sewer pipeline inspection. Lighting for the cameras shall be suitable to provide a clear color picture

of the entire periphery of the pipe. The cameras used for mains must be able to pan, tilt and zoom in order to allow for 360-degree viewing. The television system shall be equipped to indicate the camera travel distance in feet by display on the video viewing screen. All television equipment (camera, monitor, etc.) must be capable of producing picture quality which is satisfactory to the Engineer.

Within 2 hours of the video inspection, the Contractor shall clean the sewer mains and service connections with a high velocity water jet. All debris shall be collected in the downstream manhole and removed by the Contractor. Debris shall not be released into the existing sewer system. During the entire video process, the distance counter must be set at zero at each upstream manhole for each segment (set the counter at zero at the ground for each service connection). The Contractor will be required to pan and tilt at each manhole and at each service connection. The interior of each manhole must be marked with the manhole station (or manhole number) with paint or some other legible identifier (6” - 12” high letters or numbers). Each cleanout stack must be marked with the house number or the lot number. For mains, the Contractor will also be required to pan, tilt and zoom at all couplings, at all dates for ceramic-epoxy lined ductile iron pipe, and when any potential problems or abnormalities are noticed or suspected. Travel speed for the camera will be 15 - 30 feet per minute. The following video screen data will be required:

- Project name and project number
- Date of inspection
- Travel distance and time
- Station of start and end manholes
- Depth of start and end manholes
- Size of main
- Type of pipe

All above data shall be shown at the start and end manholes of each segment. While the camera is moving through the main and service connections, distance shall be the only data shown on the screen (top left or top right of screen).

For mains, a stream of water approximately 1” in width must be flowing during the entire video process. For service connections, a minimum of 5 gallons of water must be introduced into each cleanout stack just prior to the video process. In all cases, the flow must be shown on the bottom of the video screen.

Two copies of the entire video inspection along with a properly formatted PACP standard exchange database shall be submitted to the Engineer on a data disc (DVD or flash drive). A "properly formatted PACP standard exchange database" includes properly PACP coded defects (NASSCO version 6.x), proper media paths to associated video files, and all asset IDs used in the inspection must match what the submitted record drawings indicate for each asset. The video file shall be formatted to MPEG-4 (MP4) with software compatible and readable by the City of Winston-Salem. The City of Winston-Salem shall not be responsible for purchasing additional software necessary to view the video file. Each inspection (manhole to manhole or cleanout to main) shall be separated into its own chapter or file. In the event of a main inspection, the chapter or file shall be named to indicate the upstream manhole station or number and then the downstream manhole station or number (e.g. MH1-MH2). In the event of a service connection inspection, the

chapter or file shall be named to indicate the house number or lot number associated with the inspection. All file naming should match the identification numbers (manhole station or number, house number, or lot number) shown on the Record Drawings. The submitted video must have the ability to be viewed using fast forward and rewind.

Any video that does not clearly show the pipe and service connections will be rejected. In the event that repairs are made, the segment receiving the repairs shall be flushed and televised again. The Engineer must oversee the entire cleaning and televising process. Final approval of the video inspection will only be after the Engineer has reviewed the video in the office (videos will not be field approved).

No direct payment will be made for cleaning and video inspection, as such work will be incidental to the installation of the pipe and/or service connections.

Page 15-13, Article 1520-4, Measurement and Payment:
Add the following:

All materials, permits, and work performed to reconnect existing sewer services to new cleanouts will be considered incidental to the installation of Sanitary Sewer Clean-Out.

Page 15-14, Article 1525-2, Materials
In the first paragraph, add the following after the second sentence:

All manhole joints shall be sealed on the outside of the manhole with butyl adhesive tape (minimum 6" wide). When unstable subgrade is encountered, manholes shall be bedded on stabilization stone. Manholes on outfalls shall be built 24" above existing ground unless a Type "B" manhole is used or the manhole is in a yard. Precast reinforced concrete manholes used on right-of-way maintained by the North Carolina Department of Transportation must be approved the North Carolina Department of Transportation before being installed.

Page 15-14, Article 1525-2, Materials
First paragraph, delete the third sentence in its entirety.

Replace with the following: "Flexible manhole connectors shall conform to ASTM C923."

Page 15-14, Article 1525-2, Materials
On Line 10, add the following:

Connectors shall be manufactured by Press-Seal Gasket Corporation, Hamilton Kent, NPC Inc. or approved equal.

Page 15-14, Article 1525-2, Materials
Replace the second paragraph (Lines 12 – 16) with the following:

Type 1 manhole rings and covers will be made of cast iron and will conform to ASTM A48, Class 35B. In addition, all manhole rings and covers shall be designed to support an H-20 wheel load. All castings will conform to the shape and dimensions shown on the City of Winston- Salem detail

drawing for "Manhole Ring and Cover (Type 1)" and will be free from holes, cracks or any other defects. Rings and covers will have machined seats so that the cover will not rattle. Rings will weigh a minimum of 190 pounds and covers a minimum of 120 pounds. The name of the manufacturer and the part number shall be cast permanently on the ring and the cover. Castings that do not meet specifications shall be rejected. Type 2 manhole rings and covers shall meet all specifications for Type 1 rings and covers and shall conform to the City of Winston-Salem detail drawing for "Manhole Ring and Cover (Type 2)". Type 3 manhole rings and covers shall meet all specifications for Type 1 rings and covers, except that rings will weigh a minimum of 136 pounds and covers a minimum of 120 pounds. All rings and covers shall conform to the City of Winston-Salem detail drawing for "Manhole Ring and Cover (Type 3)".

Page 15-14, Article 1525-3, Construction Methods
In the second paragraph, first sentence, delete "resilient" and replace with "flexible".

Delete the second and third sentences in their entirety.

Page 15-14, Article 1525-3, Construction Methods
In the fifth paragraph, fourth sentence, delete "recommended but not required", and replace with "required, except for horseshoe (doghouse) manholes".

Page 15-15, Sub-Article 1525-3 (D), Testing
Replace with the following:

Each manhole constructed by the Contractor shall be vacuum tested by the Contractor after assembly of the manhole. Prior to testing, and as directed by the Engineer, the Contractor shall clean out each manhole without foreign material being discharged into the existing sanitary sewer system. The test shall be conducted in accordance with ASTM C-1244. The test shall be performed after all grade rings and rings and covers have been installed. After the testing equipment is in place, a vacuum of l0 inches of mercury shall be drawn on the manhole. The time for the vacuum to drop to 9 inches of mercury must be greater than the minimum time listed below:

Minimum Vacuum Test Time (Seconds)

Manhole Depth	Diameter of Manhole		
	4'	5'	6'
0' - 10'	60 sec.	75 sec.	90 sec.
10' - 15'	75 sec.	90 sec.	105 sec.
15' - 25'	90 sec.	105 sec.	120 sec.
25' - 30'	105 sec.	120 sec.	135 sec.

The Engineer shall be present during the entire testing process. Any subsequent repairs to manholes which fail the vacuum test must be made on the inside and outside of each manhole. The Contractor will be responsible for the complete removal of all plugs.

No direct payment will be made for vacuum testing of manholes, as such work will be incidental to the installation of the manhole.

Page 15-16, Subarticle 1530-3 (A), Abandoning Pipe
Add the following paragraph:

When abandoning water mains up to a main that is to remain in service, any valve or tee associated with the main to be abandoned shall be removed. A sleeve and any necessary piping shall be installed to reconnect the water main to remain in service. All other main line valves on abandoned water mains that are plugged and left in place shall be abandoned by removing the valve box. Hydrants connected to abandoned mains that are plugged and left in place shall also be abandoned by removing the hydrant and valve box. The work covered in this paragraph shall be considered incidental to the abandonment.

Page 15-17, Subarticle 1530-3 (C), Remove Water Meter
Replace the first sentence with the following:

Remove water meter by closing the corporation cock at the main and removing the lateral including the angle valve, setter and meter box.

Page 15-17, Subarticle 1530-3 (D), Remove Fire Hydrant
Replace the first paragraph with the following: "The work performed to remove a hydrant from a main to be left in service shall include removing the hydrant, valve box and hydrant tee. A sleeve and any necessary piping shall be installed to reconnect the water main to be left in service."

Replace the second paragraph with the following: "Removed hydrants shall be provided to the City."

Page 15-17, Article 1530-3 Construction Methods
Add the following Subarticle:

(E) Abandoning Sewer Connections
Sewer connections shall be abandoned by removing the cleanout stack (if one exists) and plugging the lateral at the base of the stack. If no cleanout exists, the Contractor shall plug the lateral at the right-of-way line.

Page 15-17, Article 1530-4 Measurement and Payment
After the fourth paragraph, add the following paragraph: "*Abandon Sewer Connections* will not be measured and paid."

Page 15-18, Article 1540-2, Materials
Add the following:

Item	Section
Casing Spacers	1036-11

Page 15-18, Subarticle 1540-3 (D), Carrier Pipe Installation
Replace the first paragraph with the following:

Carrier pipe installed through encasement shall be ductile iron flexible restrained joint pipe. Casing spacers are required and shall be placed at 10-foot intervals within the encasement. One spacer

shall be placed not more than 2 feet from each end of the encasement. Only the runners of the casing spacer shall be in contact with the encasement. The bell of the carrier pipe will not be allowed to be in contact with the encasement. The Engineer must be present to observe the entire installation of the carrier pipe.

Page 15-20, Subarticle 1550-4 (A), Bore and Jack
Add the following paragraphs after Line 44:

As the boring operation progresses, each new section of encasement pipe shall be butt-welded to the previously installed section. Voids are to be filled with a Portland cement grout consisting of one (1) part Portland cement grout to three (3) parts sand at sufficient pressure to insure there will be no settlement of the highway or railroad. In the event that an obstruction is encountered during the dry boring operation, the auger is to be withdrawn, the excess pipe cut off and capped, and the pipe abandoned by completely filling the void with Portland cement grout as described above.

Encasement pipe installed either trenchless or by open-cut shall be installed prior to laying the carrier pipe within 50 feet of either end of the encasement. The Contractor is responsible for using the methods and equipment needed to attain the alignment, grade and elevation shown on the Engineer's drawings. Any deviations shall be corrected at the Contractor's expense.

Additional attempts may be required at alternate locations as directed by the Engineer. The option to install the encasement by open-cutting shall not be permitted unless approved by the Engineer and, when applicable, the North Carolina Department of Transportation. If approved, open-cut encasement shall be installed per Section 1505 for excavation, trenching, pipe laying and backfill.

City of Winston-Salem Acceptable Product List:

Hydrants accepted by the City of Winston-Salem are as follows:
(1) Super Centurion 250, manufactured by Mueller Company
(2) B-84-B-5, manufactured by American Flow Control
(3) K -81D Guardian, manufactured by Kennedy Valve Company
(4) Medallion , Manufactured by Clow Valve Company

Gate valves furnished under these specifications must be manufactured by one of the following:
(1) Clow Valve Company
(2) M & H Valve Company
(3) American Flow Control
(4) U.S. Pipe and Foundry Company
(5) Mueller Company
(6) Kennedy Valve Company

Approved tapping saddles are as follows:
(1) American Flow Control
(2) U.S. Pipe and Foundry Company

Approved tapping sleeves are as follows:
(1) Mueller Company

(2) American Flow Control
(3) Tyler Pipe Company
(4) U.S. Pipe and Foundry Company
(5) Kennedy Valve Company

Approved tapping valves are as follows:
(1) Clow Valve Company
(2) M & H Valve Company
(3) American Flow Control
(4) U.S. Pipe and Foundry Company
(5) Mueller Company
(6) Kennedy Valve Company

All corporation cocks shall be: 3/4", 1", 1 1/2" and 2"- FB1000-G by Ford or 74701BT by McDonald.

Saddles shall be Model 202SSU by Romac Industries, Inc. or Model F202-SSB by Ford.

A. 3/4" Water Connection
1. Meter yoke- Y501 by Ford, H-5010 by Mueller or 14-1 by McDonald.
2. Angle ball valve with padlock wings- BA94-313W-G-NL by Ford (City side).
3. Angle ball valve without padlock wings- BA94-313-G-NL by Ford (property side).

B. 1" Water Connection
1. Meter Yoke - Y504 by Ford.
2. Angle ball valve with padlock wings- BA94-444W-G-NL by Ford- two required.

C. 1-1/2" Water Connection
Custom-setter with ball valve bypass and ball valves on inlet and outlet. (VBB76-12B-11-66-NL by Ford) as per City detail drawing.

D. 2" Water Connection
Custom-setter with ball valve bypass and ball valves on inlet and outlet (VBB77-12B-11-77-NL by Ford) as per City detail drawing.

METER BOXES (CAST IRON - 5/ 8" AND 1" METERS): Cast iron meter boxes furnished under these specifications shall be manufactured by one of the following:
(1) Sigma Corp.
(2) SIP Industries
(3) DSI International
(4) Star pipe Products
(5) Tri Cast Inc.

METER BOXES (POLYMER CONCRETE- 1 1/2" AND 2" METERS): Part numbers are as follows:
Box: PG2436B500
Cover: PG2436WAP1-50

Approved ductile iron flexible restrained joint pipe and fittings are as follows:
(1) Flex Ring by American
(2) TR-Flex by US Pipe
(3) TR-Flex by McWane

Approved flexible manhole connectors are as follows:
(1) Press-Seal Gasket Corporation
(2) Hamilton Kent

Approved manhole rings and covers are as follows:
(1) East Jordan Iron Works
(2) U.S. Foundry & Manufacturing Corp.

All interior linings for a sewer ductile iron pipe and fittings shall be Protecto 401™.

All butyl adhesive tape used for joint sealant on the exterior of manholes shall be EZ Wrap by Press-Seal Gasket Corporation.

All interior linings for ductile iron flexible restrained joint pipe and fittings shall be Protecto 401™.

Plan Sheet UC-3A, Steel Pile Pier Detail. The Contractor's attention is directed to this detail.

STEEL PILE PIERS:

For the proposed 8" sanitary gravity sewer line (PS500), install Steel Pile Piers per the details shown on Sheet UC-3D and to the depth shown on sheet UC-24 or to refusal, whichever is less. The locations of the proposed Steel Pile Piers are shown on Sheets UC-14, UC-15, and UC-24. All steel shall conform to the requirements of ASTM A992 Grade 50. All welds shall be by a certified welder. All steel members and straps will be power tool cleaned to a minimum of SSPC-SP3 and hot-dipped galvanized per ASTM A123. Bolts and washers shall be hot-dip galvanized per ASTM A153. All welds shall be grinded and coated with two (2) coats of a cold-applied galvanizing paint.

Measurement and Payment:

Payment for Steel Pile Piers, installed in accordance with the plans and provisions herein and accepted, will be measured and paid for at the contract unit price per each for "Steel Pile Pier". Such price and payment will be full compensation for furnishing all materials, installation, excavation, equipment including pile driving, backfilling, and incidentals necessary to complete the work as required.

Pay Item:	**Pay Unit**
Steel Pile Pier	Each

Plan Sheet UC-3H, 4" Combination Air Valve in Manhole. The Contractor's attention is directed to this detail.

The 4" Combination Air Valve in Manhole shall be installed in accordance with the applicable Special Provisions herein, as shown on the Utility Plans, and/or as directed by the Engineer.

4" Combination Air Valve

A. Description and Service

1. Valve shall have four functions of uninterrupted discharge of air/gas during filling, continuous discharge of dis-entrained pressurized air/gas, unrestricted vacuum break, and pipeline surge protection in a single chamber. Valves shall be anti-surge and antishock air release and vacuum break valves.
    a. The large orifice shall allow air to escape during pipeline filling and allow air intake during pipeline draining.
    b. The small orifice shall release air accumulations after the pipeline is filled, under pressure and in operation.
    c. The valve shall be equipped with an integral surge alleviation mechanism that automatically dampens surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns.

B. Construction and Design

1. The intake/discharge orifice area is equal to the nominal size of the valve, i.e., a 4" valve shall have 4" full flow inlet and 4" outlet. Area around the floats must equal equivalent are of inlet/outet.
2. Valve shall utilize solid unbreakable HDPE floats with EPDM O-Ring seals. Floats must not deform, leak or experience damage of any kind at twice the design pressure, with floats providing continuous discharge of pressurized air release without levers, pins, springs that can break.
3. Materials of Construction:
    a. 316 Stainless Steel Barrel, Flanges, Tie Rods, Nozzle and Fasteners. ABS Polylac Top Cover.
    b. Floats: High Density Polyethylene
4. Valve shall be capable of operating between a pressure range 7.25 - 276 psi.
5. Valve shall have a 10 year in-service warranty for all internal components.
6. The valves furnished shall be standard products in regular production by the manufacturer and shall have been in satisfactory and successful operation for a period of at least five (5) years.

C. Manufacturers:

1. Vent-O-Mat – Series RBX
2. Vent-Tech – Model WTR
3. Approved equal.

Gate Valve
Gate valve inside the Combination Air Valve Manhole shall meet the requirements of Section 1036-7(A) of the NCDOT Standard Specifications, and shall be resilient-seated type gate valve with hand-wheel operator and flanged ends.

Precast Concrete Manhole
The pressure relief valve manhole shall be an approved precast concrete manhole conforming to ASTM C-478. The precast manhole top slab shall be H-20 rated. Steps shall be cast into the interior wall of the manhole as shown on the plans.

Access Hatch
The aluminum access hatch shall have a 1/4 inch thick, one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor. The inside of the frame shall have a door-support ledge on two (2) sides. Both frame and ledge must be supported by a full bed of Class A concrete. The door panel shall be 1/4" aluminum diamond plate, reinforced to withstand a live H-20 uniform load. Door shall open to 90° and automatically lock with a T-316 stainless steel hold open arms with release handle. For ease of operation, door shall incorporate enclosed stainless steel compression spring assists. Door shall close flush with the frame. Hinges and all fastening hardware shall be T-316 stainless steel. Unit shall lock with a T-316 stainless steel slam lock with removable key and have a non-corrosive handle. Unit shall carry a lifetime guarantee against defects in material and/or workmanship.

Measurement and Payment:
Payment for 4” combination air valve in MH shall be per each valve, and paid for under the contract price for “4" Combination Air Valve in MH”. Such price and payments will be full compensation for all labor, materials, excavation, backfilling, and any incidentals necessary to complete the work, as required.

Pay Item:	**Pay Unit**
4” Combination Air Valve in MH	Each

KCI TECHNOLOGIES
ENGINEERS | PLANNERS | SCIENTISTS | CONSTRUCTION MANAGERS

General:

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

A. Duke Energy – Power (Distribution)
B. Duke Energy – Power (Transmission)
C. ATT Distribution
D. Century Link
E. Time Warner
F. Piedmont Natural Gas

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

The Contractor's attention is directed to Article 105.8 of the Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utility by Others Plans.

A) Duke Energy – Power (Distribution)
Contact Information: Patrick Sizemore
336-917-2522
Patrick.sizemore@duke-energy.com

1) See Utilities by Others Plans.
2) Work is broken into segments for relocations (See Clarification of segments)
3) Segment 1 will be completed by October 1, 2021
4) Segment 2 will be completed by January 1, 2023
5) Segment 3 will be completed by January 1, 2024

B) Duke Energy – Power (Transmission)
Contact Information: Franklin Scott Webb
526 South Church St.
Charlotte, NC 28202
704-382-4049
Franklin.Webb@duke-energy.com

1. See Utilities by Others Plans.
2. Duke Transmission will have Tower relocated by July 2021
3. Caution Note: The contractor shall place High Voltage Overhead Power signs inside the project limits. Do not assume the lines are grounded unless ground lines are in place and Duke Energy confirms lines are de-energized and grounded.

C) AT&T Distribution

Contact Information: Will Pace
Telics
336-391-4843
Wp678r@att.com

1. See Utilities by Others Plans.
2. Work is broken into segments for relocations. (See clarification of segments)
3. Segment 1 will be completed by February 1, 2022
4. Segment 2 will be completed by July 1, 2023
5. Segment 3 will be completed by July 1, 2024

D) North State

Contact Information: Casey Fox
336-821-8750
Casey.fox@nscom.com

1. See Utilities by Others Plans.
2. Work is broken into segments for relocations. (See clarification of segments)
3. North State is located within segment 3 and will be completed by June 1, 2024

E) Charter

Contact Information: Eric Vivod
1410 Trade Mart Blvd.
Winston Salem, NC 27127
336-231-6109
Eric.vivod@twcable.com

1. See Utilities by Others Plans.
2. Work is broken into segments for relocations. (See clarification of segments)
3. Segment 1 will be completed by December 1, 2021
4. Segment 2 will be completed by May 1, 2023
5. Segment 3 will be completed by April 1, 2024

F) Piedmont Natural Gas (PNG)

Contact Information: David Robertson
2300 lowery Street
Winston Salem, NC 27101
339-726-7769
david.robertson@piedmontng.com

1. See Utilities by Others Plans.
2. Work is broken into segments for relocations. (See clarification of segments)
3. Segment 1 will be completed by January 1, 2022
4. Segment 2 will be completed by July 1, 2023
5. Segment 3 will be completed by July 1, 2024

G) MCI

Contact Information: Brian Nisinger
Engineering Associates
935-L East Mountain Street
Kernersville, NC 27284
brian.nisinger@engineeringassociates.com

Stephen Castellani
Lamberts Cable
3302-528-3561

1. See Utilities by Others Plans.
2. Work for MCI will be in segment 3 only and will be completed by July 1, 2024

Clarification of Segments

Segment 1: -L- (Sta. 765+00 thru Sta. 836+32), -Y15-, Y-15REV, -Y16-, -Y16B-, -Y16DET-, -Y5B-, -Y15FLYAC- -Y15FLYCA, -Y15FLYBD-, -Y15RPA-, -Y15RPB-, -Y15RPC-, -Y15RPD-, -Y15LPA-

Segment 2: -L- (Sta. 733+00 thru Sta. 765+00), -Y8-

Segment 3: -L- (Sta. 692+32 thru Sta. 733+00), -Y1-, -Y1B-, -Y1DET-, -Y4-, -Y4A-, -Y4B-, -Y4DET-

Cell Tower Special Provision

The cellphone tower located on Parcel 50 in Segment 3 of this project will remain in its current location and will not be relocated for the construction of this project. Any facilities referenced to this special provision in the contract, servicing said tower that pose conflict to the construction of this project, shall be relocated from such conflict as necessary by July 1, 2024. Upon identification of any additional facilities not accounted for prior to the beginning of relocation, these facilities shall be relocated in as timely a manner as is reasonable to not delay the construction of Segment 3 of this project.

Utilities Involved with Cell Tower:

1. Verizon One Fiber - To be relocated or adjusted by MCI
    a. Anthony Hamilton – 919-775-4940
2. T-Mobile - To be relocated or adjusted by Duke Net / Charter
    a. Eric Vivod – 336-231-6109
3. AT&T - To be relocated or adjusted by AT&T
    a. Scott Powell – 336-473-3830
4. Sprint - To be relocated or adjusted by Duke Net / Charter
    a. Eric Vivod – 336-231-6109
5. Clearwire - To be relocated or adjusted by AT&T
    a. Scott Powell – 336-473-3830
6. Alltel - To be relocated or adjusted by Charter
    a. Eric Vivod – 336-231-6109
7. Duke Energy
    a. Patrick Sizemore - 336-917-2522

STABILIZATION REQUIREMENTS:

(3-11-2016)

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

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

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

SEEDING AND MULCHING: (West)

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

Shoulder and Median Areas

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

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 – June 1		**May 1 – September 1**	
100#	Tall Fescue	100#	Tall Fescue
15#	Kentucky Bluegrass	15#	Kentucky Bluegrass
30#	Hard Fescue	30#	Hard Fescue

25#	Rye Grain	10#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Serengeti
2nd Millennium	Essential	Kalahari	Shelby
3rd Millennium	Evergreen 2	Kitty Hawk 2000	Sheridan
Apache III	Falcon IV	Legitimate	Signia
Avenger	Falcon NG	Lexington	Silver Hawk
Barlexas	Falcon V	LSD	Sliverstar
Barlexas II	Faith	Magellan	Shenandoah Elite
Bar Fa	Fat Cat	Matador	Sidewinder
Barrera	Festnova	Millennium SRP	Skyline
Barrington	Fidelity	Monet	Solara
Barrobusto	Finelawn Elite	Mustang 4	Southern Choice II
Barvado	Finelawn Xpress	Ninja 2	Speedway
Biltmore	Finesse II	Ol' Glory	Spyder LS
Bingo	Firebird	Olympic Gold	Sunset Gold
Bizem	Firecracker LS	Padre	Taccoa
Blackwatch	Firenza	Patagonia	Tanzania
Blade Runner II	Five Point	Pedigree	Trio
Bonsai	Focus	Picasso	Tahoe II
Braveheart	Forte	Piedmont	Talladega
Bravo	Garrison	Plantation	Tarheel
Bullseye	Gazelle II	Proseeds 5301	Terrano
Cannavaro	Gold Medallion	Prospect	Titan ltd
Catalyst	Grande 3	Pure Gold	Titanium LS
Cayenne	Greenbrooks	Quest	Tracer
Cessane Rz	Greenkeeper	Raptor II	Traverse SRP
Chipper	Gremlin	Rebel Exeda	Tulsa Time
Cochise IV	Greystone	Rebel Sentry	Turbo
Constitution	Guardian 21	Rebel IV	Turbo RZ
Corgi	Guardian 41	Regiment II	Tuxedo RZ
Corona	Hemi	Regenerate	Ultimate
Coyote	Honky Tonk	Rendition	Venture
Darlington	Hot Rod	Rhambler 2 SRP	Umbrella
Davinci	Hunter	Rembrandt	Van Gogh
Desire	Inferno	Reunion	Watchdog
Dominion	Innovator	Riverside	Wolfpack II
Dynamic	Integrity	RNP	Xtremegreen
Dynasty	Jaguar 3	Rocket	
Endeavor	Jamboree	Scorpion	

Approved Kentucky Bluegrass Cultivars:

4-Season	Blue Velvet	Gladstone	Quantum Leap
Alexa II	Blueberry	Granite	Rambo
America	Boomerang	Hampton	Rhapsody
Apollo	Brilliant	Harmonie	Rhythm
Arcadia	Cabernet	Impact	Rita
Aries	Champagne	Jefferson	Royce
Armada	Champlain	Juliet	Rubicon
Arrow	Chicago II	Jump Start	Rugby II
Arrowhead	Corsair	Keeneland	Shiraz
Aura	Courtyard	Langara	Showcase
Avid	Delight	Liberator	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mercury	Sonoma
Bandera	Eagleton	Midnight	Sorbonne
Barduke	Emblem	Midnight II	Starburst
Barnique	Empire	Moon Shadow	Sudden Impact
Baroness	Envicta	Moonlight SLT	Total Eclipse
Barrister	Everest	Mystere	Touche
Barvette HGT	Everglade	Nu Destiny	Tsunami
Bedazzled	Excursion	NuChicago	Unique
Belissimo	Freedom II	NuGlade	Valor
Bewitched	Freedom III	Odyssey	Voyager II
Beyond	Front Page	Perfection	Washington
Blacksburg II	Futurity	Pinot	Zinfandel
Blackstone	Gaelic	Princeton 105	
Blue Note	Ginney II	Prosperity	

Approved Hard Fescue Cultivars:

Aurora II	Eureka II	Oxford	Scaldis II
Aurora Gold	Firefly	Reliant II	Spartan II
Berkshire	Granite	Reliant IV	Stonehenge
Bighorn GT	Heron	Rescue 911	
Chariot	Nordic	Rhino	

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

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

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

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

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

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

Approved Creeping Red Fescue Cultivars:

Aberdeen Boreal Epic Cindy Lou

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

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

Measurement and Payment

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

TEMPORARY SEEDING:

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

FERTILIZER TOPDRESSING:

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

SUPPLEMENTAL SEEDING:

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

MOWING:

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

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 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*.

RESPONSE FOR EROSION CONTROL:

Description

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

Section	Erosion Control Item	Unit
1605	Temporary Silt Fence	LF
1606	Special Sediment Control Fence	LF/TON
1615	Temporary Mulching	ACR
1620	Seed - Temporary Seeding	LB
1620	Fertilizer - Temporary Seeding	TN
1631	Matting for Erosion Control	SY
SP	Coir Fiber Mat	SY
1640	Coir Fiber Baffles	LF
SP	Permanent Soil Reinforcement Mat	SY
1660	Seeding and Mulching	ACR
1661	Seed - Repair Seeding	LB
1661	Fertilizer - Repair Seeding	TON
1662	Seed - Supplemental Seeding	LB
1665	Fertilizer Topdressing	TON
SP	Safety/Highly Visible Fencing	LF
SP	Response for Erosion Control	EA

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Response for Erosion Control	Each

MINIMIZE REMOVAL OF VEGETATION

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

STOCKPILE AREAS

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

ACCESS AND HAUL ROADS

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

CONSTRUCTION MATERIALS MANAGEMENT

(3-19-19) (rev. 04-24-19)

Description

The requirements set forth shall be adhered to in order to meet the applicable materials handling requirements of the NCG010000 permit. Structural controls installed to manage construction materials stored or used on site shall be shown on the E&SC Plan. Requirements for handling materials on construction sites shall be as follows:

Polyacrylamides (PAMS) and Flocculants

Polyacrylamides (PAMS) and flocculants shall be stored in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures designed to protect adjacent surface waters. PAMS or other flocculants used shall be selected from the NC DWR List of Approved PAMS/Flocculants The concentration of PAMS and other flocculants used shall not exceed those specified in the NC DWR List of Approved PAMS/Flocculants and in accordance with the manufacturer's instructions. The NC DWR List of Approved PAMS/Flocculants is available at:

https://files.nc.gov/ncdeq/Water%20Quality/Environmental%20Sciences/ATU/ApprovedPAMS4_1_2017.pdf

Equipment Fluids

Fuels, lubricants, coolants, and hydraulic fluids, and other petroleum products shall be handled and disposed of in a manner so as not to enter surface or ground waters and in accordance with applicable state and federal regulations. Equipment used on the site must be operated and maintained properly to prevent discharge of fluids. Equipment, vehicle, and other wash waters shall not be discharged into E&SC basins or other E&SC devices. Alternative controls should be provided such that there is no discharge of soaps, solvents, or detergents.

Waste Materials

Construction materials and land clearing waste shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (15A NCAC 13B). Areas dedicated for managing construction material and land clearing waste shall be at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. Paint 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.

All areas seeded and mulched shall be tacked with asphalt. Crimping of straw in lieu of asphalt tack shall not be allowed on this project.

WASTE AND BORROW SOURCES

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

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

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

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/ContractedReclamationProcedures.pdf

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

TEMPORARY DIVERSION

This work consists of installation, maintenance, and cleanout of *Temporary Diversions* in accordance with Section 1630 of the *Standard Specifications*. The quantity of excavation for installation and cleanout will be measured and paid for as *Silt Excavation* in accordance with Article 1630-3 of the *Standard Specifications*.

TEMPORARY EARTH BERMS:

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of temporary earth berms. The temporary earth berms shall be used to direct the flow of water to specific erosion control device(s), or to direct water flowing from offsite around/away from specific area(s) of construction.

Construction Methods

The Contractor shall install the temporary earth berms in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the earth berms shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Upon completion of the project, the temporary earth berms shall be removed. The earth material can be utilized in the filling of silt ditches and detention devices, or graded to match the existing contours and permanently seeded and mulched.

Measurement and Payment

The installation of the temporary earth berms will be paid for as *Borrow Excavation* as provided in Section 230 of the *Standard Specifications* or included in the lump sum price for grading.

Stabilization of the temporary earth berms will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the temporary earth berms.

CLEAN WATER DIVERSION

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of clean water diversions. The clean water diversions shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

The Contractor shall install the clean water diversions in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the excavated material shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Line clean water diversion with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven-gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*.

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

Stabilization of the excavated material will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the clean water diversions.

SAFETY FENCE AND JURISDICTIONAL FLAGGING

Description

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

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

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

Materials

(A) Safety Fencing

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

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

(B) Boundary Flagging

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

Construction Methods

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

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. Posts shall be installed a minimum of 2 ft. into the ground. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

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

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

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

(B) Boundary Flagging

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

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

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(5) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

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

Measurement and Payment

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

Payment will be made under:

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

PERMANENT SOIL REINFORCEMENT MAT:

Description

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall

be stitched together with UV stabilized polypropylene thread to form a permanent three-dimensional structure. The mat shall have the following minimum physical properties:

Property	Test Method	Value	Unit
Light Penetration	ASTM D6567	9	%
Thickness	ASTM D6525	0.40	in
Mass Per Unit Area	ASTM D6566	0.55	lb/sy
Tensile Strength	ASTM D6818	385	lb/ft
Elongation (Maximum)	ASTM D6818	49	%
Resiliency	ASTM D1777	>70	%
UV Stability *	ASTM D4355	≥80	%
Porosity (Permanent Net)	ECTC Guidelines	≥85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0	lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0	ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

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

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

Construction Methods

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

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

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item	Pay Unit
Permanent Soil Reinforcement Mat	Square Yard

SKIMMER BASIN WITH BAFFLES:

Description

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

Materials

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

Provide appropriately sized and approved skimmer device.

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

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

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

Wooden Stakes:

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

Steel Reinforcement Bars:

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

Staples:

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

Construction Methods

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

Install skimmer device according to manufacturer recommendations. Install 4” Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4” and 12” in length. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12” in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

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

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without

stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart.

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

Measurement and Payment

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

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

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

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

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

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

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

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

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

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

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

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

Payment will be made under:

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

TIERED SKIMMER BASIN WITH BAFFLES:

Description

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

Materials

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

Provide appropriately sized and approved skimmer device.

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

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

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

Wooden Stakes:

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

Steel Reinforcement Bars:

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

Staples:

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

Construction Methods

Excavate basins according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drain pipe and construct the primary spillways according to the Tiered Skimmer Basin Detail sheet in the erosion control plans. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*. Multiple upper basins, or Modified Silt Basins Type ‘B’ as labeled on the detail, may be required based on site conditions and as directed.

Install skimmer device according to manufacturer recommendations. Install 4” Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4” and 12” in length. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath

the skimmer device at bottom of basin. The pad shall be a minimum of 12” in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

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

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

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

Measurement and Payment

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

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

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

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

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

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

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

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

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

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

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

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

Payment will be made under:

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

WATTLES WITH POLYACRYLAMIDE (PAM)

Description

Wattles are tubular products consisting of excelsior fibers encased in synthetic netting. Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of wattles, matting installation, PAM application, and removing wattles.

Materials

Wattle shall meet the following specifications:

100% Curled Wood (Excelsior) Fibers
Minimum Diameter 12 in.

Minimum Density	2.5 lb/ft^3 +/- 10%
Net Material	Synthetic
Net Openings	1 in. x 1 in.
Net Configuration	Totally Encased
Minimum Weight	20 lb. +/- 10% per 10 ft. length

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

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

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environmental Quality Division of Water Resources web site as an approved PAM product for use in North Carolina.

Construction Methods

Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound
Wattle	Linear Foot

COIR FIBER WATTLES WITH POLYACRYLAMIDE (PAM)

Description

Coir Fiber Wattles are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting. Coir Fiber Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Coir Fiber Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of coir fiber wattles, matting installation, PAM application, and removing wattles.

Materials

Coir Fiber Wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12 in.
Minimum Density	3.5 lb/ft^3 +/- 10%
Net Material	Coir Fiber

Net Openings	2 in. x 2 in.
Net Strength	90 lbs.
Minimum Weight	2.6 lbs./ft. +/- 10%

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

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

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environmental Quality Division of Water Resources web site as an approved PAM product for use in North Carolina.

Construction Methods

Coir Fiber Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install coir fiber wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the coir fiber wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the coir fiber wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the coir fiber wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound
Coir Fiber Wattle	Linear Foot

WATTLE BARRIER

Description

Wattle barriers are tubular products consisting of excelsior fibers encased in natural or synthetic netting and used at the toe of fills or on slopes to intercept runoff. Wattle barriers are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation, maintenance and removing wattle barriers.

Materials

Wattle shall meet the following specifications:

Inner Material	100% Curled Wood (Excelsior) Fibers
Minimum Diameter	18"
Minimum Length	10 ft.
Minimum Density	2.9 lb./c.f.± 10%
Net Material	Synthetic
Net Openings	1" x 1"
Net Configuration	Totally Encased
Minimum Weight	5 lb./ft. ± 10%

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

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

Construction Methods

Align wattle barriers in an overlapping and alternating pattern. Excavate a trench the entire length of each wattle with a depth of 2" to 3" for the wattle to be placed. Secure wattle barriers to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the wattle barrier according to the detail provided in the plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

For wattle barriers used to reduce runoff velocity for large slopes, use a maximum spacing of 25 ft. for the barrier measured along the slope.

Maintain the wattle barriers until the project is accepted or until the wattle barriers are removed, and remove and dispose of silt accumulations at the wattle barriers when so directed in accordance with Section 1630 of the *Standard Specifications*.

Measurement and Payment

Wattle Barrier will be measured and paid as the actual number of linear feet of wattles installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the wattle barrier.

Payment will be made under:

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

TEMPORARY ROCK SILT CHECK TYPE A WITH EXCELSIOR MATTING AND POLYACRYLAMIDE (PAM)

Description

Temporary Rock Silt Checks Type A with Excelsior Matting and Polyacrylamide (PAM) are devices utilized in temporary and permanent ditches to reduce runoff velocity and incorporate PAM into the construction runoff to increase settling of sediment particles and reduce turbidity of runoff. Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of Temporary Rock Silt Checks Type A, matting installation, PAM application, and removing Temporary Rock Silt Checks Type A with Excelsior Matting and PAM.

Materials

Structural stone shall be class B stone that meets the requirements of Section 1042 of the *Standard Specifications* for Stone for Erosion Control, Class B.

Sediment control stone shall be #5 or #57 stone, which meets the requirements of Section 1005 of the *Standard Specifications* for these stone sizes.

Matting shall meet the requirements of Excelsior Matting in Subarticle 1060-8(B) of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each Temporary Rock Silt Check Type A. The PAM product used shall be listed on the North Carolina Department of Environmental Quality Division of Water Resources web site as an approved PAM product for use in North Carolina.

Construction Methods

Temporary Rock Silt Checks Type A shall be installed in accordance with Subarticle 1633-3(A) of the *Standard Specifications*, Roadway Standard Drawing No. 1633.01 and the detail provided in the plans.

Installation of matting shall be in accordance with the detail provided in the plans, and anchored by placing Class B stone on top of the matting at the upper and lower ends.

Apply PAM at a rate of 4 ounces over the center portion of the Temporary Rock Silt Checks Type A and matting where the water is going to flow over. PAM applications shall be done during construction activities and after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM until the project is accepted or until the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are removed, and shall remove and dispose of silt accumulations at the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Temporary Rock Silt Checks Type A will be measured and paid for in accordance with Article 1633-5 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the Temporary Rock Silt Checks Type A. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound

CULVERT DIVERSION CHANNEL:

Description

This work consists of providing a *Culvert Diversion Channel* to detour the existing stream around the culvert construction site at locations shown on the plans. Work includes constructing the diversion channel, disposing of excess materials, providing and placing geotextile liner, maintaining the diversion area in an acceptable condition, removing geotextile liner, backfilling diversion channel area with suitable material, and providing proper drainage when diversion channel area is abandoned.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

Grade channel according to the plans with channel surface free of obstructions, debris, and pockets of low-density material. Utilize suitable material and provide disposal area for unsuitable material.

Line channel with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp 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

Description

This work consists of furnishing, installing, maintaining, and removing an *Impervious Dike* for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed.

Materials

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious geotextile.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, and removal of the impervious dike.

Payment will be made under:

Pay Item	Pay Unit
Impervious Dike	Linear Foot

PUMP AROUND OPERATION:

Description

The work covered by this section consists of furnishing, installing, maintaining and removing any and all pump around systems used on this project. The Contractor shall install a pump around

system in locations as shown in the plans and in other locations approved by the Engineer. The pump around system shall provide a passageway for the stream flow around the work site.

The quantity of pump around systems may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work. See NCDOT *Best Management Practices for Construction and Maintenance Activities* manual for example pump around operation.

Materials

Item	Section
Special Stilling Basin	1639

Impervious Dike shall meet the specifications as provided elsewhere in this contract.

Pumps shall be of sufficient size to divert the stream flow around the work area, as approved by the Engineer.

Construction Methods

Install *impervious dike(s)* as shown on the plans or as directed. Pump water around the work site. If the water is turbid or exposed to bare soil, pump through a *special stilling basin*. Once the work is complete in an area remove the *impervious dike(s)* and pump system, and stabilize the area.

Measurement and Payment

Impervious Dike will be measured and paid for as provided elsewhere in this contract.

Special Stilling Basin will be measured and paid for in accordance with Article 1639-4 of the *Standard Specifications*.

Payment for pumping operations shall be considered incidental to the work of installing pipes and culverts. The pumping operations shall include but not be limited to, diverting the stream flow around the work area and pumping runoff from the work area into a stilling basin, special stilling basin or other sediment control device. No additional payment will be made for furnishing materials or maintenance of the pumping operations for the installation of pipes and culverts.

The above prices and payments will be full compensation for all work covered by this section including, but not limited to furnishing all of the necessary materials, construction, maintenance and removal of the impervious dike and pump around system.

TEMPORARY PIPE FOR CULVERT CONSTRUCTION

Description

This work consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction.

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passageway for the stream through the work-site. The minimum size requirements will be as stated on the erosion control plans.

Measurement and Payment

__" *Temporary Pipe* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Payment will be made under:

Pay Item	Pay Unit
__" Temporary Pipe	Linear Foot

COIR FIBER MAT

Description

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat with stakes, steel reinforcement bars or staples as directed.

Materials

Item	**Section**
Coir Fiber Mat	1060-14

Anchors: Stakes, reinforcement bars, or staples shall be used as anchors.

Wooden Stakes:

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

Steel Reinforcement Bars:

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

Staples:

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

Construction Methods

Place the coir fiber mat immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the mat with the soil. Unroll the mat and apply without stretching such that it will lie smoothly but loosely on the soil surface.

For stream relocation applications, take care to preserve the required line, grade, and cross section of the area covered. Bury the top slope end of each piece of mat in a narrow trench at least 6 in. deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. overlap. Construct check trenches at least 12 in. deep every 50 ft. longitudinally along the edges of the mat or as directed. Fold over and bury mat to the full depth of the trench, close and tamp firmly. Overlap mat at least 6 in. where 2 or more widths of mat are installed side by side.

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

Adjustments in the trenching or anchoring requirements to fit individual site conditions may be required.

Measurement and Payment

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

No measurement will be made for anchor items.

Payment will be made under:

Pay Item	**Pay Unit**
Coir Fiber Mat	Square Yard

FLOATING TURBIDITY CURTAIN

Description

This work consists of furnishing a *Floating Turbidity Curtain* to deter silt suspension and movement of silt particles during construction. The floating turbidity curtain shall be constructed at locations as directed.

Materials

The curtain material shall be made of a tightly woven nylon, plastic or other non-deteriorating material meeting the following specifications:

Property	Value
Grab tensile strength	*md-370 lbs *cd-250 lbs
Mullen burst stength	480 psi
Trapezoid tear strength	*md-100 lbs *cd-60 lbs
Apparent opening size	70 US standard sieve
Percent open area	4% permittivity 0.28 sec-1

*md - machine direction
*cd - cross machine direction

In the event that more than one width of fabric is required, a 6" overlap of the material shall also be required.

The curtain material shall be supported by a flotation material having over 29 lbs/ft buoyancy. The floating curtain shall have a 5/16" galvanized chain as ballast and dual 5/16" galvanized wire ropes with a heavy vinyl coating as load lines.

Construction Methods

The Contractor shall maintain the *Floating Turbidity Curtain* in a satisfactory condition until its removal is requested by the Engineer. The curtain shall extend to the bottom of the jurisdictional resource. Anchor the curtain according to manufacturer recommendations.

Measurement and Payment

Floating Turbidity Curtain will be measured and paid for as the actual number of square yards of curtain furnished as specified and accepted. Such price and payment will be full compensation for the work as described in this section including but not limited to furnishing all materials, tools, equipment, and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Floating Turbidity Curtain	Square Yard

STRUCTURE STONE:

Description

This work consists of furnishing, stockpiling, placing and maintaining approved stone used to construct rock cross-vanes, rock vanes, j-hook vanes, w-rock cross vanes, log vanes, root wad/log vanes, log cross vanes, root wad structures, rock cross vanes for step pools, channel blocks, double wing deflectors, single wing deflectors, stream crossings, rock energy dissipaters, constructed riffles, and for use in other locations as directed.

The quantity of stone to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of stone may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
No. 57 Stone	1005
Plain Riprap, Class A, B, 1, and 2	1042
Filter Fabric for Drainage, Type 2	1056

Boulders shall meet the requirements of Section 1042 of the Standard Specifications. Boulders of minimum dimension 48" x 36" x 24" (1200mm x 900mm x 600mm) shall be individually picked for use in the structures. Boulders shall be relatively flat on either side in the same dimension, preferably the long dimension.

Construction Methods

The Contractor shall place filter fabric and stone in locations and to the thickness, widths, and lengths as shown on the plans or as directed. All stone shall be placed to form a sediment and erosion control device, an in-stream structure, or a channel lining neatly and uniformly with an even surface in accordance with the contract and shall meet the approval of the Engineer.

Measurement and Payment

No. 57 Stone will be measured and paid as the actual number of tons (metric tons) that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. No. 57 stone that has been stockpiled will not be measured a second time.

Plain Riprap, Class __ will be measured and paid for in accordance with Subarticles 876- 5(B) and 876-6(B) of the Standard Specifications.

Filter Fabric for Drainage will be measured and paid for in accordance with Subarticles 876-5(C) and 876-6(C) of the Standard Specifications.

Boulders will be measured and paid for as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. Stone that has been stockpiled will not be measured a second time.

Such price and payment will be full compensation for all work covered by this section, including but not limited to furnishing, weighing, stockpiling, re-handling, placing, and maintaining the stone and disposal of any materials not incorporated into the project.

Payment will be made under:

Pay Item	**Pay Unit**
No. 57 Stone	Ton (Metric Ton)
Boulder	Ton (Metric Ton)

ROCK CROSS VANE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of rock cross vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10 of NCDOT 2018 Standard Specifications for Roads and Structures

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes shall be constructed in accordance with the Rock Cross Vane Detail shown in the plans or as directed. Two vanes, each approximately 1/3 of the stream channel's bankfull width, will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of both

vanes will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 10 percent. A vane running perpendicular to the stream's flow will connect the two outside vanes on the upstream end. Install header and footer rocks according to the detail and plate the upstream side with Geotextile, Type 2 and No. 57 stone. Voids between the header and footer rocks can be filled with hand placed Class A riprap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock cross vane shall be keyed into the bank at the downstream end as shown on the Rock Cross Vane Detail.

Measurement and Payment

Boulders will be measured and paid for as provided in the Structure Stone Special Provision.

No. 57 Stone will be measured and paid for as provided in the Structure Stone Special Provision.

Riprap, Class A will be measured and paid for as provided in the Structure Stone Special Provision.

Geotextile for Drainage, Type 2 will be measured and paid for as provided in the Structure Stone Special Provision.

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 construct the rock cross vanes.

CONCRETE WASHOUT STRUCTURE:
(12-10-20)

Description

Concrete washout structures are enclosures above or below grade to contain concrete waste water and associated concrete mix from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids, so that this material does not migrate to surface waters or into the ground water. These enclosures are not intended for concrete waste not associated with wash out operations.

The concrete washout structure may include constructed devices above or below ground and or commercially available devices designed specifically to capture concrete wash water.

Materials

Item	Section
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall meet the following minimum physical properties for low permeability; it shall consist of a polypropylene or polyethylene 10 mil think geomembrane. If the

minimum setback dimensions can be achieved the liner is not required. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

Construction Methods

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed.

Install temporary silt fence around the perimeter of the enclosure in accordance with the details and as directed if structure is not located in an area where existing erosion and sedimentation control devices are capable to containing any loss of sediment.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel. Install safety fence as directed for visibility to construction traffic.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

https://connect.ncdot.gov/resources/roadside/SoilWaterDocuments/ConcreteWashoutStructuredetail.pdf

Alternate details for accommodating concrete washout may be submitted for review and approval.

The alternate details shall include the method used to retain and dispose of the concrete waste water within the project limits and in accordance with the minimum setback requirements. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. Grade the earth material to match the existing contours and permanently seed and mulch area.

Measurement and Payment

Concrete Washout Structure will be paid for per each enclosure installed in accordance with the details. If alternate details or commercially available devices are approved, then those devices will also be paid for per each approved and installed device.

Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

Safety Fence shall be measured and paid for as provided elsewhere in this contract.

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

Payment will be made under:

Pay Item	Pay Unit
Concrete Washout Structure	Each

FABRIC INSERT INLET PROTECTION DEVICE (HIGH FLOW)

Description

This work shall consist of installing, maintaining, and removing *Fabric Insert Inlet Protection Device*, of the type specified, in inlet structures (catch basins, drop inlets, etc) in areas where asphalt or concrete may prevent the proper installation of a Rock Inlet Sediment Traps Type C, or as directed.

Materials

The product shall be a fabric inlet protection device composed of a fitted woven polypropylene geotextile double sewn with nylon thread. The *Fabric Insert Inlet Protection Device* shall be manufactured to fit the opening of the catch basin or drop inlet and will have two dump straps attached at the bottom to facilitate the emptying of the device and shall have lifting loops for lifting the device from the basin. The *Fabric Insert Inlet Protection Device* shall have a restraint cord approximately halfway up the bag to keep the sides away from the catch basin walls.

The stitching shall meet the following physical properties:

Physical	Test Method	English
Chapter 1 - Average Wide Width Strength	ASTM D-4884	165 lb/in

The fitted filter assembly shall have the following physical properties:

Physical	Test Method	English
Grab Tensile	ASTM D-4632	255 x 275 lbs
Minimum Puncture Strength	ASTM D-4833	125 lbs
Mullen Burst	ASTM D-3786	420 PSI
Minimum UV Resistance	ASTM D-4355	70 %.
Flow Rate	ASTM D-4491	200 gal/min/ft^2
Apparent Opening	ASTM D-4751	20 US Sieve
Permittivity	ASTM D-4491	1.5 sec^{-1}

Construction Methods

Strictly comply with manufacturer's installation instructions and recommendations. Maintenance shall include regular daily inspections and after each qualifying rain event. The *Fabric Insert Inlet Protection Device* shall be emptied, cleaned and placed back into the basin when it reaches 50% capacity or as directed.

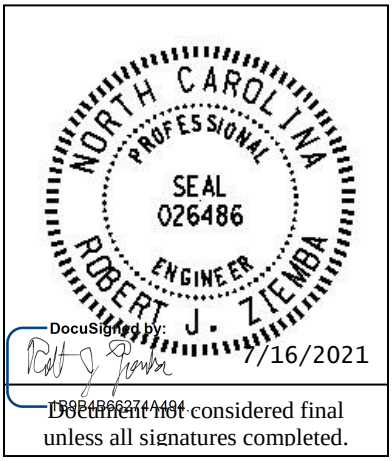
Measurement and Payment

This work will be paid for at the contract unit price per *Fabric Insert Inlet Protection Device* of the type specified, complete in place and accepted. Such payment shall be full compensation for furnishing and installing the *Fabric Insert Inlet Protection Device* in accordance with this specification and for all required maintenance.

Maintenance of the device, cleanout and disposal of accumulated sediments shall be paid for by *Fabric Insert Inlet Protection Device Cleanout*.

Payment will be made under:

Pay Item	**Pay Unit**
Fabric Insert Inlet Protection Device	Each
Fabric Insert Inlet Protection Device Cleanout	Each



U-2579AB

Signals and Intelligent Transportation Systems Project Special Provisions *(Version 18.5)*

Prepared By: IOU
16-Jul-21

Contents

1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read "Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications, Standard Drawings,* and the project plans."

Page 17-4, revise sentence beginning on line 21 to read "Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications, Standard Drawings*, and test requirements."

1.2. GENERAL REQUIREMENTS – Construction Methods (1700-3(M))

Page 17-4, Replace the sentence beginning on line 41 with "Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer."

1.3. WOOD POLES – Construction Methods (1720-3)

Page 17-18, revise sentence starting on line 13 to read "On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole."

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, wire outlet bodies, wire entrance fitting brackets and end caps when supplied as components of messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538) a minimum of 2.5 to 3.5 mils thick. Do not apply paint to the latching hardware, rigid vehicle signal head mounting brackets for mast-arm attachments, messenger cable hanger components or balance adjuster components.

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

Where required, provide polycarbonate signal heads and visors that comply with the provisions pertaining to the aluminum signal heads listed on the QPL with the following exceptions:

Fabricate signal head housings, end caps, and visors from virgin polycarbonate material. Provide UV stabilized polycarbonate plastic with a minimum thickness of 0.1 ± 0.01 inches that is highway yellow (Federal Standard 595C, Color Chip 13538). Ensure the color is incorporated into the plastic material before molding the signal head housings and end caps. Ensure the plastic formulation provides the following physical properties in the assembly (tests may be performed on separately molded specimens):

Test	Required	Method
Specific Gravity	1.17 minimum	ASTM D 792
Flammability	Self-extinguishing	ASTM D 635
Tensile Strength, yield, PSI	8500 minimum	ASTM D 638
Izod impact strength, ft-lb/in [notched, 1/8 inch]	12 minimum	ASTM D 256

For pole mounting, provide side of pole mounting assemblies with framework and all other hardware necessary to make complete, watertight connections of the signal heads to the poles and pedestals. Fabricate the mounting assemblies and frames from aluminum with all necessary hardware, screws, washers, etc. to be stainless steel. Provide mounting fittings that match the positive locking device on the signal head with the serrations integrally cast into the brackets. Provide upper and lower pole plates that have a 1 ¼-inch vertical conduit entrance hubs with the hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions, and can accommodate a minimum of ten Number 14 AWG conductors.

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
   - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

   (Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,
3. Evidence of conformance with the requirements of these specifications,

4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

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 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 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 2018 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 2018 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.

D. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

3. CONTROLLERS WITH CABINETS

3.1. 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

3.2. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -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

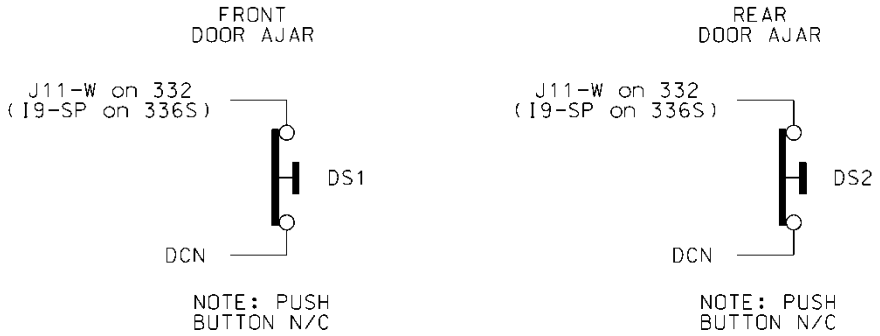
Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

- 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

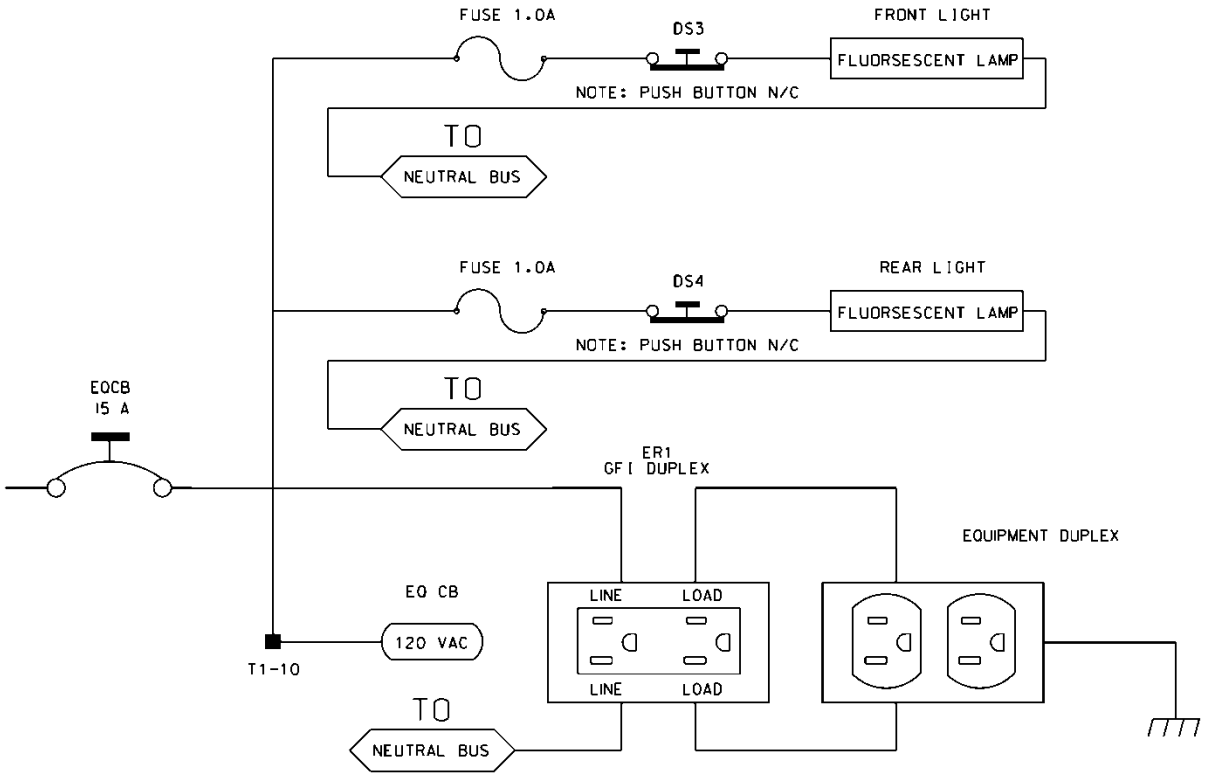
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

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.

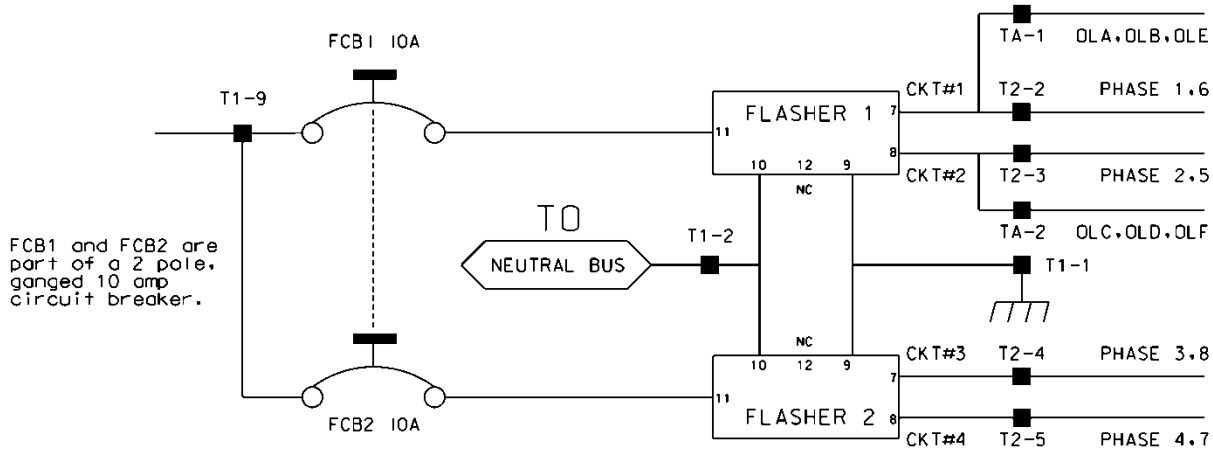
	P20 Connector				
PIN	**FUNCTION**	**CONN TO**	**PIN**	**FUNCTION**	**CONN TO**
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	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 2070L controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070L controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)
- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150 ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150 ms (210 mode).

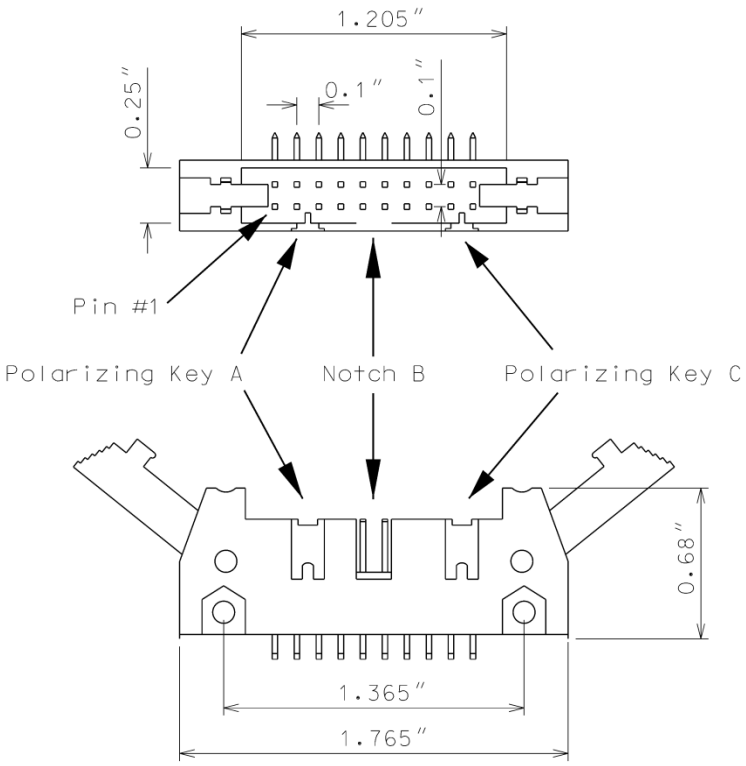
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17 ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered ‘Active’ at a voltage greater than 70 Vrms and ‘Not Active’ at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered ‘Active’ at a voltage less than 50 Vrms and ‘Not Active’ at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS’ 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right angle solder tails are designed for a 0.062” thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10” and pitch is 0.10”. Ensure the mating length of the connector pins is 0.24”. Ensure the pins are finished with gold plating 30µ” thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less than 250 ms. A Special Function input is undefined by these specifications and may or may not be

sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an "off" condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an "off" condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS' 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no "on" voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070 controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less than 700 ms when used with a 170 controller and 1200 ms when used with a 2070 controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:

   a) Red Enable input to monitor is active (Red Enable voltages are "on" at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and

   b) Neither Special Function 1 nor Special Function 2 inputs are active.

   c) Pin #EE (output relay common) is not active

2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1-second accuracy). If a channel fails to detect an "on" signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an "on" signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.

3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as "on" at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 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 10 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 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

FYAc mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
Flashing Yellow Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green
Green Arrow	Channel 9 Green	Channel 9 Yellow	Channel 10 Green	Channel 10 Yellow

If a FYA channel pair is enabled for FYA operation, the conflict monitor will monitor the FYA logical channel pair for the additional following conditions:

1. **Conflict:** Channel conflicts are detected based on the permissive programming jumpers on the program card. This operation remains unchanged from normal operation except for the solid Yellow arrow (FYA clearance) signal.
2. **Yellow Change Interval Conflict:** During the Yellow change interval of the Permissive Turn channel (flashing Yellow arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active. These conflicting channels shall be determined by the program card compatibility programming of the Permissive Turn channel (flashing Yellow arrow). During the Yellow change interval of the Protected Turn channel (solid Green arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active as determined by the program card compatibility programming of the Protected Turn channel (solid Green arrow).
3. **Flash Rate Detection:** The conflict monitor unit shall monitor for the absence of a valid flash rate for the Permissive turn channel (flashing Yellow arrow). If the Permissive turn channel (flashing Yellow arrow) is active for a period greater than 1600 milliseconds, ensure

the conflict monitor triggers and puts the intersection into flash. If the Permissive turn channel (flashing Yellow arrow) is active for a period less than 1400 milliseconds, ensure the conflict monitor does not trigger. Ensure the conflict monitor will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input. Provide a jumper or switch that will enable and disable the Flash Rate Detection function. Ensure that when the jumper is not present or the switch is in the OFF position the Flash Rate Detection function is enabled. Ensure that when the jumper is present or the switch is in the ON position the Flash Rate Detection function is disabled.

4. **Red Monitoring or Absence of Any Indication (Red Failure):** The conflict monitor unit shall detect a red failure if there is an absence of voltage on all four of the inputs of a FYA channel pair (RA, YA, FYA, GA).
5. **Dual Indications on the Same Channel:** The conflict monitor unit shall detect a dual indication if two or more inputs of a FYA channel pair (RA, YA, FYA, GA) are "on" at the same time.
6. **Short/Missing Yellow Indication Fault (Clearance Error):** The conflict monitor unit shall monitor the solid Yellow arrow for a clearance fault when terminating both the Protected Turn channel (solid Green arrow) interval and the Permissive Turn channel (flashing Yellow arrow) interval.

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

For conflict monitors used within an Ethernet communications system, provide a conflict monitor with an Ethernet 10/100 Mbps, RJ-45 port for data communication access to the monitor by a local notebook computer and remotely via a workstation or notebook computer device connected to the signal system local area network. The Ethernet port shall be electrically isolated from the conflict monitor's electronics and shall provide a minimum of 1500 Vrms isolation. Integrate monitor with Ethernet network in cabinet. Provide software to retrieve the time and date from a network server in order to synchronize the on-board times between the conflict monitor and the controller. Furnish and install the following Windows based, graphic user interface software on workstations and notebook computers where the signal system client software is installed: 1) software to view and retrieve all event log information, 2) software that will search and display a list of conflict monitor IP addresses and IDs on the network, and 3) software to change the conflict monitor's network parameters such as IP address and subnet mask.

For non-Ethernet connected monitors, provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070 controller or to a Department-furnished laptop computer. Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070). Furnish and connect a serial cable from the conflict monitor's DB-9 connector to Comm Port 1 of the 2070 controller. Ensure conflict monitor communicates with the controller. Provide a

Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	**Function**	**I/O**
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

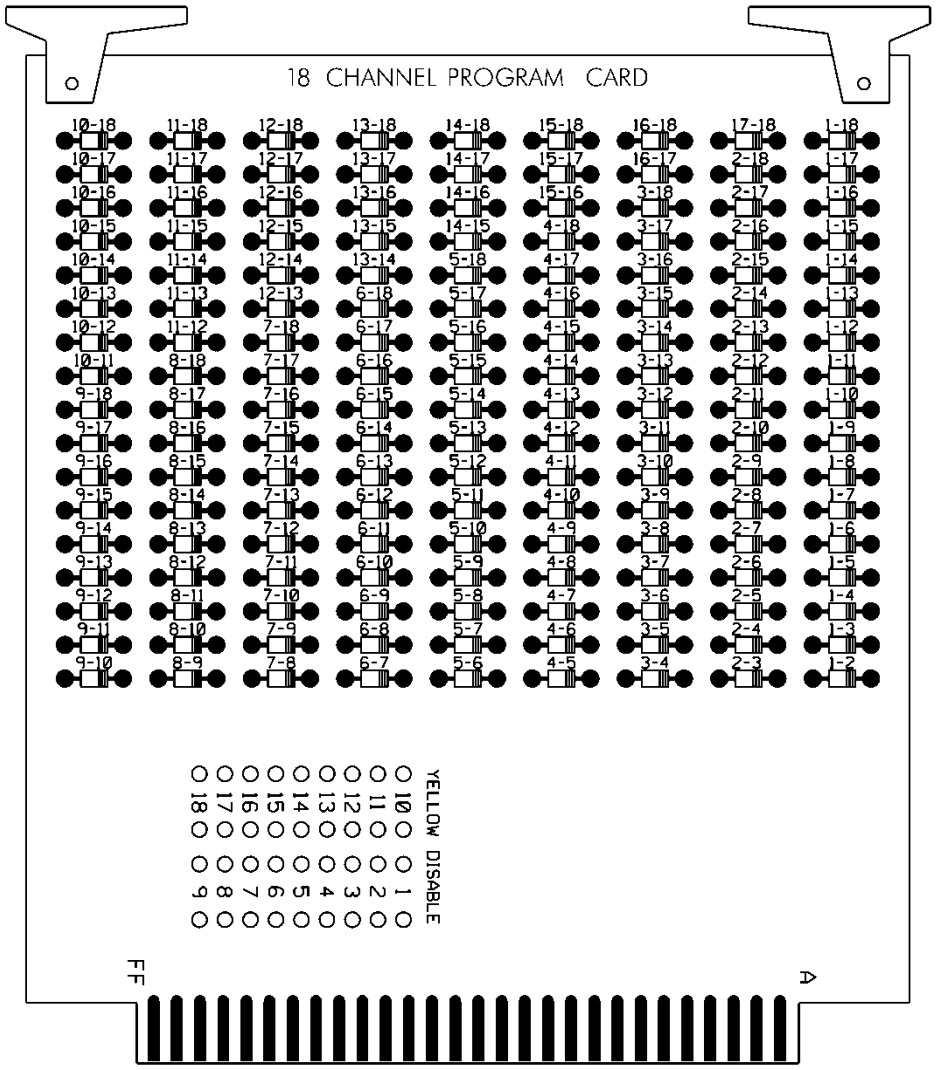
MONITOR BOARD EDGE CONNECTOR			
Pin #	**Function (Back Side)**	**Pin #**	**Function (Component Side)**
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output,Side #2,Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



3.3. 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.

3.4. MATERIALS – TYPE 2070E CONTROLLERS

Furnish model 2070E 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 2070E controllers with OS-9 release 1.3.1 or later with kernel edition #380 or later operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1E, CPU Module, Single Board, with 8Mb Datakey (blue in color)

- MODEL 2070-2E+, 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
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

4. VIDEO IMAGING LOOP EMULATOR DETECTOR SYSTEMS

4.1. DESCRIPTION

Design, furnish, provide training, and install video imaging loop emulator detection systems with all necessary hardware 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.

Relocate camera sensor units and 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.

Actual number of camera sensor units relocated with detection zones reconfigured 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
Relocate Camera Sensor 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 *2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications*. Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 (hereinafter called 6th Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi-sided cross section with no less than six sides. The sides may be straight, convex, or concave.

For bid purposes, pole heights shown on plans are estimated from available data. Prior to furnishing metal poles, use field measurements and adjusted cross-sections to determine whether pole heights will meet required clearances. If pole heights do not meet required clearances, the Contractor should immediately notify the Engineer of the required revised pole heights.

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

https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx

Comply with article 1098-1B of the *Standard Specifications* for submittal requirements. Furnish shop drawings for approval. Provide copies of detailed shop drawings for each type of structure as summarized below. Ensure shop drawings include material specifications for each component. Ensure shop drawings identify welds by type and size on the detail drawing only, not in table format. **Do not release structures for fabrication until shop drawings have been approved by NCDOT**.

Ensure shop drawings contain an itemized bill of materials for all structural components and associated connecting hardware.

Comply with article 1098-1A of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, signal or asset inventory number(s) and project number or work order number.

Summary of information required for metal pole review submittal:

Item	Electronic Submittal	Comments / Special Instructions
Sealed, Approved Signal or ITS Plan/Loading Diagram	1 set	All structure design information needs to reflect the latest approved Signal or ITS plans
Custom Pole Shop Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a 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 595 Grade A tubes. For structural steel shapes, plates, and bars use, as a minimum, ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent. Provide pole shafts of round or near round (18 sides or more) cross-section, or multi-sided tubular cross-section with no less than six sides, having a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single-ply plate or coil. For anchor base fabrication, conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Use the submerged arc process, or other NCDOT previously approved process suitable for shafts, to continuously weld pole shafts along their entire length. Finish the longitudinal seam weld flush with the outside contour of the base metal. Ensure shaft has no circumferential welds except at the lower end joining the shaft to the pole base. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 6th Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications.* No field welding on any part of the pole will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel poles and all assembly components in accordance with section 1076-3 of the *Standard Specifications*. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Galvanize hardware in accordance with section 1076-4 of the *Standard Specifications*. Ensure threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing in accordance with section 1076-7 of the Standard *Specifications. Ensure* all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring the Designer/Fabricator specifies connecting hardware and/or materials that prevent a dissimilar metal corrosive reaction.

Ensure each anchor rod is 2-inch minimum diameter and 60-inch length. Provide 10-inch minimum thread projection at the top of the rod, and 8-inch minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials complying with SP09_R005, hereinafter referred to as *Foundations and Anchor Rod Assemblies for Metal Poles*.

Ensure anchor bolt hole diameters are ¼-inch larger than the anchor bolt diameters in the base plate.

Provide a circular anchor bolt lock plate securing the anchor bolts at the embedded end with two (2) washers and two (2) nuts. Provide a base plate template matching the bolt circle diameter of the

anchor bolt lock plate. Construct plates and templates from ¼-inch minimum thick steel with a minimum width of 4 inches. Hot-dip galvanizing is not required for both plates.

Provide four (4) heavy hex nuts and four (4) flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material. Ensure anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

For each pole, provide a grounding lug with a ½-inch minimum thread diameter, coarse thread stud and nut that will accommodate #4 AWG ground wire. Ensure the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

Provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy stainless-steel chain that is long enough to permit cap to hang clear of the pole-top opening when cap is removed.

Where required by the plans, furnish couplings 42 inches above bottom of the pole base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1½-inch internally threaded half-couplings complying with the NEC, mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required hot-dip galvanizing. Provide a threaded plug in each mounting point. Ensure the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed slot that will accommodate a ½ “drive standard socket wrench.

Metal poles may be erected and fully loaded after concrete has attained a minimum allowable compressive strength of 3,000 psi.

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

When field drilling is necessary for wire or cable entrances into the pole, comply with the following requirements:

- Do not drill holes within 2 inches of any welds.
- Do not drill any holes larger than 3 inches in diameter without checking with the ITS & Signals Structure Engineers.
- Avoid drilling multiple holes along the same cross section of tube shafts.
- Install rubber grommets in all field drilled holes that wire, or cable will directly enter unless holes are drilled for installation of weather heads or couplings.
- Treat the inside of the drilled holes and repair all galvanized surfaces in accordance with Section 1076-7 of the latest edition of the *Standard Specification prior to installing grommets, caps, or plugs.*
- Cap or plug any existing field drilled holes that are no longer used with rubber, aluminum, or stainless-steel hole plugs.

When street lighting is installed on metal signal structures, isolate the conductors feeding the luminaires inside the pole shaft using liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or approved equivalent.. All conductors supplying power for luminaires must run through an external disconnect prior to entrance into the structure. Comply with applicable National Electrical Safety Codes (NESC). Refer to Article “G” Luminaire Arms.

Install a ¼-inch thick plate for a concrete foundation tag to include the following information: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation. Install galvanized wire mesh to cover gap between the base plate and top of foundation for debris and pest control. Refer to standard drawing M7 for further details.

Immediately notify the Engineer of any structural deficiency that becomes apparent in any assembly, or member of any assembly, because of the design requirements imposed by these specifications, the plans, or the typical drawings.

C. Design:

Unless otherwise specified, design all metal pole support structures using the following 6th Edition AASHTO specifications:

- Design for a 50-year service life as recommended by Table 3.8.3-2.
- Use wind pressure map developed from 3-second gust speeds, as provided in Section 3.8.
- Assume wind loads as shown in Figures 3.9.4.2-2 and 3.9.4.2-3 of the 6th Edition AASHTO for Group III loading with Ice.
- Ensure metal pole support structures include natural wind gust loading and truck-induced gust loading for fatigue design, as provided in Sections 11.7.1.2 and 11.7.1.3, respectively. Designs need not consider periodic galloping forces.
- Assume 11.2 mph natural wind gust speed in North Carolina. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) based on the yearly mean wind velocity of 11.2 mph.
- When selecting Fatigue Importance Factors, utilize Fatigue Importance Category II, as provided for in Table 11.6-1, unless otherwise specified.
- Calculate all stresses using applicable equations from Section 5. The Maximum allowable stress ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements. For CCTV support structures, ensure maximum deflection at top of pole does not exceed 2.0 percent of pole height.
- Assume the combined minimum weight of a messenger cable bundle (including messenger cable, signal cable and detector lead-in cables) is 1.3 lbs/ft. Assume the combined minimum diameter of the cable bundle is 1.3 inches.

Unless otherwise specified by special loading criteria, the following computed surface area for ice load on signal heads shall be used:

- 3-section, 12-inch, Surface area: 26.0 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:

Case 1 Circular or rectangular solid base plate with the upright pole welded to the top surface of base plate with full penetration butt weld, where no stiffeners are provided. A base plate with a small center hole, which is less than 1/3 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

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

M = bending moment at the critical section of the base plate induced by one (1) anchor bolt

P = anchoring force of each anchor bolt

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.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two (2) lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/3 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt is $M = P \times D_2$,

where P = anchoring force of each anchor bolt

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.

E. Mast Arm Poles:

Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details.

Fabricate metal arm shaft from coil or plate steel that meet the requirements of ASTM A 595 Grade A tubes. Provide arm 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, eliminating circumferential weld splices.

Use the submerged arc process, or other NCDOT previously approved process suitable for arm shafts, to continuously weld arm shafts along their entire length. The longitudinal seam weld shall be finished flush to the outside contour of the base metal. Ensure arm shaft has no circumferential welds except at the lower end joining the shaft to the arm flange plate. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 6th Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications*, except no field welding on any part of the arm shaft will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel arm shafts and all assembly components per section 1076 of the *Standard Specifications*. Design arm shafts with weep holes large enough and properly located to drain molten zinc during the galvanization process. Provide hot-dip galvanizing on steel arm shafts that meets or exceeds ASTM Standard A-123, AASHTO M111, or an approved equivalent. Perform repair of damaged galvanizing that complies with the following *Standard Specifications* article:

Repair of Galvanizing.....Article 1076-7

Ensure metal arm shafts permit cables to be installed inside arm shafts. For holes in arm shafts used to accommodate cables, provide full-circumference grommets. Wire access holes for arm flange plates should be deburred, non-grommeted, and oversized to fit around 4-inch diameter grommeted wire access holes for shaft flange plates.

Provide a minimum of four (4) 1-1/2" diameter high strength bolts for connection between arm plate and pole plate. Increase number of bolts to a minimum of six (6) 1-1/2" diameter high strength bolts when arm lengths are greater than 50'-0" long.

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 M4.

Provide a removable end cap with stainless steel attachment screws for the end of each mast arm. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to arm with a sturdy chain or cable approved by the Engineer. Ensure chain or cable is long enough to permit cap to hang clear of arm end opening when cap is removed.

Provide pole flange plates and associated gussets and fittings for attachment of required mast arms. As part of each mast arm attachment, provide a cable passage hole in pole to allow passage of cables from pole to arm. Provide a grommeted 4-inch diameter cable passage hole on the shaft side of the connection to allow passage of cables from pole to arm.

Furnish all arm plates and necessary attachment hardware, including bolts and brackets.

Provide two (2) extra bolts for each arm.

Provide arms with weatherproof connections for attaching to the pole shaft.

Provide hardware that is galvanized steel, stainless steel, or corrosive-resistant aluminum.

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.

Install horizontal-type arms with a manufactured rise preventing arm from deflecting below arm attachment height.

Ensure maximum angular rotation of the top of mast arm pole does not exceed 1 degree 40 minutes (1°40'). Ensure allowable mast arm deflection does not exceed that allowed per 6th Edition AASHTO. For all group load combinations specified under Section 3 of 6th Edition AASHTO, restrict tip of fully loaded arm from going below arm attachment point with the pole.

5.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI-318 code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. Design methods based on engineering publications or research papers must have prior approval from NCDOT. The Department reserves the right to accept or reject any method used for the analysis.

Use the following Safety Factors for the foundation design:

- 1.0 x Service (Unfactored) Loads for LPile Shaft Lateral Deflection
- 1.3 x Torsion (Unfactored) Load for Drilled Shaft Concrete and Steel Strength
- (1.3 / 1.33) x Torsion (Unfactored) Load for Shaft Soil-to-Concrete Torsion Capacity
- (2.0 / 1.33) x Axial (Unfactored) Load for Shaft Axial Capacity in Soil

Ensure deflection at top of foundation does not exceed 1 inch for worst-case lateral load.

Use LPILE Plus V6.0 or later for lateral analysis. Submit inputs, results and corresponding graphs with the design calculations.

Calculate skin friction using the α-method for cohesive soils and the β-method for cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the "α" and "β" methods can be found in *FHWA-NHI-10-016*.

Omit first 2.5 feet for cohesive soils when calculating skin friction.

Assume a hammer efficiency of 0.70 unless value is provided.

Design custom foundations to carry maximum capacity of each metal pole. For standard case strain poles with custom design, use actual shear, axial and moment reactions from the Standard Strain Pole Foundation Selection Table shown on Standard Drawing No. M8.

When poor soil conditions are encountered, which could create an excessively large foundation design, consideration may be given to allow an exemption to the maximum capacity design. The Contractor must gain approval from the Engineer before reducing a foundation's capacity. On projects where poor soil is known to be present, the Contractor should have foundation designs approved before releasing poles for fabrication.

Have the Contractor notify the Engineer if the proposed foundation is to be installed on a slope other than 8H: 1V or flatter.

A. Description:

Furnish and install foundations for NCDOT metal poles with all necessary hardware in accordance with the plans and specifications.

Metal Pole Standards have been developed and implemented by NCDOT for use at signalized intersections in North Carolina. If the plans call for a standard strain pole, then a standard foundation may be selected from the plans. However, the Contractor is not required to use a standard foundation. If the Contractor chooses to design a non-standard site-specific foundation for a standard strain pole or if the plans call for a non-standard site-specific pole, design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standard Drawings and Section B4 (Non-Standard Foundation Design) below. If non-standard site-specific foundations are designed for standard QPL approved strain poles, the foundation designer must use the design moment specified by load case on Metal Pole Standard Drawing Sheet M8. Failure to conform to this requirement will be grounds for rejection of the design.

If the Contractor chooses to design a non-standard foundation for a standard strain pole and the soil test results indicate a standard foundation is feasible for the site, the Contractor will be paid the cost of the standard foundation. Any additional cost associated with a non-standard site-specific foundation including additional materials, labor and equipment will be considered incidental to the cost of the standard foundation. All costs for the non-standard foundation design will be considered incidental to the cost of the standard foundation.

B. Soil Test and Foundation Determination:

1. General:

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

2. Soil Test:

Perform a soil test at each proposed metal pole location. Complete all required fill placement and excavation at each pole location to finished grade before drilling each boring. Soil tests

performed that are not in compliance with this requirement may be rejected and will not be paid. Drill one boring to a depth of 26 feet within a 25-foot radius of each proposed foundation.

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

- A total of 100 blows have been applied in any two consecutive 6-inch intervals.
- A total of 50 blows have been applied with < 3-inch penetration.

Describe each pole location along the project corridor in a manner that is easily discernible to both the Contractor's Designer and NCDOT Reviewers. If the pole is at an intersection, label the boring the "Intersection of (*Route or SR #*), *(Street Name)* and (*Route or SR #*), *(Street Name)*, _____ County, Signal or Asset Inventory No. _____". Label borings with "B- *N, S, E, W, NE, NW, SE or SW*" corresponding to the quadrant location within the intersection.

If the pole location is located between intersections, provide a coordinate location and offset, or milepost number and offset. Pole numbers should be made available to the Drill Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers. For each boring, submit a legible (hand-written or typed) boring log signed and sealed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at each depth, depth of the boring, hammer efficiency, depth of water table and a general description of the soil types encountered using the AASHTO Classification System.

Borings that cannot be easily correlated to their specific pole location will be returned to the Contractor for clarification; or if approved by the Engineer, the foundation may be designed using the worst-case soil condition obtained as part of this project.

3. Standard Foundation Determination:

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

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest\ Boring\ Depth}}{Total\ Number\ of\ N\ values}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest\ Boring\ Depth})^2$$

$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deeepest\ Boring\ Depth}$$

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

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/ITS-Design-Resources.aspx

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (Soil Test). Design drilled piers for side resistance in accordance with Section 4.6 of the *2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition*. Use computer software LPILE version-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use computer software gINT V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide a drilled pier foundation for each pole with a length and diameter resulting in horizontal lateral movement less than 1 inch at top of the pier, and horizontal rotational movement less than 1 inch at the edge of pier. Contact the Engineer for pole loading diagrams of standard poles used for non-standard foundation designs. Submit non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval, before construction.

C. Drilled Pier Construction:

Construct drilled pier foundation and Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Standard Special Provision SP09-R005 located at:

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

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 metal poles with single mast arms furnished, installed, and accepted.

Actual number of designs for mast arms with metal poles furnished 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 or CCTV support structures.

Payment will be made under:

Metal Strain Signal Pole .....Each
Metal Pole with Single Mast Arm .....Each
Mast Arm with Metal Pole Design .....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 or Division 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 traffic signal controllers as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 100 megabits per second from each remote ITS device location to the routing switches.

Contact the City or Division to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the Project IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum five (5) days working notice to allow the City or Division to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the City's or Division's existing 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 Field Ethernet Transceiver along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch and Field Ethernet Transceiver for deployment**. The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City Signal System network, monitoring software and Traffic Operations Center network hardware.** Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed

C. Standards:

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;
- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications;
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX;
- IEEE 802.3x standard regarding flow control with full duplex operation; and
- IFC 2236 regarding IGMP v2 compliance.
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3ad Ethernet Link Aggregation
- IEEE 802.3i for 10BASE-T (10 Mbit/s over Fiber-Optic)
- IEEE 802.3ab for 1000BASE-T (1Gbit/s over Ethernet)

- IEEE 802.3z for 1000BASE-X (1 Gbit/s Ethernet over Fiber-Optic)

D. Functional:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard.
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous).
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- A minimum 4-kilobit MAC address table.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP).
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of remote monitoring (RMON-1 & RMON-2) of the Ethernet agent.
- Support of the TFTP and 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.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full

or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5E unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

*Port Security***:** Ensure that the edge switch supports/complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access;
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward; and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

F. Management Capabilities:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and
- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

*Network Capabilities***:** Provide an edge switch that supports/complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON–I groups, at a minimum:
    - Part 1: Statistics
    - Part 2: History
    - Part 3: Alarm
    - Part 9: Event
- Provide support for the following RMON–2 groups, at a minimum:

- Part 13: Address Map
- Part 16: Layer Host
- Part 17:Layer Matrix
- Part 18:User History

- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet/CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

*Network Security***:** Provide an edge switch that supports/complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

G. Electrical Specifications:

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

H. Environmental Specifications:

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)

- IEC 61000-6-2 (generic industrial)
- EMF – FCC Part 15 CISPR (EN5502) Class A

I. Ethernet Patch Cable:

Furnish a factory pre-terminated/pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 5e or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB
- Return Loss: 10dB
- Propagation Delay: 548 nsec

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 5E and Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the Signal Shop a minimum of 5 days prior to installation for the most current edge switch IP Address, VLAN, subnet mask, default gateway and configuration files.

B. Edge Switch:

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the upper end of the right rear vertical rail of the equipment rack using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware and fasteners.

Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that has connectors on both ends, primarily used for interconnecting termination or patching facilities and/or equipment.

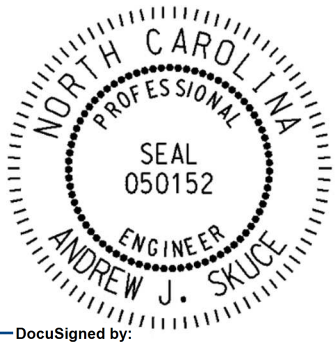
6.4. MEASURMENT AND PAYMENT

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, 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



Document not considered final unless all signatures completed.

Intelligent Transportation Systems
Project Special Provisions

Prepared By: AJS
19-Aug-21

Contents

1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read "Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications, Standard Drawings,* and the project plans."

Page 17-4, revise sentence beginning on line 21 to read "Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications, Standard Drawings,* and test requirements."

1.2. GENERAL REQUIREMENTS – Construction Methods (1700-3(M))

Page 17-4, Replace the sentence beginning on line 41 with "Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer."

1.3. WOOD POLES – Construction Methods (1720-3)

Page 17-18, revise sentence starting on line 13 to read "On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole."

2. METAL POLE SUPPORTS

2.1. METAL POLES

A. General:

Furnish and install metal poles, grounding systems, and all necessary hardware. Work covered under this special provision includes requirements for design, fabrication, and installation of standard and custom/site-specific designed metal pole supports and associated foundations.

Comply with applicable sections of the *2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications.* Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 (hereinafter called 6th Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi-sided cross section with no less than six sides. The sides may be straight, convex, or concave.

For bid purposes, pole heights shown on plans are estimated from available data. Prior to furnishing metal poles, use field measurements and adjusted cross-sections to determine whether pole heights will meet required clearances. If pole heights do not meet required clearances, the Contractor should immediately notify the Engineer of the required revised pole heights.

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

https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx

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

Comply with article 1098-1A of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, signal or asset inventory number(s) and project number or work order number.

Summary of information required for metal pole review submittal:

Item	Electronic Submittal	Comments / Special Instructions
Sealed, Approved Signal or ITS Plan/Loading Diagram	1 set	All structure design information needs to reflect the latest approved Signal or ITS plans
Custom Pole Shop Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a 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 595 Grade A tubes. For structural steel shapes, plates, and bars use, as a minimum, ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent. Provide pole shafts of round or near round (18 sides or more) cross-section, or multi-sided tubular cross-section with no less than six sides, having a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single-ply plate or coil. For anchor base fabrication, conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Use the submerged arc process, or other NCDOT previously approved process suitable for shafts, to continuously weld pole shafts along their entire length. Finish the longitudinal seam weld flush with the outside contour of the base metal. Ensure shaft has no circumferential welds except at the lower end joining the shaft to the pole base. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 6th Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications.* No field welding on any part of the pole will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel poles and all assembly components in accordance with section 1076-3 of the *Standard Specifications*. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Galvanize hardware in accordance with section 1076-4 of the *Standard Specifications*. Ensure threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing in accordance with section 1076-7 of the Standard *Specifications. Ensure* all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring the Designer/Fabricator specifies connecting hardware and/or materials that prevent a dissimilar metal corrosive reaction.

Ensure each anchor rod is 2-inch minimum diameter and 60-inch length. Provide 10-inch minimum thread projection at the top of the rod, and 8-inch minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials complying with SP09_R005, hereinafter referred to as *Foundations and Anchor Rod Assemblies for Metal Poles.*

Ensure anchor bolt hole diameters are ¼-inch larger than the anchor bolt diameters in the base plate.

Provide a circular anchor bolt lock plate securing the anchor bolts at the embedded end with two (2) washers and two (2) nuts. Provide a base plate template matching the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼-inch minimum thick steel with a minimum width of 4 inches. Hot-dip galvanizing is not required for both plates.

Provide four (4) heavy hex nuts and four (4) flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material. Ensure anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

For each pole, provide a grounding lug with a ½-inch minimum thread diameter, coarse thread stud and nut that will accommodate #4 AWG ground wire. Ensure the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

Provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy stainless-steel chain that is long enough to permit cap to hang clear of the pole-top opening when cap is removed.

Where required by the plans, furnish couplings 42 inches above bottom of the pole base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1½-inch internally threaded half-couplings complying with the NEC, mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required hot-dip galvanizing. Provide a threaded plug in each mounting point. Ensure the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed slot that will accommodate a ½ “drive standard socket wrench.

Metal poles may be erected and fully loaded after concrete has attained a minimum allowable compressive strength of 3,000 psi.

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

When field drilling is necessary for wire or cable entrances into the pole, comply with the following requirements:

- Do not drill holes within 2 inches of any welds.
- Do not drill any holes larger than 3 inches in diameter without checking with the ITS & Signals Structure Engineers.
- Avoid drilling multiple holes along the same cross section of tube shafts.
- Install rubber grommets in all field drilled holes that wire, or cable will directly enter unless holes are drilled for installation of weather heads or couplings.
- Treat the inside of the drilled holes and repair all galvanized surfaces in accordance with Section 1076-7 of the latest edition of the *Standard Specification prior to installing grommets, caps, or plugs.*
- Cap or plug any existing field drilled holes that are no longer used with rubber, aluminum, or stainless-steel hole plugs.

When street lighting is installed on metal signal structures, isolate the conductors feeding the luminaires inside the pole shaft using liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or

approved equivalent.. All conductors supplying power for luminaires must run through an external disconnect prior to entrance into the structure. Comply with applicable National Electrical Safety Codes (NESC). Refer to Article "G" Luminaire Arms.

Install a ¼-inch thick plate for a concrete foundation tag to include the following information: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation. Install galvanized wire mesh to cover gap between the base plate and top of foundation for debris and pest control. Refer to standard drawing M7 for further details.

Immediately notify the Engineer of any structural deficiency that becomes apparent in any assembly, or member of any assembly, because of the design requirements imposed by these specifications, the plans, or the typical drawings.

C. Design:

Unless otherwise specified, design all metal pole support structures using the following 6th Edition AASHTO specifications:

- Design for a 50-year service life as recommended by Table 3.8.3-2.
- Use wind pressure map developed from 3-second gust speeds, as provided in Section 3.8.
- Assume wind loads as shown in Figures 3.9.4.2-2 and 3.9.4.2-3 of the 6th Edition AASHTO for Group III loading with Ice.
- Ensure metal pole support structures include natural wind gust loading and truck-induced gust loading for fatigue design, as provided in Sections 11.7.1.2 and 11.7.1.3, respectively. Designs need not consider periodic galloping forces.
- Assume 11.2 mph natural wind gust speed in North Carolina. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) based on the yearly mean wind velocity of 11.2 mph.
- When selecting Fatigue Importance Factors, utilize Fatigue Importance Category II, as provided for in Table 11.6-1, unless otherwise specified.
- Calculate all stresses using applicable equations from Section 5. The Maximum allowable stress ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements. For CCTV support structures, ensure maximum deflection at top of pole does not exceed 2.0 percent of pole height.
- Assume the combined minimum weight of a messenger cable bundle (including messenger cable, signal cable and detector lead-in cables) is 1.3 lbs/ft. Assume the combined minimum diameter of the cable bundle is 1.3 inches.

Unless otherwise specified by special loading criteria, the following computed surface area for ice load on signal heads shall be used:

- 3-section, 12-inch, Surface area: 26.0 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.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two (2) lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/3 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt is $M = P \times D_2$,

where P = anchoring force of each anchor bolt

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. CCTV Poles:

Refer to Metal Pole Standard Drawing Sheets M2 and M3 for fabrication details.

Furnish hand hole covers attached to the pole by a sturdy chain or cable approved by the Engineer. Ensure chain or cable is long enough to permit cover to hang clear of the compartment opening when cover is removed and is strong enough to prevent vandalism. Ensure chain or cable will not interfere with service to cables in the pole shaft.

Furnish and Install the required Air Terminal & Lightning Protection System as described in the "Air Terminal & Lightning Protection System" Project Special Provisions and as referenced in the following Typical Details:

- CCTV Camera Installation for Metal Pole with Aerial Electrical Service
- CCTV Camera Installation for Metal Pole with Underground Electrical Service

Have poles permanently stamped above the hand holes with the identification tag details as shown on Metal Pole Standard Drawing Sheets M2 and M3.

Provide a 2-inch hole equipped with an associated coupling and weatherhead approximately 5 feet below top of pole to accommodate passage of CCTV cables from inside pole to CCTV camera.

Provide a 2-inch hole equipped with an associated coupling and conduit fittings/bodies approximately 18 inches above base of pole to accommodate passage of CCTV cables from CCTV cabinet to inside of pole. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Install CCTV metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Ensure the installed pole, when fully loaded, is within 0.5 degrees of vertical. Where required, use threaded leveling nuts to establish rake.

2.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI-318 code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. Design methods based on engineering publications or research papers must have prior approval from NCDOT. The Department reserves the right to accept or reject any method used for the analysis.

Use the following Safety Factors for the foundation design:

- 1.0 x Service (Unfactored) Loads for LPile Shaft Lateral Deflection
- 1.3 x Torsion (Unfactored) Load for Drilled Shaft Concrete and Steel Strength
- (1.3 / 1.33) x Torsion (Unfactored) Load for Shaft Soil-to-Concrete Torsion Capacity
- (2.0 / 1.33) x Axial (Unfactored) Load for Shaft Axial Capacity in Soil

Ensure deflection at top of foundation does not exceed 1 inch for worst-case lateral load.

Use LPILE Plus V6.0 or later for lateral analysis. Submit inputs, results and corresponding graphs with the design calculations.

Calculate skin friction using the α-method for cohesive soils and the β-method for cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the "α" and "β" methods can be found in *FHWA-NHI-10-016.*

Omit first 2.5 feet for cohesive soils when calculating skin friction.

Assume a hammer efficiency of 0.70 unless value is provided.

Design custom foundations to carry maximum capacity of each metal pole. For standard case strain poles with custom design, use actual shear, axial and moment reactions from the Standard Strain Pole Foundation Selection Table shown on Standard Drawing No. M8.

When poor soil conditions are encountered, which could create an excessively large foundation design, consideration may be given to allow an exemption to the maximum capacity design. The Contractor must gain approval from the Engineer before reducing a foundation's capacity. On projects where poor soil is known to be present, the Contractor should have foundation designs approved before releasing poles for fabrication.

Have the Contractor notify the Engineer if the proposed foundation is to be installed on a slope other than 8H: 1V or flatter.

A. Description:

Furnish and install foundations for NCDOT metal poles with all necessary hardware in accordance with the plans and specifications.

Metal Pole Standards have been developed and implemented by NCDOT for use at signalized intersections in North Carolina. If the plans call for a standard strain pole, then a standard foundation may be selected from the plans. However, the Contractor is not required to use a standard foundation. If the Contractor chooses to design a non-standard site-specific foundation for a standard strain pole or if the plans call for a non-standard site-specific pole, design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standard Drawings and Section B4 (Non-Standard Foundation Design) below. If non-standard site-specific foundations are designed for standard QPL approved strain poles, the foundation designer must use the design moment specified by load case on Metal Pole Standard Drawing Sheet M8. Failure to conform to this requirement will be grounds for rejection of the design.

If the Contractor chooses to design a non-standard foundation for a standard strain pole and the soil test results indicate a standard foundation is feasible for the site, the Contractor will be paid the cost of the standard foundation. Any additional cost associated with a non-standard site-specific foundation including additional materials, labor and equipment will be considered incidental to the cost of the standard foundation. All costs for the non-standard foundation design will be considered incidental to the cost of the standard foundation.

B. Soil Test and Foundation Determination:

1. General:

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

2. Soil Test:

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

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

- A total of 100 blows have been applied in any two consecutive 6-inch intervals.
- A total of 50 blows have been applied with < 3-inch penetration.

Describe each pole location along the project corridor in a manner that is easily discernible to both the Contractor's Designer and NCDOT Reviewers. If the pole is at an intersection, label the boring the "Intersection of (*Route or SR #*), *(Street Name)* and (*Route or SR #*), *(Street Name)*, _____ County, Signal or Asset Inventory No. _____". Label borings with "B- *N, S, E, W, NE, NW, SE or SW*" corresponding to the quadrant location within the intersection.

If the pole location is located between intersections, provide a coordinate location and offset, or milepost number and offset. Pole numbers should be made available to the Drill Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers. For each boring, submit a legible (hand-written or typed) boring log signed and sealed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at

each depth, depth of the boring, hammer efficiency, depth of water table and a general description of the soil types encountered using the AASHTO Classification System.

Borings that cannot be easily correlated to their specific pole location will be returned to the Contractor for clarification; or if approved by the Engineer, the foundation may be designed using the worst-case soil condition obtained as part of this project.

3. Standard Foundation Determination:

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

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest\ Boring\ Depth}}{Total\ Number\ of\ N\ values}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest\ Boring\ Depth})^2$$

$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deeepest\ Boring\ Depth}$$

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

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/ITS-Design-Resources.aspx

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (Soil Test). Design drilled piers for side resistance in accordance with Section 4.6 of the *2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition.* Use computer software LPILE version-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use computer software gINT V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide a drilled pier foundation for each pole with a length and diameter resulting in horizontal lateral movement less than 1 inch at top of the pier, and horizontal rotational movement less than 1 inch at the edge of pier. Contact the Engineer for pole loading diagrams of standard poles used for non-standard foundation designs. Submit non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval, before construction.

C. Drilled Pier Construction:

Construct drilled pier foundation and Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Standard Special Provision SP09-R005 located at:

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

2.3. POLE NUMBERING SYSTEM

A. New Poles

Attach an identification tag to each pole shaft section as shown on Metal Pole Standard Sheet M2 "Typical Fabrication Details for All Metal Poles."

2.4. MEASUREMENT AND PAYMENT

Actual number of metal strain signal poles (without regard to height or load capacity) furnished, installed and accepted.

Actual number of reused metal strain signal poles (without regard to height or load capacity) installed and accepted.

Actual number of designs for metal strain poles furnished and accepted.

Actual number of metal poles with single mast arms furnished, installed, and accepted.

Actual number of CCTV Metal Poles furnished, installed and accepted.

Actual number of soil tests with SPT borings drilled furnished and accepted.

Actual volume of concrete poured in cubic yards of drilled pier foundation furnished, installed and accepted.

No measurement will be made for foundation designs prepared with metal pole designs, as these will be considered incidental to designing Traffic Signal or CCTV support structures.

Payment will be made under:

CCTV Metal Pole .....Each

Soil Test.....Each

Drilled Pier Foundation.....Cubic Yard

3. ETHERNET EDGE SWITCH

Furnish and install a managed Ethernet edge switch as specified below that is fully compatible, interoperable, and completely interchangeable and functional within the existing City or Division traffic signal system communications network.

3.1. DESCRIPTION

A. Ethernet Edge Switch:

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for traffic signal controllers as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 100 megabits per second from each remote ITS device location to the routing switches.

Contact the City or Division to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the Project IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum five (5) days working notice to allow the City or Division to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the City's or Division's existing Network Management Software.

3.2. MATERIALS

A. General:

Ensure that the edge switch is fully compatible and interoperable with the trunk Ethernet network interface and that the edge switch supports half and full duplex Ethernet communications.

Furnish an edge switch that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

B. Compatibility Acceptance

The Engineer has the authority to require the Contractor to submit a sample Field Ethernet Switch and Field Ethernet Transceiver along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch and Field Ethernet Transceiver for deployment**. The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City Signal System network, monitoring software and Traffic Operations Center network hardware.** Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed

C. Standards:

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;
- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications;
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX;
- IEEE 802.3x standard regarding flow control with full duplex operation; and
- IFC 2236 regarding IGMP v2 compliance.
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3ad Ethernet Link Aggregation
- IEEE 802.3i for 10BASE-T (10 Mbit/s over Fiber-Optic)
- IEEE 802.3ab for 1000BASE-T (1Gbit/s over Ethernet)
- IEEE 802.3z for 1000BASE-X (1 Gbit/s Ethernet over Fiber-Optic)

D. Functional:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard.
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous).

- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- A minimum 4-kilobit MAC address table.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP).
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of remote monitoring (RMON-1 & RMON-2) of the Ethernet agent.
- Support of the TFTP and 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.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5E unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

*Port Security***:** Ensure that the edge switch supports/complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access;
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward; and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

F. Management Capabilities:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and
- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

*Network Capabilities***:** Provide an edge switch that supports/complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON–I groups, at a minimum:
  - Part 1: Statistics
  - Part 2: History
  - Part 3: Alarm
  - Part 9: Event
- Provide support for the following RMON–2 groups, at a minimum:
  - Part 13: Address Map
  - Part 16: Layer Host
  - Part 17:Layer Matrix
  - Part 18:User History
- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet/CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

*Network Security***:** Provide an edge switch that supports/complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

G. Electrical Specifications:

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

H. Environmental Specifications:

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)
- IEC 61000-6-2 (generic industrial)
- EMF – FCC Part 15 CISPR (EN5502) Class A

I. Ethernet Patch Cable:

Furnish a factory pre-terminated/pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 5e or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB
- Return Loss: 10dB
- Propagation Delay: 548 nsec

3.3. CONSTRUCTION METHODS

A. General:

Ensure that the edge switch is UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 5E and Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the Signal Shop a minimum of 5 days prior to installation for the most current edge switch IP Address, VLAN, subnet mask, default gateway and configuration files.

B. Edge Switch:

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the upper end of the right rear vertical rail of the equipment rack using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware and fasteners.

Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that has connectors on both ends, primarily used for interconnecting termination or patching facilities and/or equipment.

3.4. 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, power cord, mounting hardware, nuts, bolts, brackets, or edge switch programming as these will be considered incidental to furnishing and installing the edge switch.

Payment will be made under:

Ethernet Edge Switch ..... Each

4. DIGITAL CCTV CAMERA ASSEMBLY

4.1. DESCRIPTION

Furnish and install a Digital CCTV Camera Assembly as described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the video management software

currently in use by the Region and the Statewide Traffic Operations Center (STOC). Provide a Pelco Spectra Enhanced low light 30X minimum zoom, Axis Dome Network Camera low light 30X minimum zoom or an approved equivalent that meets the requirements of these Project Special Provisions.

Materials

A. General

Furnish and install new CCTV camera assembly at the locations shown on the Plans and as approved by the Engineer. Each assembly consists of the following:

- One dome CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories in a single enclosed unit
- A NEMA-rated enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing.
- Motorized pan, tilt, and zoom
- Built-in video encoder capable of H.264/MPEG-4 compression for video-over IP transmission
- Pole-mount camera attachment assembly
- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components.
- All necessary cable, connectors and incidental hardware to make a complete and operable system.

B. Camera and Lens

1. Cameras

Furnish a new CCTV camera that utilizes charged-coupled device (CCD) technology or Complementary Metal-Oxide-Semiconductor (CMOS) technology. The camera must meet the following minimum requirements:

- Video Resolution: Minimum 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Wide Dynamic Range (WDR) operation
- Electronic Image Stabilization (EIS)
- Automatic focus with manual override

2. Zoom Lens

Furnish each camera with a motorized zoom lens that is a high-performance integrated dome system or approved equivalent with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- 30X minimum optical zoom, and 12X minimum digital zoom
- Preset positioning: minimum of 128 presets

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

Communication Standards:

The CCTV camera shall support the appropriate NTCIP 1205 communication protocol (version 1.08 or higher), ONVIF Profile G protocol, or approved equal.

Networking Standards:

- Network Connection: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
    - Video 1: H.264 (Main Profile, at minimum)
    - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4, IP6
- 130 db Wide Dynamic Range (WDR)

The video camera shall allow for the simultaneous encoding and transmission of the two digital video streams, one in H.264 format (high-resolution) and one in H.264 or MJPEG format (low- resolution).

Initially use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The 10/100BaseTX port shall support half-duplex or full-duplex and provide auto negotiation and shall be initially configured for full-duplex.

The camera unit shall be remotely manageable using standard network applications via web browser interface administration. Telnet or SNMP monitors shall be provided.

C. Camera Housing

Furnish new dome style enclosure for the CCTV assembly. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass. The pendant must meet NEMA Type 4X, IP66 rating and use 1-1/2-inch NPT thread. The sustained operating temperature must be -50 to 60C (-58 to 144F), condensing temperature 10 to 100% Relative Humidity (RH).

D. Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit must be integral to the high-performance integrated dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units must meet or exceed the following specifications:

- Pan: continuous 360 Degrees rotation
- Tilt: up/down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: minimum of 128 presets
- Low latency for improved Pan and Tilt Control
- FCC, Class A; UL/cUL Listed

E. Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units must be built into the camera housing and require no additional equipment to transmit encoded video over IP networks.

Encoders must have the following minimum features:

- Network Interface: Ethernet 10/100Base-TX (RJ-45 connector)
- Protocols: IPv4, Ipv6, HTTP, UpnP, DNS, NTP, RTP, RTSP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface
- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p
- Aspect Ratio: 16:9
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps – 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

F. Control Receiver/Driver

Provide each new camera unit with a control receiver/driver that is integral to the CCTV dome assembly. The control receiver/driver will receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan/tilt unit, camera controls, and motorized lens. As a minimum, the control receiver/drivers must provide the following functions:

- Zoom in/out
- Automatic focus with manual override
- Tilt up/down
- Automatic iris with manual override
- Pan right/left
- Minimum 128 preset positions for pan, tilt, and zoom, 16 Preset Tours, 256 Dome Presets
- Up to 32 Window Blanks.

In addition, each control receiver/driver must accept status information from the pan/tilt unit and motorized lens for preset positioning of those components. The control receiver/driver will relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver/driver must accept “goto” preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan/tilt and motorized zoom lens to the correct

preset position. The preset commands from the camera control unit will consist of unique values for the desired pan, tilt, zoom, and focus positions.

G. Electrical

The camera assembly shall support Power-over-Ethernet (PoE) in compliance with IEEE 802.3. Provide any external power injector that is required for PoE with each CCTV assembly.

H. CCTV Camera Attachment to Pole

Furnish and install an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer.

Furnish CCTV attachments that allow for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather tight, seal that does not allow moisture to enter the enclosure.

Furnish a CCTV Camera Attachment Assembly that can withstand wind loading at the maximum wind speed and gust factor called for in these Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

I. Riser

Furnish material meeting the requirements of Section 1091-3 and 1098-4 of the 2018 Standard Specifications for Roads and Structures. Furnish a 1" riser with weatherhead for instances where the riser is only carrying an Ethernet cable. For installations where fiber optic cable is routed to the cabinet through a 2" riser with heat shrink tubing the Contractor may elect to install the Ethernet cable in the same riser with the fiber cable.

J. Data line Surge Suppression

Furnish data line surge protection devices (SPD) shall meet the following minimum requirements:

- UL497B
- Service Voltage: < 60 V
- Protection Modes: L-G (All), L-L (All)
- Response Time: <5 nanoseconds
- Port Type: Shielded RJ-45 IN/Out
- Clamping Level: 75 V
- Surge Current Rating: 20 kA/Pair
- Power Handling: 144 Watts
- Data Rate: up to 10 GbE
- Operating Temperature: -40º F to + 158º F
- Standards Compliance: Cat-5e, EIA/TIA 568A and EIA/TIA 568B
- Warranty: Minimum of 5-year limited warranty

The data line surge protector shall be designed to operate with Power Over Ethernet (POE) devices. The SPD shall be designed such that when used with shielded cabling, a separate earth ground is not required. It shall be compatible with Cat-5e, Cat 6, and Cat-6A cablings.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections.

K. POE Injector

Furnish POE Injectors meeting the following minimum performance requirements and that is compatible with the CCTV Camera and Ethernet Switch provided for the project.

- Working temp/humidity: 14º F to 131º F/maximum 90%, non-condensing
- Connectors: Shielded RJ-45, EIA 568A and EIA 568B
- Input Power: 100 to 240 VAC, 50 to 60 Hz
- Pass Through Data Rates: 10/100/1000 Mbps
- Regulatory: IEEE 802.3at (POE)
- Number of Ports: 1 In and 1 Out
- Safety Approvals: UL Listed

Ensure the POE Injector is designed for Plug-and-Play installation, requiring no configurations and supports automatic detection and protection of non-standard Ethernet Terminal configurations.

4.2. CONSTRUCTION METHODS

A. General

Obtain approval of the camera locations and orientation from the Engineer prior to installing the CCTV camera assembly.

Mount CCTV camera units at a height to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height is 45 feet above ground level unless specified elsewhere or directed by the Engineer.

Mount the CCTV camera units such that a minimum 5 feet of clearance is maintained between the camera and the top of the pole.

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

Install the data line surge protection device and POE Injector in accordance with the manufacturer's recommendations.

Install the riser in accordance with Section 1722-3 of the 2018 Standard Specifications for Roads and Structures. Install the Ethernet cable in the riser from the field cabinet to the CCTV camera.

B. Electrical and Mechanical Requirements

Install an "Air Terminal and Lightning Protections System" in accordance with the Air Terminal and Lightning Protection System Specification for the the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

4.3. General Test Procedure

Test the CCTV Camera and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

4.4. Compatibility Tests

A. CCTV System

Compatibility Tests are applicable to CCTV cameras that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The

Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

4.5. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. CCTV System

Final CCTV locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the camera assembly field site in accordance with the test plans and in the presence of the Engineer. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the camera, PTZ, camera control receiver, and control cabinet.
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the camera control address.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.
- Ensure camera field of view is adjusted properly and there are no objects obstructing the view.
- Ensure camera lens is dust-free.
- Ensure risers are bonded and conduits entering cabinets are sealed properly.
- Lightning arrestor bonded correctly.

Central Operations Testing

- Interconnect the CCTV Camera's communication interface device with one of the following methods as depicted on the plans:
    - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.

    OR

    - to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

4.6. MEASUREMENT AND PAYMENT

Digital CCTV Camera Assembly will be measured and paid as the actual number of digital CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for electrical cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, PoE Injectors, PoE Cable, Air Terminal and Lightning Protection System, compatibility testing, operational testing or any other equipment or labor required to install the digital CCTV assembly.

Payment will be made under:

Digital CCTV Camera Assembly .....Each

5. CCTV FIELD EQUIPMENT CABINET

5.1. DESCRIPTION

For standalone CCTV Camera installations, furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

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

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

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

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

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

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

5.2. MATERIALS

A. Shelf Drawer

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

B. Cabinet Light

Each cabinet must include two (2) fluorescent lighting fixtures (one front, one back) mounted horizontally inside the top portion of the cabinet. The fixtures must include a cool white lamp and must be operated by normal power factor UL-listed ballast. A door-actuated switch must be installed to turn on the applicable cabinet light when the front door or back door is opened. The lights must be mounted not to interfere with the upper door stay.

C. Surge Protection for System Equipment

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

1. Main AC Power Input

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

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must be provided with the following terminals:

- Main Line (AC Line first stage terminal).

- Main Neutral (AC Neutral input terminal).
- Equipment Line Out (AC line second state output terminal, 19 amps).
- Equipment Neutral Out (Neutral terminal to protected equipment).
- GND (Earth connection).

- The Main AC line in and the Equipment Line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid-state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must have an MOV similar solid-state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment.

2. Ground Bus

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

3. Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output

Output Power Capacity	480 Watts / 750 VA
Max Configurable Power	480 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5:1
Waveform Type	Sine wave

Output Connections	(4) NEMA 5-15R
Input	
Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V
Battery Type	
Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.	
Typical recharge time	2 hours
Communications & Management	
Interface Port(s)	DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs
Surge Protection and Filtering	
Surge energy rating	480 Joules
Environmental	
Operating Environment	-32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%
Conformance	
Regulatory Approvals	FCC Part 15 Class A, UL 1778

5.3. CONSTRUCTION METHODS

A. General

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

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

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

5.4. MEASUREMENT AND PAYMENT

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

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

Payment will be made under:

Field Equipment Cabinet.....Each

6. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

6.1. DESCRIPTION

Furnish an air terminal and lightning protection system that is comprised of items meeting UL 96 and UL 467 product standards for lightning protection and installed to be compliant with the National Fire Protection Association 780 Standards for Lightning Protection Systems. The lightning protection system shall consist of, as a minimum, an Air Terminal, vertical Air Terminal Base (wood pole) or Air Terminal Rod Clamps (metal pole), 28-Strand bare-copper lightning conductor, 4-point grounding systems (grounding electrodes), #4 AWG copper bonding conductors, marker tape and other miscellaneous hardware.

6.2. Materials

A. General

Reference the following Typical Details where applicable:

- CCTV Camera Installation for Metal Pole with Aerial Electrical Service
- CCTV Camera Installation for Metal Pole with Underground Electrical Service
- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

B. Wood Pole

Furnish a UL Listed Class II, copper clad minimum 48” long by ½” diameter air terminal. Ensure the air terminal has a tapered tip with a rounded point on one end and is threaded on the connection end with standard Unified Coarse (UNC) 13 threads per inch.

Furnish a copper vertical air terminal base that has internal threading to accept a ½” diameter air terminal with UNC 13 threads per inch. Provide a base that allows for a minimum ¼” mounting hole to secure the base to the vertical side of a wood pole. Ensure the air terminal base includes (2) 5/16” cap screws to secure the bare copper lightning conductor. Additionally, provide (2) ½” copper tube straps (conduit clamps) to secure the air terminal and bare copper lightning conductor to the pole.

C. Metal Pole

Furnish a UL Listed Class II, stainless steel minimum 48” long by ½” diameter air terminal with a tapered tip with a rounded point on one end. No threading is required on the opposing end.

Furnish an air terminal rod clamp manufactured out of 304 stainless steel. Ensure the air terminal rod clamp has two horizontal support arms that are 2” wide by 3/16” thick and design to

offset the air terminal approximately 8” away from the metal pole. Ensure the support arms at the point where the air terminal is to be installed has an internal crease to secure the air terminal along with four (4) bolts to provide the clamping action between the two support arms. Provide two (2) stainless steel banding clamps to secure the air terminal rod clamp’s base plate to the metal pole.

D. Copper Lightning Conductor and Ground Rods

Furnish a Class II rated copper lightning conductor which consists of 28 strands (minimum) of 15 AWG copper wires to form a rope-lay bare copper lightning conductor. Furnish 5/8” diameter, 10-foot-long copper-clad steel ground rods with a 10-mil thick copper cladding to serve as an integral part of the 4-point grounding system. Furnish irreversible mechanical clamps to secure the 28-strand lightning conductor, #4 AWG bare copper ground wires and grounding electrodes together to complete the grounding system.

6.3. Construction Methods

A. Wood Pole

Install the vertical air terminal base approximately 12” below the top of the wood pole and install the air terminal to the threaded connection on the base. Install a ½” copper tube strap (conduit clamp) over the air terminal, 6” from the top of the pole. Additionally, secure the copper lightning conductor under both 5/16” diameter cap screws located on the base. Install an additional ½” copper tube strap (conduit clamp) over the bare copper lightning conductor, 6” below the air terminal base. Locate the ¼” mounting hole on the vertical air terminal base and install a ¼” by 3” (minimum) long lag bolt through the base and into the wood pole to support the air terminal assembly.

Route the bare copper lightning conductor to maintain maximum horizontal separation from any risers that traverse up the pole. Secure the bare copper lightning conductor to the pole on 24” centers using copper cable clips. From the bottom of the pole (ground level) install a 2” by 10’ long PVC U-Guard over the bare copper lightning conductor to protect the cable from vandalism.

B. Metal Pole

Install two (2) stainless steel air terminal rod clamps to the side of the metal pole structure starting at 6” below the top of the pole with the second air terminal clamp 12” from the top of the pole (approximately 6” of separation between the 2 clamps). Secure each air terminal rod clamp to the pole structure with two (2) stainless steel banding clamps. Install the air terminal between the horizontal support arms on each air terminal rod clamp and tighten the bolts to provide a secure connection.

C. Copper Lightning Conductor and Ground Rods

Install the 4-point grounding system by installing a central grounding electrode that is surrounded by a minimum of three (3) additional grounding electrodes spaced approximately 20 feet away from the central grounding electrode and approximately 120 degrees apart. Interconnect each grounding electrode using a #4 AWG bare copper conductor back to the central grounding electrode using irreversible mechanical crimps. Additionally, using an irreversible mechanical crimp, connect the bare copper lightning conductor to the central grounding electrode. Install each grounding electrode and its corresponding #4 AWG bare copper grounding wire and 28 strand copper lightning conductor such that the wires are 24” below grade. Install marker tape 12” below grade and above all grounding conductors.

In instances where right-of-way does not allow for ground rod spacing as required above, reference the 2018 Roadway Standard Drawings - Section 1700.02 “Electrical Service Grounding” for “Limited Shoulder” or “Restricted Space” installation alternatives.

Prior to connecting the lightning protection system to an electrical service, perform a grounding electrode test on the lightning protection system to obtain a maximum of 20 ohms or less. Install additional grounding electrodes as need to obtain the 20 ohms or less requirement. The grounding electrode resistance test shall be verified or witnessed by the Engineer or the Engineer's designated representative.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than one ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method. Submit a completed inductive Loop & Grounding Test Form available on the Department's website.

6.4. Measurement and Payment

No measurement will be made for furnishing and installing the "Air Terminal and Lightning Protection System" as this will be considered incidental to "CCTV Metal Pole" & "CCTV Wood Pole" installations.

7. DYNAMIC MESSAGE SIGN (DMS)

7.1. DESCRIPTION

To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 or latest version software (also referred to hereinafter as the "Control Software"). Contact the engineer to inquire about the current version being used.

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

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the Project Plans.

Furnish operating Dynamic Message Signs, not limited to, the following types. Dimensions represent DMS sizes commonly used by the Department, other size DMS may be specified in the project plans.

DMS Naming Convention	
Type	Color
Type 1 – Front Access Type 2 – Walk-in Type 3 – Embedded Type 4 – Lane Control	A – Amber – 66mm C – Full Color – 20mm

- **DMS Type 1A** – Front Access Amber 66mm – 27 pixels high by 60 pixels wide
    - 3 lines, 10 characters per line, using 18" high characters.

- **DMS Type 1C** – Front Access Full Color 20mm – 96 pixels high by 208 pixels wide
    - 3 lines, 11 characters per line, using 18" high characters.
- **DMS Type 2A** – Walk-in Amber 66mm – 27 pixels high by 90 pixels wide
    - 3 lines, 15 characters per line, using 18" high characters.
- **DMS Type 2C** – Walk-in Full Color 20mm – 96 pixels high by 288 pixels wide
    - 3 lines, 15 characters per line, using 18" high characters.
- **DMS Type 3A** – Embedded Front Access Tri-color 66mm – 7 pixels high by 35 pixels wide
    - 1 line, 7 characters per line, using 18" high characters.
- **DMS Type 3C** – Embedded Front Access Full Color 20mm – 24 pixels high by 160 pixels wide
    - 1 line, 8 characters per line, using 18" high characters.
- **DMS Type 4C** – Lane Control Sign Full Color 20mm – 48- or 64-pixels square
    - 48 pixels high by 48 pixels wide
        - 1 line, 2 characters per line using 18" high characters
    - 64 pixels high x 64 pixel wide
        - 2 lines, 3 characters per line using 18" high characters

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

Use only approved DMS models listed on the NCDOT Qualified Products List (QPL) at the time of construction. NCDOT Qualified Products List can be accessed via official website at https://apps.ncdot.gov/products/qpl/

7.2. MATERIALS

A. Environmental Requirements

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

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2016.

B. Viewing Requirements for all DMS

Each line of text should be clearly visible and legible to a person with 20/20 corrected vision from a distance of 900 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

Any line must display equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height (unless otherwise noted in the plans) and composed from a luminous dot matrix.

C. Housing Requirements for all DMS

Construct the external skin of the sign housing out of aluminum alloy 5052 H32 that is a minimum of 1/8 inches thick for all walk-in DMS and 0.090-inch-thick for all front access or

embedded DMS. Ensure the interior structure is constructed of aluminum. Ensure that no internal frame connections or external skin attachments rely upon adhesive bonding or rivets. Ensure the sign housing meets the requirements of Section 3 of NEMA TS 4-2016.

Ensure that all drain holes and other openings in the sign housing are screened to prevent the entrance of insects. Design and construct the DMS unit for continuous usage of at least 20 years. Ensure that the top of the housing includes multiple steel lifting eyebolts or equivalent hoisting points. Ensure hoist points are positioned such that the sign remains level when lifted. Ensure that the hoist points and sign frame allow the sign to be shipped, handled, and installed without damage. Ensure all external assembly and mounting hardware, including but not limited to; nuts, bolts, screws, and locking washers are corrosion resistant galvanized steel and are sealed against water intrusion. Ensure all exterior housing surfaces, excluding the sign face, and all interior housing surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum. Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist. Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet. Do not paint the stainless-steel bolts on the Z-bar assemblies used for mounting the enclosure.

D. Housing Requirements for Walk-in type DMS

Ensure the sign housing meets the requirements of Section 3.2.8 of NEMA TS 4-2016. Ensure that exterior seams and joints, except the finish coated face pieces, are continuously welded using an inert gas welding method. Stitch weld the exterior housing panel material to the internal structural members to form a unitized structure. Ensure that exterior mounting assemblies are fabricated from aluminum alloy 6061-T6 extrusions a minimum of 3/16 inches thick. Ensure housing access is provided through an access door at each end of the sign enclosure that meets the requirements of NEMA TS 4-2016, Section 3.2.8.1. Ensure the access doors include a keyed tumbler lock and a door handle with a hasp for a padlock. Ensure the doors include a closed-cell neoprene gasket and stainless-steel hinges. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.8.3 for service lighting. All service lighting should be LED, incandescent and fluorescent lamps are not permitted. Ensure that the sign housing includes LED emergency lighting that automatically illuminates the interior when the door is open in the event of a power outage. Emergency lighting must be capable of operation without power for at least 90 minutes. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.9 for convenience outlets.

E. Housing Requirements for Front Access DMS

Comply with the requirements of Section 3.2.5 and 3.2.6 of NEMA TS 4-2016 as it applies to front access enclosures. The following requirements complement TS 4-2016. Ensure access door does not require specialized tools or excessive force to open. Provide multiple access doors that allow maintenance personnel access to 2 or 3 sign modules are a time. Vertically hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend each door the full height of the display matrix. Provide a retaining latch mechanism for each door to hold the door open at a 90-degree angle. Each door will form the face panel for a section of the sign. Mount the LED modules to the door such that they can be removed from the door when in the open position. Other sign components can be located inside the sign enclosure and be accessible through the door opening. Provide for each door a minimum of two (2) screw-type captive latches to lock

them in the closed position and pull the door tight and compress a gasket located around the perimeter of each door. Install the gasket around the doors to prevent water from entering the cabinet.

F. Housing Face Requirements for all DMS

Ensure the sign face meets the requirements of NEMA TS 4-2016, Section 3.1.3. Protect the DMS face with contiguous, weather-tight, removable panels. The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix. The panels shall be fabricated using aluminum sheeting on the exterior and polycarbonate sheeting on the interior of the panel. These panels must be a polycarbonate material that is ultraviolet protected and have an antireflection coating. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade semi-gloss black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years. Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

G. Housing Face Requirements for Walk-in type DMS

The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix.

No exposed fasteners are allowed on the housing face. Ensure that display modules can be easily and rapidly removed from within the sign without disturbing adjacent display modules.

H. Housing Face Requirements for Front Access type DMS

The DMS front face shall be constructed with multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

I. Housing Face Requirements for Embedded Front Access type DMS

Front Face shall be constructed with a single, horizontally hinged rigid face panel which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

J. Sign Housing Ventilation System for all DMS

Install a minimum of one (1) temperature sensor that is mounted near the top of the DMS interior. The sensor(s) will measure the temperature of the air in the enclosure over a minimum range of -40ºF to +176ºF. Ensure the DMS controller will continuously monitor the internal temperature sensor output and report to the DMS control software upon request.

Design the DMS with systems for enclosure ventilation, face panel fog and frost prevention, and safe over-temperature shutdown.

Design the DMS ventilation system to be thermostatically controlled and to keep the internal DMS air temperature lower than +140ºF, when the outdoor ambient temperature is +115ºF or less.

The ventilation system will consist of two or more air intake ports located near the bottom of the DMS rear wall. Cover each intake port with a filter that removes airborne particles measuring 500 microns in diameter and larger. Mount one or more ball bearing-type ventilation fans at each intake port. These fans will positively pressure the DMS enclosure.

Design the ventilation fans and air filters to be removable and replaceable from inside the DMS housing. To ease serviceability, mount the ventilation fans no more than four (4) feet from the floor of the DMS enclosure. Position ventilation fans so they do not prevent removal of an LED pixel board or driver board.

Provide each ventilation fan with a sensor to monitor its rotational speed, measured in revolutions per minute and report this speed to the sign controller upon request.

The ventilation system will move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. Design the airflow system to move air from the bottom of the enclosure towards the top to work with natural convection to move heat away from the modules.

Install each exhaust port near the top of the rear DMS wall. Provide one exhaust port for each air intake port. Screen all exhaust port openings to prevent the entrance of insects and small animals.

Cover each air intake and exhaust port with an aluminum hood attached to the rear wall of the DMS. Thoroughly seal all intakes and exhaust hoods to prevent water from entering the DMS. Provide a thermostat near the top of the DMS interior to control the activation of the ventilation system.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal enclosure air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140ºF. The DMS provide an output to the controller to notify the Vanguard client when the DMS shuts down due to high temperature.

K. Sign Housing Ventilation System for Walk-in DMS

Ensure the sign includes a fail-safe ventilation subsystem that includes a snap disk thermostat that is independent of the sign controller. Preset the thermostat at 140°F. If the sign housing's interior reaches 140°F, the thermostat must override the normal ventilation system, bypassing the sign controller and turning on all fans. The fans must remain on until the internal sign housing temperature falls below 115°F.

L. Sign Housing Photoelectric sensors

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

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

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

M. Display Modules

Manufacture each display module with a standard number of pixels which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

Design display modules that are interchangeable, self-addressable, and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module. Ensure that the sign has a full matrix display area as defined in NEMA TS 4-2016, Section 1.6.

Design each module to display:

- All upper- and lower-case letters,
- All punctuation marks,
- All numerals 0 to 9,
- Special user-created characters.

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

Design Type 3A and 3C DMS with at least the following message displays:

- A static display, green in color, reading “OPEN”
- A static display, red in color, reading “CLOSED”
- A static display, amber in color, with the ability to display a toll rate in the following format “$ XX.XX”

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

N. Discrete LEDs

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

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing AlInGaP technology for Red and InGaN technology for Green and Blue. No substitutions will be allowed. Provide LEDs that emit a full color.

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

Obtain the LEDs used in the display from a single LED manufacturer. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display.

Individually mount the LEDs on circuit boards that are at least 1/16” thick FR-4 fiberglass, flat black printed circuit board in a manner that promotes cooling. Protect all exposed metal on both

sides of the LED pixel board (except the power connector) from water and humidity exposure by a thorough application of acrylic conformal coating. Design the boards so bench level repairs to individual pixels, including discrete LED replacement and conformal coating repair is possible.

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

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

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

O. LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 24 volts DC or less. Wire the power supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the power supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

Provide power supplies to operate within a minimum input voltage range of +90 to +135 volts AC and within a temperature range of –22° F to 140° F. Power supply output at 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide power supplies that are overload protected by means of circuit breakers, that have an efficiency rating of at least 75%, a power factor rating of at least .95, and are UL listed. Provide all power supplies from the same manufacturer and with the same model number for each Type of DMS. Design the power driver circuitry to minimize power consumption.

Design the field controller to monitor the operational status (normal or failed) of each individual power supply and be able to display this information on the Client Computer screen graphically. Color code power supply status, red for failed and green for normal.

P. LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel with either 66mm or 20mm spacing depending on the type of DMS called for in the plans.

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

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

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

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel and does not lower the luminous intensity of the pixel more than 25% of the 40Cd requirement. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed.

Q. DMS Mini Controller

For Walk-In and Front Access DMS Types only, furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber-optic cable. The mini controller will enable a technician to perform all functions available from the main controller. Provide the

mini controller with an LCD/keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

R. DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the supporting structures. Design the DMS enclosure supports and structure to allow full access to the DMS enclosure inspection door. Mount the DMS enclosure according to the manufacturer's recommendations.

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

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

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

Design the DMS structure to conform to the applicable requirements of the most recent version of the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, currently in use by the department and the section titled "DMS Assemblies" of these Project Special Provisions.

S. DMS / DMS Controller Interconnect

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

T. DMS Controller and DMS Cabinet

Furnish and install one DMS controller with accessories per DMS in a protective cabinet. Controlling multiple DMS with one controller is allowed when multiple DMS are mounted on the same structure. Mount the controller cabinet on the Sign support structure. Install cabinet so that the height from the ground to the middle of the cabinet is 4 feet. Ensure a minimum of 3' x 3' level working surface under each cabinet that provides maintenance technicians with a safe working environment.

Provide the DMS controller as a software-oriented microprocessor and with resident software stored in non-volatile memory. The Control Software, controller and communications must comply with the NTCIP Standards identified in these Project Special Provisions. Provide sufficient non-volatile memory to allow storage of at least 500 multi-page messages and a test pattern program.

For DMS Type 4C installations provide a single controller that can control up to eight (8) signs simultaneously.

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

- Power supply and distribution assemblies,
- Power line filtering hybrid surge protectors,
- Radio Interference Suppressor,
- Communications surge protection devices,
- Industrial-Grade UPS system and local disconnect,

- Microprocessor based controller,
- Display driver and control system (unless integral to the DMS),
- RJ45 Ethernet interface port for local laptop computer,
- Local user interface,
- Interior lighting and duplex receptacle,
- Adjustable shelves as required for components,
- Temperature control system,
- All interconnect harnesses, connectors, and terminal blocks,
- All necessary installation and mounting hardware.

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

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

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

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

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

Provide a torsionally rigid door with a continuous stainless-steel hinge on the side that permits complete access to the cabinet interior. Provide a gasket as a permanent and weather resistant seal at the cabinet door and at the edges of the fan / exhaust openings. Use a non-absorbent gasket material that will maintain its resiliency after long term exposure to the outdoor environment. Construct the doors so that they fit firmly and evenly against the gasket material when closed. Provide the cabinet door with louvered vents and air filters near the bottom as described in the paragraph above.

The cabinet shall contain a full-height standard EIA 19-inch rack. The rack shall be secured within the cabinet by mounts at the top and bottom.

The rack shall contain a minimum of one (1) pullout drawer. The drawer shall be suitable for storing manuals and small tools. The drawer shall be able to latch in the out position to function as a laptop/utility shelf.

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless-steel material. Key all locks on the project alike and provide 1 key per lock to the Engineer. In addition, design the handle to permit padlocking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

Arrange the equipment to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a 3-inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

Provide power supply monitoring circuitry to detect power failure and to automatically report the occurrence to the Control Software.

Install two 15-watt fluorescent light strips with shields, one in the top of the cabinet and the other under the bottom shelf. Design both lights to automatically turn on when the cabinet door is opened and turn off when the door closes.

Mount and wire a 120V (+10%) GFCI duplex receptacle of the 3-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

No cabinet resident equipment may utilize the GFCI receptacle. Furnish one spare non-GFCI duplex receptacle for future equipment.

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on between 80° F and 160° F with a differential of not more than 10° F between automatic turn on and turn off. Mount it in an easily accessible location, but not within 6 inches of the fan.

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

1. Wiring

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

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

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

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

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

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

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

Label all equipment and equipment controls clearly.

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

2. Power Supply and Circuit Protection

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

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

3. Circuit Breakers

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

Provide a subpanel in the sign enclosure with a main and branch circuit breakers sized appropriately per NEC.

Provide a detailed plan for power distribution within the cabinet and the sign. Label all breaker and conductor with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans for review and approval.

4. Surge Suppressor

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

Provide power line surge protector that meets the following requirements:

Peak surge current occurrences	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape	50,000 Amperes
Energy Absorption	> 500 Joules
Clamp voltage	240 Volts
Response time	<1 nanosecond
Minimum current for filtered output	15 Amperes for 120VAC*
Temperature range	-40^{o}F to +158^{o}F

*Capable of handling the continuous current to the equipment

5. Transients and Emissions

DMS and DMS controller will be designed in such a way to meet the latest NEMA TS-4 for Transients and Emissions.

6. Transient Protection

The RS232 and Ethernet communication ports in the DMS sign controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

7. Lightning Arrester

Protect the system with an UL approved lightning arrester installed at the main service disconnect that meets the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single phase, 3 wires
Maximum current	100,000 Amps
Maximum energy	3000 Joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground Wire	Separate

8. Uninterruptible Power Supply (UPS)

Provide the cabinet with an industrial grade power conditioning UPS unit to supply continuous power to operate the equipment connected to it if the primary power fails. **The UPS must continue to condition power supplied to the DMS controller in the event of battery failure within the UPS.** The UPS must detect a power failure and provide backup power within 20 milliseconds. Transition to the UPS source from primary power must not cause loss of data or damage to the equipment being supplied with backup power. Provide an UPS with at least three outlets for supplying conditioned AC voltage to the DMS controller. Provide a unit to meet the following requirements:

Input Voltage Range	120VAC +12%, -25%
Power Rating	1000 VA, 700 Watts
Input Frequency	45 to 65 Hz
Input Current	7.2A
Output Voltage	120VAC +/- 3%
Output Frequency	50/60 +/-1 Hz

Output Current	8.3A
Output Crest Factor Ratio	@50% Load Up to 4.8:1 @75% Load Up to 3.2:1 @100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.
Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input/Output Short Circuit Input/Output Overload Excessive Battery Discharge
Specifications	UL1778, FCC Class A, IEE 587

Provide the UPS unit capable of supplying **30 minutes** of continuous backup power to the cabinet equipment connected to it when the equipment is operating at full load.

9. Controller Communications Interface

Provide the controller with the following interface ports:

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

10. Controller Local User Interface

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

- On / Off Switch: controls power to the controller,

- Control Mode Switch: for setting the controller operation mode to either remote or local mode,
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc.) running diagnostics, viewing peripherals status, message creation, message preview, message activation, etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

Protected access to the LUI with an alphanumeric and PIN passwords. Allow the user to select a preferred method of password protection. Default and hardcoded passwords are not allowed.

11. Controller Address

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

12. Controller Functions

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

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

13. DMS Controller Memory

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

Messages uploaded and stored in the controller’s non-volatile memory may be erased and edited using the Control Software and the controller. New messages may be uploaded to and stored in the controller’s non-volatile memory using the Control Software and the controller.

U. Equipment List

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

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

V. Physical Description

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

W. Parts List

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

X. Character Set Submittal

Submit an engineering drawing of the DMS character set including at a minimum, 26 upper case and lower case letters, 10 numerals, 9 punctuation marks (. , ! ? – ‘ “ ; :) 12 special characters (# & * + / ( ) [ ] < > @) and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

Y. Wiring Diagrams

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

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

Z. Routine of Operation

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

AA. Maintenance Procedures

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

BB. Repair Procedures

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

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

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

CC. Warranty

Ensure that the DMS system and equipment has a manufacturer's warranty covering defects for a minimum of five (5) years from the date of final acceptance by the Engineer.

7.3. CONSTRUCTION METODS

A. Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of DMS systems, auxiliary equipment and the construction of related structures.

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between DMS equipment and DMS sign housing and electric utilities that conform to NEC standards.

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

B. Layout

The Regional ITS engineer or Division Traffic Engineer will establish the actual location of each DMS assembly. It is the Contractor's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the Project Plans, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

C. Construction Submittal

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

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

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

D. Conduit

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

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

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

Attach the conduit system to and install along the structural components of the Sign structure assemblies with beam clamps or stainless-steel strapping or inside the structure if there is available space. Install strapping according to the strapping manufacturer's recommendations and according to NEC requirements. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

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

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

E. Wiring Methods (Power)

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

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

Do not splice underground circuits unless specifically noted in the Project Plans.

F. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the Project Plans, in conformance with the dimensions shown. Install fasteners as recommended by the manufacturer and space them evenly. Use all mounting holes and attachment points for attaching DMS enclosures and controller cabinets to the structures.

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

Provide cabinets with all strapping hardware and any other necessary mounting hardware in accordance with these Project Special Provisions and the Project Plans.

Seal all unused conduit installed in cabinets at both ends to prevent water and dirt from entering the conduit and cabinet with approved sealing material.

Install a ground bushing attached inside the cabinet on all metal conduits entering the cabinet. Connect these ground bushings to the cabinet ground bus.

Install a level concrete technician pad measuring a minimum 4 inches thick, 36 inches wide and 36 inches long at the front door of the DMS equipment cabinet as shown on the Typical Details sheet within the Project Plans.

G. Work Site Clean-Up

Clean the site of all debris, excess excavation, waste packing material, wire, etc. Clean and clear the work site at the end of each workday. Do not throw waste material in storm drains or sewers.

7.4. GENERAL TEST PROCEDURE

Test the DMS and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

7.5. COMPATIBILITY TESTS

A. DMS System

Compatibility Tests are applicable to DMS that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

7.6. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. DMS System

Final DMS locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the DMS assembly field site in accordance with the test plans. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the DMS and control cabinet,
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the DMS assembly manufacturer’s initial power-on test in accordance with the manufacturer’s recommendation.
- Set the DMS control address.

Central Operations Testing

- Interconnect the DMS’s communication interface device with one of the following methods as depicted on the plans:
    - communication network’s assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.

OR

- to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.

- Review DMS date and time and DMS controller information.
- Run DMS diagnostics and review results.
- Run DMS pixel test and review results.
- Run test message.
- Run test schedule.
- Program burn-in scenario.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

7.7. MEASUREMENT AND PAYMENT

Dynamic Message Sign (_____) will be measured and paid as the actual type and number of DMS furnished, installed, and accepted. Each DMS consists of a LED Dynamic Message Sign, spare display modules, warranty, strapping hardware, controller, UPS, controller cabinet, concrete technician pad, conduit, fittings, couplings, sweeps, conduit bodies, wire, flexible conduit, feeder conductors and communications cable between the controller cabinet and the DMS enclosure, connectors, circuit protection equipment, photo-electric sensors, tools, materials, all related testing, cost of labor, cost of transportation, incidentals, and all other equipment necessary to furnish and install the DMS system.

Payment will be made under:

Dynamic Message Sign (Type 2C) .....Each

8. NTCIP REQUIREMENTS

This section defines the NTCIP requirements for the DMSs covered by these Project Special Provisions and Project Plans.

8.1. References

A. Standards

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards.

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Abbreviated Number	Title
NTCIP 1201	*Global Object (GO) Definitions*
NTCIP 1203	*Object Definitions for Dynamic Message Signs*
NTCIP 2101	*SP-PMPP/232* *Subnet Profile for PMPP over RS-232*
NTCIP 2104	*SP-Ethernet* *Subnet Profile for Ethernet*
NTCIP 2201	*TP-Null* *Transport Profile*
NTCIP 2202	*Internet Transport Profile (TCP/IP and UDP/IP)*
NTCIP 2301	*AP for Simple Transportation Management Framework*

B. Features

Each DMS shall be required to support the following optional features, conformance groups and all functional requirements and objects that apply herein.

Feature	Reference
Time Management	NTCIP 1201 v3
Timebase Event Schedule	NTCIP 1201 v3
PMPP	NTCIP 1201 v3
Determine Sign Display Capabilities	NTCIP 1203 v03
Manage Fonts	NTCIP 1203 v03
Manage Graphics	NTCIP 1203 v03
Schedule Messages for Display	NTCIP 1203 v03
Change Message Display Based on and Internal Event	NTCIP 1203 v03
Control External Devices	NTCIP 1203 v03
Monitor Sign Environment	NTCIP 1203 v03
Monitor Door Status	NTCIP 1203 v03
Monitor Controller Software Operations	NTCIP 1203 v03
Monitor Automatic Blanking of Sign	NTCIP 1203 v03
Report	NTCIP 1103 v03

C. Objects

The following table represents objects that are considered optional in the NTCIP standards but are required by this specification. It also indicated modified objects value ranges for certain objects. Each DMS shall provide the full, standard object range support (FSORS) of all the objects required by these specifications unless otherwise stated below.

Object	Reference	Requirement
moduleTable	NTCIP 1201 – 2.2.3	Shall contain at least one row with moduleType equal to 3 (software) The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the moduleVersion indicates the model version number of the component.
maxTimeBaseScheduleEntries	NTCIP 1201 – 2.4.3.1.	Shall be at least 28
maxDayPlans	NTCIP 1201 – 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 – 2.4.4.2	Shall be at least 12
maxGroupAddresses	NTCIP 1201 – 2.7.1	Shall be at least 1
maxEventLogConfigs	NTCIP 1103 – A.7.4	Shall be at least 50
eventConfigMode	NTCIP 1103 – A.7.5.3	The DMS shall support the following Event Configurations: onChange, greaterThanValue, smallerThanValue
eventConfigLogOID	NTCIP 1103 – A.7.5.7	FSORS
eventConfigAction	NTCIP 1103 – A.7.5.8	FSORS
maxEventLogSize	NTCIP 1103 – A.7.6	Shall be at least 20
maxEventClasses	NCTIP 1103 – A.7.2	Shall be at least 16
eventClassDescription	NTCIP 1103 – A.7.3.4	FSORS
communityNamesMax	NTCIP 1103 – A.7.8	Shall be at least 3
numFonts	NTCIP 1203 – 5.4.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 – 5.4.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 – 5.5.3	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOnActive	NTCIP 1203 – 5.5.4	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 - 5.5.5	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second

		increments
defaultFlassOffActive	NTCIP 1203 – 5.5.6	The DMS shall support flash "off" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 – 5.5.2	The DMS shall support the black background color
defaultForegroundColor	NTCIP 1203 - 5.5.2	The DMS shall support the amber foreground color
defaultJustificationLine	NTCIP 1203 - 5.5.9	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 - 5.5.11	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 - 5.5.13	The DMS shall support page "on" times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 - 5.5.15	The DMS shall support page "off" times ranging from 0.0 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 - 5.5.21	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 - 5.6.3	Shall be at least 100.
dmsMessageMultiString	NTCIP 1203 - 5.6.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 - 5.7.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 - 5.7.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 - 5.7.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 - 5.7.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 - 5.7.9	FSORS
dmsShortPowerLossTime	NTCIP 1203 – 5.7.14	FSORS
dmsResetMessage	NTCIP 1203 - 5.7.11	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 - 5.7.12	FSORS
dmsTimeCommLoss	NTCIP 1203 - 5.7.13	FSORS
dmsEndDurationMessage	NTCIP 1203 - 5.7.15	FSORS
dmsMultiOtherErrorDescription	NTCIP 1203 - 5.7.20	If the vendor implements any vendor-specific MULTI tags,

		the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error
dmsIllumControl	NTCIP 1203 - 5.8.1	The DMS shall support the following illumination control modes: Photocell, and Manual
dmsIllumNumBrightLevels	NTCIP 1203 - 5.8.4	Shall be at least 100
dmsIllumLightOutputStatus	NTCIP 1203 - 5.8.9	FSORS
numActionTableEntries	NTCIP 1203 - 5.9.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 - 5.11.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 - 5.11.1.6	FSORS
fanFailures	NTCIP 1203 - 5.11.2.3.1	FSORS
fanTestActivation	NTCIP 1203 - 5.11.2.3.2	FSORS
tempMinCtrlCabinet	NTCIP 1203 - 5.11.4.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 - 5.11.4.2	FSORS
tempMinSignHousing	NTCIP 1203 - 5.11.4.5	FSORS
tempMaxSignHousing	NTCIP 1203 - 5.11.4.6	FSORS

D. MULTI Tags

Each DMS shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer specific MULTI tags.

Code	**Feature**
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 – day of month
f9	field 9 – month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year
fl (and /fl)	flashing text on a line by line basis with flash rates controllable in 0.5 second increments.
fo	Font
jl2	Justification – line – left
jl3	Justification – line – center
jl4	Justification – line – right

Code	Feature
jl5	Justification – line – full
jp2	Justification – page – top
jp3	Justification – page – middle
jp4	Justification – page – bottom
mv	moving text
nl	new line
np	new page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page)
pt	page times controllable in 0.5 second increments.

E. Documentation

Supply software with full documentation, including a CD-ROM containing ASCII versions of the following MIB files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. Name this file identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

Allow the use of any and all of this documentation by any party authorized by the Department for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

F. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

8.2. Measurement and Payment

There will be no direct payment for the work covered by this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for "Dynamic Message Sign ( )" and will be full compensation for all work listed above.

9. DMS PEDESTAL STRUCTURE

9.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structure, platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structure in accordance with the requirements of these Project Special Provisions and the Project Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Project Plans.

Provide pedestal DMS structures with a minimum of 25 feet clearance from the high point of the road to the bottom of the DMS enclosure.

Design the new DMS assemblies (including footings), DMS mounting assemblies, maintenance platforms, and access ladders and submit shop drawings for approval. A Professional Engineer that is registered in the state of North Carolina will prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 of the Standard Specifications apply to all work covered by this section.

The Standard Provisions SP09R005 and SP09R007 found at the link below apply to all work covered by this section.

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

It is the Contractor's responsibility to verify DMS S-dimension elevation drawings for the DMS locations and provide them with the DMS shop drawings for the Engineer's approval.

9.2. MATERIALS

Use materials that meet the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations.*

9.3. CONSTRUCTION METHODS

A. General

Construct DMS structures and assemblies in accordance with the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations.*

B. DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid resistant surface and safety railing on the DMS assemblies for access to one of the DMS inspection doors as shown on the plans. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door. No gap is allowed between walkway and inspection door or along any part of the safety rails.

Ensure the design, fabrication and installation of the access platforms on new DMS structures complies with the following:

A. The top of the platform grading surface is vertically aligned with the bottom of the DMS door,

B. The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails,

C. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections,

D. Install a 4” x 4” safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform,

E. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

C. DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Furnish the lock to operate with a Corbin #2 key and furnish two keys per lock. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the finished ground. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

9.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure will be measured and paid as the actual number of dynamic message sign pedestal structure assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete relocated dynamic message sign assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

DMS Access Ladder will be measured and paid as the actual number of DMS access ladders, platform, walkway furnished, installed and accepted. Payment includes design, fabrication, transportation, attachment to the DMS assembly as described above, lock with two keys each, and concrete pad.

Overhead Footings will be measured and paid in cubic yards and will be full compensation for all materials and labor required in *Overhead and Dynamic Message Sign Foundations (SP09 R007) and Foundations and Anchor Rod Assemblies for Metal Poles* (PS09 R005) referred in the link above. Payment will be made according to PS09 R007

The contract unit price for Overhead Footings will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2018 Standard Specifications for Roads and Structures.*

Payment will be made under:

DMS Pedestal Structure .....Each

DMS Access Ladder .....Each

10. OBSERVATION PERIOD

10.1. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be considered part of work to be completed by the project completion date.

Upon successful completion of all project work the 30-day Observation Period may commence. Examples of project work includes but is not limited to:

- Installation of all project devices and communications infrastructure.
- Field Acceptance Testing of all devices.
- Central System Testing of all devices and network communications.
- Correction of all deficiencies and punch list items. (including minor construction items)

This observation consists of a 30-day period of normal, day-to-day operations of the field equipment in operation with new or existing central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the Plans and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct any failures within forty-eight (48) hours (includes time of notification). Any failure that affects a major system component as defined below for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the Contractor is was notified that the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or a failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period for that system. The 30-day Observation Period will be restarted from day zero when the

redesigned components have been installed and/or the failures corrected. The major system components are:

- CCTV Cameras and Central Operations
- Dynamic Message Sign (DMS) and Central equipment/Operations
- Portable Changeable Message Sign (PCMS)
- Communications infrastructure (examples: Fiber, Radios, Ethernet Switches, Core Switches, etc.)
- Any other ITS Devices not named above (examples: DSRC radios, Radar and Out-of-Street Detection, signals, etc.)

10.2. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The completed System will be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including as-built plans.

10.3. MEASUREMENT AND PAYMENT

There will be no payment for this item of work as it is incidental to the project as a whole and to the item of work in which it is associated.

11. HUB CABINET

11.1. DESCRIPTION

Furnish and install air-conditioned hub cabinets, hub cabinet base extenders, hub cabinet foundations and all necessary hardware as described herein. Size the cabinet appropriately to fit all the equipment and to allow for 25% free space available after all equipment is installed. Size the cabinet to ensure ease of access to equipment and provide proper ventilation in order to maintain an internal operating environment that does not exceed the environmental operating ranges for devices placed within the cabinet.

1.2 MATERIALS

A. Hub Cabinet

1. *Standards*

Ensure that the hub cabinets comply with the following standards:

- ANSI;
- ASTM;
- IMSA ;
- ISO 9001;
- NEC;

- NEMA TS-2; and
- UL listed.

2. *Functional*

Furnish Caltrans Type 340 base-mounted hub cabinets meeting the following minimum requirements:

- Side-by-side, double doors on both front and rear of cabinet.
- Fiber-optic interconnect centers (paid separately).
- Grounding bus bar.
- 19-inch rack system for mounting of all devices in the cabinet.
- Pull-out shelf for laptop and maintenance use.
- Maintenance access connections.
- LED lighting.
- Ventilation fans.
- 120VAC power supply.
- 120VAC ground fault circuit interrupter (GFCI)-protected duplex outlets for tools.
- 120VAC surge-protected duplex outlets for equipment.
- Sunshields constructed of light gauge aluminum that sit approximately one inch above the surface of the cabinet on all sides, including doors.
- Lightning and surge protection on incoming and outgoing electrical lines (power and data).
- Managed Ethernet switch (provided by DIT).
- Door status sensors compatible with provided Managed Ethernet switches
- Power strip along vertical rail.
- HVAC system to maintain optimal temperature and humidity for the Ethernet hub switches and other powered electronics in the cabinet.
- UPS with sufficient capacity to hold hub's electrical load (minus the HVAC) for 4 hours. Cabinet AC system will not be connected to the UPS.

3. *Physical Features*

Provide cabinets that are completely weatherproof to prevent the entry of water. Provide cabinet and door exterior seams that are continuously welded, and all exterior welds are smooth. Provide cabinets with four full-size doors with full-length stainless-steel piano hinges, with stainless steel pins spot-welded at the top. Provide hinges that utilize stainless steel hinge pins. Provide hinges that are mounted so that they cannot be removed from the door or cabinet without first opening the door. Provide door and hinges braced to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. Ensure that there is no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide cabinet door fitted with a #2 Corbin lock. Provide two keys for each cabinet. Provide cabinet doors that are also pad lockable. Provide door openings that are double flanged on all four sides.

Provide cabinets constructed of unpainted sheet aluminum alloy H5052-H32 with a minimum thickness of 0.125 inch.

Provide the hub cabinet with sunshields outside to deflect solar heat away from the cabinet. The sunshields must be offset a minimum of one inch from the exterior cabinet walls. Ensure that the

sunshields are fabricated from 5052-H32 aluminum sheet that is 0.125-inch-thick, and that sunshield corners are rounded and smoothed for safety. Mount the sunshields on standoffs on the top and on each side of the cabinet including the doors.

Provide doorstops at 90 and 180-degree positions. Ensure that both the door and the doorstop mechanism are of sufficient strength to withstand a simulated wind load of five pounds per square foot of door area applied to the both inside and outside surfaces without failure, permanent deformation, or compromising of door position and normal operation. Do not provide auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Ensure that the gasket material is closed-cell neoprene and maintains its resiliency after exposure to the outdoor environment. Ensure that the gasket shows no sign of rolling or sagging and provide a uniform dust and weather-resistant seal around the entire door facing.

Provide door alarms for all 4 doors that are compatible with the hub switches to be provided and installed by DIT. Door alarms should send a network alert to the switch when a hub cabinet door is opened or if the door alarm fails or is tampered with. Coordinate with the Engineer and DIT for hub switch model information.

Provide cabinets that include predrilled holes of standard diameter and bolt pattern with four (4) anchor bolts with each cabinet unit as part of the unit price bid. Provide a panel with each cabinet that matches the rest of the cabinet; and is held in place by four bolts provided with the panel. Drill or punch the panel to accommodate the bolts; the drill holes shall match the bolt pattern of the base cabinet of the cabinet. Provide a panel designed to be fitted in the interior of the cabinet and fabricated of the same material and thickness as the cabinet bottom.

Provide rails to create a cage to mount hardware, wiring panels and miscellaneous mounting brackets. Provide rails constructed of .1345-inch steel or .105-inch stainless steel. Provide rails with a keyhole design with slots 2 inches on center with a top opening of 5/8 inch in diameter to allow the insertion of a .625-inch by 1-inch carriage bolt. Ensure that the rails are 1.5 to 2 inches wide by .5 inches deep. Drill and tap the rails for 10-32 screws or rack screws with EIA universal spacing.

Provide rack assemblies that have a removable, standard 19-inch EIA compliant rack. The rack shall have a clearance between the rails of 17.5 inches.

Equip each cabinet with an aluminum storage compartment mounted in the rack assembly with the following dimensions (±0.5 inch): 16 inches wide, 14 inches long, and 1.75 inches deep. Provide compartment with ball-bearing telescoping drawer guides to allow full extension from the rack assembly. Ensure that when extended, the storage compartment opens to provide storage space for cabinet documentation and other miscellaneous items. Ensure that the storage compartment is of adequate construction to support a weight of 20 pounds when extended without sagging. Provide a top to the storage compartment that is hinged aluminum. Provide two (2) removable metal shelves with each cabinet.

Furnish a cabinet base extender with each hub cabinet that complies with the requirements of the “Cabinet Base Adapter and Base Extender” section of these Project Special Provisions.

Install an external generator connection port on the side of the cabinet opposite the air conditioning unit. Port should be designed and sized for the appropriate electrical requirements of the cabinet.

4. *Lighting*

Provide the field cabinet with four LED lamps (one above each door) and clear shatterproof shield assemblies which are mounted on the inside front and rear top of the cabinet. Ensure that these lamps are unobstructed and able to cast light on the equipment. Equip the field cabinet with door-actuated switches so that the lamps automatically turn on when any cabinet door is opened and go off when all the doors are closed.

5. *Electrical*

Provide a service panel assembly to function as the entry point for AC power to the cabinet and the location for power filtering, transient suppression, and equipment grounding. Provide AC isolation within the cabinet. Configure cabinet to accept 120 VAC from the utility company.

Provide circuit breakers that meet the NEC requirements, are UL listed and have an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide the hub cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the electronics in the hub cabinet. Provide a dedicated branch circuit for each of the following items:

- HVAC
- Lighting
- Receptacles
- Ventilation fan
- One circuit per rack
- Others as needed.

Provide UL listed surge protection devices according to the UL 1449, 2nd edition standard that comply with the NEMA requirements as detailed in the NEMA LS 1 (1992) standard.

Provide branch circuits, surge protection devices, and grounding for the connected load served by the cabinet, including ventilation fans, internal lights, electrical receptacles, etc., as shown on the Plans.

Furnish a power distribution assembly that fits in the EIA 19-inch rack and provides for protection and distribution of 120VAC power.

Ensure that ground bus bars are fabricated from a copper alloy material compatible with copper wire. Use ground bus bars that have at least two positions where a #6 AWG stranded copper wire can be attached.

Mount the ground bus bar on the side of the cabinet wall adjacent to the service panel assembly for the connection of AC neutral wires and chassis ground wires. If more than one ground bus bar is used in a cabinet, use a minimum of a #10 AWG copper wire to interconnect them.

Provide a detailed plan for power distribution within the cabinet. Label all breakers and conductors with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans for review and approval.

6. *Ventilation*

Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the hub switches and other powered electronics in the cabinet.

Include two cooling fans with 100 CFM, minimum capacity. Provide thermostats to be incorporated into the ventilation system. Mount fans in the top of the cabinet.

Provide the cabinets with vent openings in the lower portion of the door to allow convection cooling of electronic components. Cover them fully on the inside with a commercially available disposable three-layer graded type filter. All air entering the cabinet must pass through the air filter.

7. *Air Conditioner*

Furnish each hub cabinet with a rack mounted air-cooled air conditioner that operates on 120VAC. The air conditioner shall be fit within a 19-inch EIA communications rack and shall not be external mounted on the cabinet. The air conditioner shall be mounted in the bottom of the cabinet to avoid damage to any communications equipment.

The air conditioners shall have a built-in condensate evaporator and condensate drain fitting and hose that is plumbed to the outside of the cabinet. The air conditioner shall be rated for a minimum of 3500 BTU. There shall be low temperature control to prevent overcooling.

Provide EMI/RFI transient spike protection. Equip the cabinet and air conditioner with remote monitoring of high temperature and low airflow conditions. Intake air shall enter through cabinet door vent and be exhausted through top cabinet vents. Air conditioners shall be CFC free or low ODP (R-22) refrigerant and shall use closed loop cooling. Insulate all cold components (coolant lines, compressor, evaporator, etc.) with high-performance insulation.

Blower motors shall be UL listed. Ensure the blower motors are equipped with automatic reset thermal overload protection. Provide double sealed and double shielded ball bearings.

The air conditioners shall have permanent corrugated aluminum or stainless steel air filters. The filters shall be removable and washable.

All grilles shall be stainless steel.

A. Hub Cabinet Base Extender

Fabricate hub cabinet base extenders from the same materials and with the same finish as the hub cabinet housing. Fabricate base extender in the same manner as hub cabinets, meeting all of the same applicable specifications called for in these project special provisions. Provide cabinet base extenders with a height of at least 8 inches.

B. Hub Cabinet Foundation

Furnish either poured concrete hub cabinet foundations or preformed hub cabinet foundations. Obtain approval of foundation type from the engineer.

Comply with Section 1000-4 of the *2018 Standard Specifications for Road and Structures.*

Provide hub cabinet foundations with a minimum pad area that extend 24 inches from the front and back of the hub cabinet and 3 inches from the sides of the cabinet.

On the same side as the cabinet generator hookup, cast a three inch inside width galvanized steel U-bolt into the cabinet foundation. A minimum of four inches of the U-bolt shall be cast into the concrete and a minimum of three inches of the U-bolt shall be exposed for securing a generator to the foundation.

Furnish hub cabinet foundations with chamfered top edges. Provide minimum class B concrete.

Provide preformed hub cabinet foundations with 7" (L) x 18" (W) minimum opening for the entrance of conduits. For precast hub cabinet foundations, include steel reinforcement to ensure structural integrity during shipment and placing of item. Include four ¾ inch coil thread inserts for lifting. Comply with Article 1077-16 of the *2018 Standard Specifications for Road and Structures.*

C. Hub Cabinet UPS

Furnish and install one rack mounted UPS in each new cabinet.

Furnish UPS with external temperature monitoring that will shut off when running on battery power and the maximum operating temperature for the hub switch is reached.

Install UPS with RJ-45 ethernet network monitoring ports that can be disabled via the UPS software/firmware.

UPS shall meet the following minimum specifications:

Output

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

Input

Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V

Battery Type

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

Typical recharge time	2 hours

Communications & Management

Interface Port(s)	RJ, 45, DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating	480 Joules
Environmental	
Operating Environment	-32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%
Conformance	
Regulatory Approvals	FCC Part 15 Class A, UL 1778

11.2. CONSTRUCTION METHODS

A. Hub Cabinet

Ensure all cabinet wiring is tagged and identified using insulated pre-printed sleeves and follows the project's cable identification scheme. Ensure that the wire markers identify usage in plain words with sufficient details without abbreviations or codes.

Use stranded copper for all conductors, including those in jacketed cables and solid copper for all grounding. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug, or connector. Do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks with permanent and waterproof tags. Provide strain relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include, but are not limited to, terminal blocks; bus bars, panel and socket mounted TVSS, circuit breakers, accessory and equipment outlets, and DC power supply chassis.

Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. Ensure that all fastener heads and nuts (when used) are fully accessible within a complete cabinet assembly, and any component is removable without requiring removal of other components, panels or mounting rails. Do not use self-tapping or self-threading fasteners.

Mount the air conditioner in the bottom of the cabinet and do not obstruct any cable entry into the cabinet. Install condensate drains to drain condensation water out of the cabinet. Ensure the cabinet has provisions to route conduit to the existing cabinet as shown in the drawings.

Furnish and install a 48" 120 VAC power strip vertically along one of the rear rails of the communications rack. Provide a power strip that has at least eight outlets along its length.

Provide a cabinet that is ISO 9001 certified at the time of bid letting.

Locate cabinets as close to the edge of the controlled access as possible and protect hub cabinets with guardrail unless instructed otherwise by the engineer.

Install base mounted cabinets as shown on the Plans and as approved by the Engineer. Refer to the "Hub Cabinet Foundation" section of these Project Special Provisions for installation requirements for the hub cabinet foundations. Install only the required number of conduits as shown on the Plans plus one additional spare stub out conduit. Position the ends of conduits approximately 2 inches above the finished surface of the concrete base.

Mount the hub cabinets on cabinet base extenders in accordance with the "Hub Cabinet Base Extender" section of these Project Special Provisions.

Mount surge protection devices in the cabinet for the field devices that will be connected to that cabinet.

Terminate power service wire, video, and data cabling on the appropriate terminal strips, surge protection devices or jacks in the cabinet with insulated terminal lugs or connectors. Use a calibrated ratchet-type crimping tool to install the insulated terminal lugs onto the field wires.

Label spare circuits of the data cables and connect them to the cabinet ground bus bar.

Neatly bundle and identify all field wiring cables in the cabinet with permanent waterproof tags.

Ground all hub cabinets in accordance with NEC requirements and the Hub Cabinet Grounding Detail included in these Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

B. Hub Cabinet Base Extender

Install hub cabinet base extender at all hub cabinet locations.

Use permanent, flexible, waterproof sealing material to:

(a) Seal between the hub cabinet base and hub cabinet base extender.

(b) Seal 2-piece hub cabinet base extender seams.

(c) Seal space between hub cabinet base extender and the hub cabinet foundation.

C. Hub Cabinet Foundation

Comply with Section 825 of the *2018 Standard Specifications for Road and Structures.*

When using poured concrete foundations and preformed concrete foundations, use procedures, equipment and hardware as follows:

(d) Locate new hub cabinets in locations as shown on the plans and approved by the Engineer.

(e) Do not install foundations over uncompacted fill or muck.

(f) Do not install foundations in low areas or locations prone to standing water.

(g) Hand tamp soil before placing concrete to ensure ground is level.

(h) Use a minimum of four ½ inch diameter expanding type anchor bolts to secure cabinet to foundation.

(i) Install minimum 4 inches above and 4 inches below finished grade.

(j) Locate external stubbed out conduit at cabinet foundation so conduit is located on the side of the hub cabinet with the UPS, do not locate conduit under the air conditioning system. Install a minimum of 6 conduit stub-outs.

(k) Give hub cabinet foundation a broom finish and chamfered edges.

(l) Seal space between cabinet base and foundation with a permanent, flexible, waterproof sealing material.

D. Hub Cabinet UPS

Install rack mounted UPS in each hub cabinet in accordance with the plans and detail drawings.

11.3. MEASUREMENT AND PAYMENT

Hub Cabinet will be measured and paid as the actual number of hub cabinets furnished, installed and accepted.

No payment will be made for the UPS, HVAC, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, DIN rail mounting brackets, DIN rails, signs, decals, labels or any other equipment or labor required to install the hub cabinet as these will be considered incidental to the installation of the hub cabinet.

Hub Cabinet Base Extender will be measured and paid as the actual number of hub cabinet base extenders furnished, installed and accepted.

Hub Cabinet Foundation will be measured and paid for as the actual number of hub cabinet foundations furnished, installed and accepted.

Payment will be made under:

Pay Item	**Pay Unit**
Hub Cabinet	Each
Hub Cabinet Base Extender	Each
Hub Cabinet Foundation	Each

12. SPECIAL OVERSIZED JUNCTION BOXES

12.1. DESCRIPTION

Furnish and install special oversized junction boxes (pull boxes) with covers, washed stone, grounding systems, and all necessary hardware.

12.2. MATERIALS

A. General

Provide special oversized junction boxes with covers of the type and size indicated by the contract or the Plans for the splicing and storing fiber-optic communications cable.

Provide #67 washed stone aggregates in conformance with Sections 545 and 1005 of the *Standard Specifications.*

B. Polymer Concrete (PC) Junction Boxes

Provide polymer concrete (PC) boxes which are stackable, have bolted covers and have open bottoms. Ensure vertical extensions of 6" to 12" are available from the junction box manufacturer.

Use polymer concrete material made of an aggregate consisting of sand and gravel bound together with a polymer and reinforced with glass strands to fabricate box and cover components which are exposed to sunlight. Other thermosetting glass-reinforced materials may be used for components that are not normally exposed to sunlight.

Provide certification that the polymer concrete boxes and covers meet Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

Provide junction box covers with the required logos on the cover as follows:

- For oversize or special-size junction boxes, provide covers with the NCDOT Fiber Optic logo.

Provide at least two size 3/8" diameter hex head stainless steel cover bolts to match inserts in the box. Provide pull slot(s) with stainless steel pin(s). Polymer concrete junction boxes are not required to be listed electrical devices.

A. Junction Box Sizes

Provide special oversized junction boxes and covers of the following size as called for in the Plans:

Junction Box Size	Minimum Inside Dimensions
Special Oversized	36"(l) x 24"(w) x 24"(d)

12.3. CONSTRUCTION METHODS

A. General

Install junction boxes flush with finished grade. Backfill beneath and around the junction box using #67 washed stone as shown in NCDOT Roadway Standard Drawing No. 1716.01. Do not install sealant compound between junction boxes and covers.

Upon completion of junction box installation and backfilling of all excavations, restore the disturbed ground to its original condition as determined and approved by the Engineer. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with same type of grass as surrounding area and mulch the newly seeded area. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

Install special-sized junction boxes at all underground splice enclosure locations in underground fiber-optic communications cable runs as shown in the Plans.

B. GPS Coordinates

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

Provide both a digital copy and hard copy of all information regarding the location (including to but not limited to manufacturer, model number) in the Microsoft Excel spreadsheet using the format shown in example below.

City Sys ID#	Name	Location	Latitude	Longitude	Manufacturer	Model #
	Equipment Cabinet	US 70 at Raynor Road/ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Road/ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

12.4. MEASUREMENT AND PAYMENT

Junction box (_____) will be measured and paid in actual number of junction boxes of each size and type furnished, installed, and accepted.

No measurement will be made of covers, curb markers on covers, washed stone, removal of existing junction boxes and grounding systems as these will be considered incidental to furnishing and installing junction boxes.

No measurement will be made of restoration of paved roadways/driveways and unpaved ground surfaces with like materials, including but not limited to backfill, graded stone, paved materials, seeding and mulching, as this work will be considered incidental to junction box installation. The Department will make no payment for a given junction box until all repairs to paved and unpaved surfaces damaged/disturbed during the installation of the junction box have been completed and accepted.

No measurement will be made of collecting and recording GPS coordinates for junction boxes and compiling this data in the prescribed Microsoft Excel spreadsheet as such work will be considered incidental to furnishing and installing junction boxes.

Payment will be made under:

Pay Item **Pay Unit**

Junction Box (Special Oversized) Each

13. ELECTRICAL SERVICE

13.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service pedestals, poles, and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

Obtain the maximum available ground fault current from the utility company. Print this information on a durable label and adhere to the dead front of the disconnect.

13.2. MATERIAL

A. Wood Poles

Use 40’ Class 4 or better wood poles for overhead electrical service structures as shown in the Plans. Refer to 2018 NCDOT *Standard Specifications for Roads and Structures* Article 1720-3.

B. Wood Pedestal

Furnish 6” x 6” x 8’ wood pedestals for electrical service equipment as shown in the Plans. Refer to Articles 1082-3 (Treated Timber and Lumber), 1082-4 (Preservative Treatment) of the Standard Specifications..

C. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum of eight (8) spaces in the disconnect. Furnish a single pole 15A circuit breaker at CCTV-2, and 3 locations. Furnish a double pole 50A circuit breaker at DMS-1/CCTV-1 location, and at DMS-2 location. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Furnish NEMA Type 3R combinational panels rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meet the requirements of the local utility. Provide meter base with sockets’ ampere rating based on sockets being wired with

a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load, and Neutral Terminals accept 4/0 AWG and smaller Copper/Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified.

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

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

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single Phase, 3 wire
Maximum current	100,000 amps
Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground wire	Separate

D. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

E. 3-Wire Copper Service Entrance Conductors

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

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

See the Plans for wire sizes.

F. 3-Wire Copper Feeder Conductors

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

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

See the Plans for wire sizes.

G. 4-Wire Copper Feeder Conductors

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

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

See the Plans for wire sizes.

H. Grounding System

Furnish 5/8”x10’ copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors, and mechanical crimping kits for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

13.3. CONSTRUCTION METHODS

A. General

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting any modifications.

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

B. Wood Poles

Install all 40’ Class 4 poles for electrical services in compliance with all requirements of Section1720-3 of the Standard Specifications.

C. Wood Pedestal

Install a 6” x 6” x 8’wood pedestal in compliance with all requirements of Section1720-3 of the Standard Specifications.

D. Meter Base/Disconnect Combination Panel

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

E. Electrical Service Disconnect

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

F. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.5 inch rigid galvanized risers as shown in the plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

G. 3-Wire Copper Feeder Conductors

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

H. 4-Wire Copper Feeder Conductors

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

I. Grounding System

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

13.4. MEASUREMENT AND PAYMENT

Wood Poles will be measured and paid in accordance with section 1720-4 of the *2018 Standard Specifications*

Wood Pedestal will be measured and paid as the actual number of complete and functional 6" x 6" x 8' wood pedestals installed for underground electrical services.

Meter base/disconnect combination panel will be measured and paid as the actual number of complete and functional meter base/disconnect combination panel service locations furnished, installed and accepted. Breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, 3-Wire Service Entrance Conductors, and any remaining hardware, fittings, and conduit bodies to connect the electrical service to the cabinet will be considered incidental to meter base/disconnect combination panels. All other required feeder conductors will be paid for separately.

Equipment cabinet disconnect will be measured and paid as the actual number of complete and functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed vertical conduit runs to the cabinet, ground rods, ground wire and any remaining hardware and conduit to connect the equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet subpanel.

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

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

#4 solid bare copper grounding conductor will be measured and paid as the actual linear feet of #4 AWG solid bare copper grounding conductor furnished, installed and accepted.

Measurement will be along the approximate centerline from the base of the electrical service disconnect to the last grounding electrode.

Payment will be made under:

Pay Item	Pay Unit
Wood Pedestal	……..Each
Meter Base/Disconnect Combination Panel	……..Each
Equipment Cabinet Disconnect	……..Each
4-Wire Copper Feeder Conductors	Linear Foot
3-Wire Copper Feeder Conductors	Linear Foot
5/8” X 10’ Grounding Electrode	……..Each
#4 Solid Bare Copper Grounding Conductor	Linear Foot

14. SOLAR POWER ASSEMBLY

14.1. DESCRIPTION

Install new solar power assembly equipment with equipment cabinets and all necessary hardware in accordance with these Project Special Provisions and the Plans. Comply with the provisions of Section 1700 of the Standard Specifications.

14.2. MATERIALS

Furnish and install a solar power assembly at the locations shown in the Plans consisting of the following:

- Solar Array
- Solar Charge Controller
- Batteries
- Assembly Cabinet
- Concrete Cabinet Pad

A. Solar Array

Furnish solar modules made in North America and have a minimum 20-year factory warranty. The solar array should have a minimum peak output of 100W. Solar modules must be UL listed, FM Class I, Div II, Group C & D approved. For the solar array, power wiring should be 10-2, stranded copper, double insulated, sunlight resistant, 600V 90C rated cable. The array mount will attach to the side of the CCTV pole with stainless steel fasteners. The array mount must be aluminum alloy or stainless steel. The array must be capable of withstanding 125 mph winds.

B. Solar Charge Controller

Furnish solar charge controllers that are UL listed, a minimum 45A with solid state, low voltage disconnects. Ensure that the solar charge regulator is sealed with internal temperature compensation,

lightning protection, reverse polarity protection, and LED indicators. Provide controllers with the capability of 3 functions: battery charging, load control, and diversion regulation. Controllers must be furnished with fully adjustable DIP switches and RS-232 and RJ45 communications ports to adjust the unit's operational modes and monitor the battery health via the network. Ensure the solar charge regulator is FMS Class I, Groups ABCD and have the CE mark.

C. Batteries

Provide 12V gel electrolyte, non-spillable, maintenance free batteries. Furnish batteries capable of providing power for 10 days without being charged by the Solar Array and Solar Charge Controller. Furnish batteries with a minimum operating temperature of -76° F to 140°F.

D. Ground Mounted Battery Cabinet

Furnish and install a ground mounted cabinet, constructed of 0.125" aluminum with stainless steel hardware, that is separate from the CCTV equipment cabinet to house the batteries. Cabinet shall not be installed in a ditch line or an area prone to flooding. The enclosures must be NEMA 3R rated and large enough to contain the batteries plus 20% spare space. Mount the battery cabinet on a concrete pad. Install a ridged metal conduit from the CCTV Equipment Cabinet to the ground mounted battery Cabinet.

14.3. CONSTRUCTION METHODS

Furnish and install new solar power assemblies. Install solar power equipment as shown in the Plans. Provide wiring, disconnects, and all other required equipment as required by Article 690 of the NEC. Install all solar charging electronics and the solar charge controller in the CCTV cabinet. Install the batteries in the ground mounted battery cabinet. Install solar panel collectors at a height that will prohibit theft and/or vandalism. At a minimum, mount the solar panel collectors 20 feet from ground level. Install the solar array with the orientation and tilt angle that provide the maximum solar-hours and gain. Installation of multiple collector panels shall be approved by the Engineer prior to installation. Ensure that the maximum resistance between the grounding electrode and all points in the grounding system does not exceed 5 ohms. In addition to the requirements of the NEC, test grounding electrode resistance at the connection point to the electrical service ground bus for a maximum of 20 ohms. Furnish and install ground rods to the grounding electrode system as necessary to meet the test requirements.

14.4. TESTING

In addition to any testing requirements of the applicable ITS device, before a solar site is accepted the contractor must demonstrate that the solar array is functioning properly and that the batteries can power the ITS device for 10 days without charging.

14.5. MEASUREMENT AND PAYMENT

Solar Power Assembly will be measured and paid as the actual number of solar power assemblies furnished, installed and accepted. No measurement will be made for solar arrays, solar power assembly equipment cabinet, installing breakers, temperature sensors, concrete cabinet pad, mounting system, grounding system, conduits, risers, wiring, and hardware as these will be considered incidental to furnishing and installing the solar power assembly.

Payment will be made under:

Pay Item Pay Unit

Solar Power Assembly ..... Each

Project Special Provisions
Structures and Culverts

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10/7/2021

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURE **(SPECIAL)**

1.0 GENERAL

Maintain traffic on travelways listed in Table 1 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance as shown in Table 1 at all times during construction.

STATION	OVER	MIN. VERT. CLR.
60+66.06 -Y15FLYAC-	EXISTING I-40	17’
47+63.62 -Y15FLYBD-	I-40	17’
58+33.94 -Y1FLYCA-	EXISTING I-40	17’

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

2.0 PROTECTION OF TRAFFIC

Protect traffic from any operation that affords the opportunity for construction materials, equipment, tools, etc. to be dropped into the path of traffic beneath the structure. Based on Contractor means and methods determine and clearly define all dead and live loads for this system, which, at a minimum, shall be installed between beams or girders over any travelway or shoulder area where traffic is maintained. Install the protective system before beginning any construction operations over traffic. In addition, for these same areas, keep the overhang falsework in place until after the rails have been poured.

3.0 BRACING GIRDERS

Brace girders to resist wind forces, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the member during all stages of erection and construction. Before casting of intermediate diaphragms, decks, or connecting steel diaphragms do not allow the horizontal movement of girders to exceed ½ inch.

4.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

TEMPORARY BENTS **(9-30-11)**

When girder erection requires the use of temporary bents, design, construct, maintain and afterwards remove the temporary bents in accordance with the Standard Specifications and this Special Provision. For the purpose of this Special Provision, the term "temporary bents" includes girder erection temporary bents, vertical shoring and proprietary shoring systems.

Temporary bents for structures over railroads shall maintain a minimum horizontal clearance of 25' from center of track.

Design temporary bents in accordance with the 1995 AASHTO Guide Design Specification for Bridge Temporary Works (including the 2008 Interim Revisions) and the Project Special Provision entitled "Falsework and Formwork". The design calculations and detailed drawings of the structural components shall be signed and sealed by a North Carolina Registered Professional Engineer.

Submit design calculations and detailed drawings of temporary bents to the Engineer for review and approval. The detailed drawings shall show the position of the temporary bents in relationship to the existing travel way, the location of the temporary bents with respect to the ends of the girders, the top of support elevations for setting girders in the cambered position, and a girder erection procedure. For stream crossings, determine the bent stability assuming a scour depth equal to 250% of the pile diameter or width below the existing bed elevation. The Engineer may require a more detailed analysis of scour depth for temporary bents containing more than a single row of piles.

Include all material specifications for new and used materials in the detail drawings. In addition, show the location of the used materials indicating condition of the material, the location and geometry of existing but unused holes, attachments left over from previous use and any other irregularities in the material. Account for the condition of all used materials in the design calculations.

For all manufactured components, provide engineering data supplied by the manufacturer. For proprietary shoring systems, evaluate differential leg loading.

Provide access to all new and used materials for inspection prior to assembly.

Before the temporary bent is loaded, the contractor shall inspect the bent in the presence of the Engineer, and submit a written statement certifying that the erected bent complies with the approved detailed drawings. Any condition or material that does not comply with the accepted drawings, or any other condition deemed unsatisfactory by the Engineer, is cause for rejection until corrections are made.

Remove temporary bents in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. During removal do not disturb or otherwise damage the finished work.

Unless otherwise specified, temporary bents will not be directly measured. Payment will be full compensation at the contract unit prices for the various pay items requiring temporary bents.

BRIDGE DECK RIDEABILITY AND GROOVING AT STATIONS 60+66.06 -Y15FLYAC-, 58+33.94 -Y15FLYCA-, 47+63.62 -Y15FLYBD- **(9-30-11)**

1.0 GENERAL

This Special Provision shall govern the testing, diamond grinding, transverse grooving and all other related work associated with obtaining satisfactory rideability and surface texture of the bridge deck surface. Provide a surface finish in accordance with Article 420-14(B) of the Standard Specifications.

2.0 TESTING REQUIREMENTS

Perform acceptance testing of the longitudinal profile of the finished bridge deck in each wheel path of each lane in the presence of the Engineer. It is the Contractor's responsibility to submit a proposed plan of action and schedule for profilograph testing. Use a certified independent provider, approved by the Engineer, to perform the profilograph test.

Prior to profilograph testing, placement of the bridge deck and barrier rail within the section to be tested shall be complete, with the exception of blockouts required for the installation of joints. Do not install joints until the Engineer determines that the rideability requirements herein have been met. Joint locations should be temporarily bridged sufficiently to facilitate operation of the profilograph and corrective equipment across the joint. Remove all obstructions from the bridge deck and sweep the surface clean of debris prior to testing. If automated profilograph equipment is used, there shall be no radio transmissions or other activities that might disrupt the automated profilograph equipment during the testing.

Ensure that the profilograph is in good operating condition per the manufacturer's recommendations. Maintain tires free of debris and buildup during each test run. Operate the profilograph at a maximum speed of 2 miles per hour. If a propulsion vehicle is used, it shall be approved, and the gross vehicle weight shall not exceed 1,000 pounds.

At the beginning and end of each day's testing, and at other times determined to be necessary by the Engineer, operate the profilograph over a calibration strip so the Engineer can verify correct operation of the profilograph. The calibration strip shall be a 100 foot section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the profilograph in accordance with the current NCDOT procedure entitled "Determination of Profile Index". Copies of this procedure may be obtained from the NCDOT Construction Unit.

Plot each profilogram on a continuous graph at a horizontal scale of 25 feet per inch with the vertical scale plotted at a true scale. Station numbers shall be recorded on the profilogram at distances not to exceed 200 feet. Note joint locations on the profilogram.

Take profiles with the recording wheel in each wheel path of each lane. The wheel paths of a lane are considered parallel to and approximately 3.5 feet inside both edges of the travel lane. Take profiles over the entire length of the travel lanes on the bridge deck including approach slabs. Upon completion of testing, submit the profilograms for each wheelpath to the Engineer for analysis. The Engineer will retain the profilograms.

The Engineer will determine the Profile Index for each wheel path in accordance with the procedure entitled "Determination of Profile Index".

A test section is defined as a 600 foot length of each travel lane. The maximum allowable Profile Index per lane shall not exceed 25" per mile as determined with a 0.0" blanking band over any 600 foot test section. The Contractor will correct individual deviations in excess of 0.3" over any 25 foot length on the line tested by diamond grinding. Additionally, the entire deck surface shall meet a 0.125" in 10 feet straightedge check made atop the deck either transversely or longitudinally as deemed necessary by the Engineer.

3.0 DIAMOND GRINDING

If the deck does not meet the testing requirements, diamond grinding is required to make corrections. Diamond grind the full width of all lanes and shoulders in the direction of travel.

Diamond grinding shall be performed using a Boart Longyear PC 5000, a Target 3804 or an approved equal. Submit grinding equipment specifications to the Engineer for approval before any grinding is performed. Use a grinding machine capable of removing a minimum of 3 feet of width with each pass. Multiple passes may be needed to achieve the required depth of removal. In addition, hand grinding may be required to remove vertical steps between passes.

The ground surface shall consist of between 50 and 60 grooves per foot of width. The grooves shall be between 0.09" and 0.15" in width and 0.0625" in depth. The area between the grooves shall be between 0.06" and 0.13" in width. The final concrete texture shall be uniform.

Construct and operate the grinding machine such that it will not cause strain or damage to the deck surface, excessive ravels, aggregate fractures, spalls, or disturbance of transverse joints. Longitudinally grind the deck parallel to the roadway centerline.

Continuously remove all slurry or other debris resulting from the grinding operations by vacuum pick-up or other approved methods. Prevent the slurry from flowing into floor drains, onto the ground or into the body of water under the bridge. Dispose of all residues off the project.

In completing all corrective work on the deck surface to satisfy the rideability criteria stated herein, limit grinding such that the final reinforcement cover is not less than the plan cover minus ½ inch. In cases where this cannot be achieved, other corrective work may be required as directed by the Engineer.

Provide additional profilograph testing as necessary following grinding until the rideability requirements above are satisfied.

4.0 GROOVING BRIDGE FLOORS

After the concrete surface profile has been accepted by the Engineer, the concrete blockouts poured, and the joints installed, groove the bridge deck in accordance with Article 420-14(B) of the Standard Specifications. If a substantial amount of bridge deck surface has been diamond ground and/or the concrete cover over the slab reinforcement has been reduced to the minimum, the Engineer may delete all or a portion of the requirement of grooving in that area. In this instance, no additional compensation shall be made for underruns in grooving.

5.0 BASIS OF PAYMENT

No separate payment will be made for profilograph testing or diamond grinding of the bridge deck. The cost of the testing procedure, equipment, grinding operation, and removal and disposal of slurry resulting from the grinding operation is considered incidental to the contract bid price for “Reinforced Concrete Deck Slab”.

STEEL REINFORCED ELASTOMERIC BEARINGS **(6-22-16)**

The 2018 Standard Specifications shall be revised as follows:
In **Section 1079-2(A) – Elastomeric Bearings** add the following after the second paragraph:

Internal holding pins are required for all shim plates when the contract plans indicate the structure contains the necessary corrosion protection for a corrosive site.

Repair laminated (reinforced) bearing pads utilizing external holding pins via vulcanization. Submit product data for repair material and a detailed application procedure to the Materials and Tests Unit for approval before use and annually thereafter.

DISC BEARINGS (2-3-14)

1.0 GENERAL

This item consists of furnishing, fabrication and installation of disc bearings in accordance with AASHTO LRFD Bridge Design Specifications, the Standard Specifications, the recommendations of the manufacturer, the details shown on the plans and as specified herein. Disc Bearings consist of a polyether urethane structural element (elastomeric disc) confined by upper and lower steel bearing plates. Equip disc bearings with a shear restriction mechanism (shear pin) to prevent movement of the disc. Supply disc bearings as fixed bearings and guided expansion bearings as designated by the Contract Documents.

Fixed disc bearings allow rotation but no longitudinal or transverse movement in the bearing plane. Fixed bearings consist of a steel sole plate, an elastomeric disc, a shear pin, a steel upper bearing plate, a steel lower bearing plate, a steel masonry plate, a preformed bearing pad, anchor bolts, nuts and washers.

Guided expansion disc bearings allow rotation and only longitudinal movement in the bearing plane. Guided expansion disc bearings consist of a steel sole plate, a polished stainless steel sheet welded to the bottom of the sole plate within the sliding region, a steel upper bearing plate, a layer of virgin polytetrafluoroethylene (PTFE) material bonded to the top and sides of the upper plate within the sliding regions, guide bars welded to the bottom of the sole plate surrounding the sliding region to restrict transverse movement, polished stainless steel sheets welded to the sides of the guide bars within the sliding regions, an elastomeric disc, a shear pin, a steel lower bearing plate, a steel masonry plate, a preformed bearing pad, anchor bolts, nuts, washers, pipe sleeves, a closure plate, grout and various sizes of standard pipe, and any other necessary material as detailed on the plans. Align the stainless steel sheet on the bottom of the sole plate with the PTFE material on the top of the upper bearing plate. Align the PTFE material on the sides of the upper bearing plate with the stainless steel sheets on the sides of the guide bars.

2.0 MATERIALS

Use disc bearings produced by the same manufacturer.

Use AASHTO M270 Grade 50W (345W) or Grade 50 (345) for all steel plates except the stainless steel sheets in the disc bearings. Clean, coat, and seal the plates in the disc bearing assemblies except for the areas with special facings and the areas that come in contact with the elastomer disc, in accordance with the Special Provision for “Thermal Sprayed Coatings (Metallization)”. The surfaces shall be coated to a thickness of 8 mils minimum on all external parts. Repair surfaces that are abraded or damaged after the application of metallizing in accordance with the Special Provision for “Thermal Sprayed Coatings (Metallization)”.

Provide anchor bolts and nuts in accordance with the Standard Specifications.

When the maximum plan dimension of the sheet is 12" or less, provide a stainless steel sheet in expansion disc bearings that is at least 16 gage or 1/16". When the maximum plan dimension is greater than 12", provide a stainless steel sheet that is at least 11 gage or 1/8". Ensure that all stainless steel sheets are in conformance with ASTM A240/A167 Type 304 and polished to a minimum #8 mirror surface finish.

Blast clean the surfaces of the steel sole plate and the steel guide bars that will be attached to the stainless steel sheets to a near white condition in accordance with the Standard Specifications. Position and clamp the back of the stainless steel sheets in contact with the steel sole plate and the steel guide bars. Apply the stainless steel sheets to the blast cleaned surfaces of the steel sole plate and the steel guide bars as soon as possible after blasting and before any visible oxidation of the blast cleaned surfaces occurs. Weld the stainless steel sheets continuously around the perimeter using a tungsten inert gas, wire-fed welder.

For the PTFE sheets bonded to the top and side sliding surfaces of the steel upper bearing plate, used as mating surfaces for the stainless steel sheets attached to the steel sole plate and the guide bars, provide an unfilled virgin PTFE sheet (recessed) or a glass-fiber filled PTFE sheet, resulting from skiving billets formed under hydraulic pressure and heat. Provide resin that conforms to the requirements of ASTM D4894 or D4895.

To bond the PTFE sheets and the steel upper bearing plate, use heat cured high temperature epoxy capable of withstanding temperature of –320°F to 500°F.

Weld the guide bars in expansion bearings to the bottom of the sole plate. Alternatively, integrate the guide bars and sole plate from the same piece of steel, ensuring that the required dimensions are provided. Provide 1/16” clearances between the stainless steel sheets attached to the side sliding surfaces of the guide bars and the PTFE sheet attached to the side sliding surface of the steel upper bearing plate.

Mold the polyether urethane structural element (elastomeric disc) from a polyether urethane compound. The top and bottom surfaces of the disc shall be roughened. Ensure that the physical properties of the polyether urethane conform to the following requirements:

Physical Property	ASTM Test Method	Requirements	
		Min.	Max.
Hardness, Type D Durometer	D2240	60	64
Tensile Stress psi At 100% elongation At 200% elongation	D412	 2000 3700	- - - -
Tensile Strength psi	D412	5000	- - - -
Ultimate Elongation %	D412	220	- - - -

Compression Set % 22 hrs. at 158°F	D395	- - - -	40

3.0 DESIGN

Design the disc bearings for the loads and movements shown on the contract plans. However, use the anchor bolt size, length, spacing and masonry plate thickness as shown on the contract plans and provide an overall bearing height within ½ inch of the bearing assembly height shown on the contract plans. Either combine and cast the sole plate and upper bearing plate (for fixed bearings), the sole plate and guide bars (for expansion bearings), and the lower bearing plate and masonry plate (for fixed and expansion bearings) as a single unit or weld together prior to the installation of the disc.

Ensure access and removal of anchor bolt nut is not in conflict with the upper bearing plate, guide bars or sole plate.

When designing the bearings, use the following allowable bearing stresses:

- On polyether urethane structural element: 5000 psi
- On PTFE Sliding Surface, filled or unfilled PTFE (recessed): 3500 psi

Submit eight sets of shop drawings and one set of design calculations for review, comments and acceptance. Have a North Carolina Registered Professional Engineer check and seal the shop drawings and design calculations.

After the Engineer reviews the drawings and, if necessary, corrections are made, submit one 22" x 34" reproducible set of the working drawings.

4.0 SAMPLING AND TESTING

A. Sampling

The manufacturer is responsible for randomly selecting and testing sample bearings from completed lots of bearings. The manufacturer is also responsible for certifying that the completed bearings and their components have been tested and are in compliance with the requirements of this Special Provision. The manufacturer shall furnish the results of the tests to the Materials and Tests Engineer.

B. Testing

1. Proof Load Test

   Load a test bearing to 150% of the bearing's rated design capacity and simultaneously subject it to a rotational range of 0.02 radians (1.146°) for a period of 1 hour.

Have the bearing visually examined both during the test and upon disassembly after the test. Any resultant visual defects, such as extruded or deformed elastomer or PTFE, damaged seals or rings, or cracked steel is cause for rejection.

Keep continuous and uniform contact between the polyether urethane element and the bearing plates and between the stainless steel sheets and the PTFE sheets (for expansion bearings) for the duration of the test. Any observed lift-off or separation is cause for rejection.

2. Sliding Coefficient of Friction

For all guided expansion bearings, measure the sliding coefficient of friction at the bearing's design capacity in accordance with the test method described below, and on the fifth and fiftieth cycles, at a sliding speed of 1 in/min.

Calculate the sliding coefficient of friction as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's vertical design capacity.

The test results are evaluated as follows:

- A maximum measured sliding coefficient of friction of 3%.
- A visual examination both during and after the test. Any resultant visual defects, such as bond failure, physical destruction, cold flow of PTFE to the point of debonding, or damaged components is cause for rejection of the lot.

Using undamaged test bearings in the work is permitted.

3. Test Method

The test method and equipment shall meet the following requirements:

a. Arrange the test to determine the coefficient of friction on the first movement of the manufactured bearing.

b. Clean the bearing surface prior to testing.

c. Conduct the test at maximum working stress for the PTFE surface with the test load applied continuously for 12 hours prior to measuring friction.

d. Determine the first movement static and dynamic coefficient of friction of the test bearing at a sliding speed of less than 1 in/min, not to exceed:
   0.04 unfilled PTFE
   0.08 filled PTFE

e. Subject the bearing specimen to 100 movements of at least 1 inch of relative movement and, if the test facility permits, the full design movement at a speed of less than 1 ft/min. Following this test determine the static and kinetic

coefficient of friction again. The specimen is considered a failure if it exceeds the values measured in (d) above or if it shows any signs of bond failure or other defects.

Bearings represented by test specimens passing the above requirements are approved for use in the structure subject to on-site inspection for visible defects.

5.0 INSTALLATION

Store disc bearings delivered to the bridge site upright and under cover on a platform above the ground surface. Protect the bearings from injury at all times and, before placing the bearings, dry and clean all dirt, oil, grease or other foreign substances from the bearing. Do not disassemble the bearings during installation, except at the manufacturer's direction. Lift bearing assemblies by their bottom surfaces only, unless lifting brackets that have been designed and approved by the manufacturer are used. Ensure that the polyether urethane disc is not exposed to direct flame or sparks. Place the bearings in accordance with the recommendations of the manufacturer, Contract Drawings, and as directed by the Engineer. If there is any discrepancy between the recommendations of the manufacturer, Special Provisions, and Contract Drawings, the Engineer is the sole judge in reconciling any such discrepancy.

Provide preformed bearing pads under the masonry plates in accordance with Article 1079-1 of the Standard Specifications.

Do not install any bearing before the Engineer approves it.

6.0 BASIS OF PAYMENT

Payment for all disc bearings will be at the lump sum contract price bid for "Disc Bearings" which includes full compensation for furnishing all disc bearings, labor, materials, tools, equipment, testing and incidentals required to complete the work in accordance with the Standard Specifications, this Special Provision, the manufacturer's requirements and as directed by the Engineer.

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the Thermal Sprayed Coatings (Metallization) Program and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The Thermal Sprayed Coatings (Metallization) Program is available on the Materials and Tests Unit website.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

3.0 MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the Thermal Sprayed Coatings (Metallization) Program. Apply TSC with the alloy to the thickness specified on the plans or as required by Thermal Sprayed Coatings (Metallization) Program.

5.0 INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

6.0 REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the Thermal Sprayed Coatings (Metallization) Program.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic zinc-rich coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

    1. Minor localized areas less than or equal to 0.1 ft^2 with exposed substrate shall be repaired as outlined above for marine and non-marine environments.

    2. Large localized areas greater than 0.1 ft^2 with exposed substrate shall require the Contractor to submit a detailed repair procedure to the Engineer for review and approval.

- Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

7.0 TWELVE MONTH OBSERVATION PERIOD

All TSC materials applied under the Thermal Sprayed Coatings (Metallization) Program shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

8.0 BASIS OF PAYMENT

The contract price bid for the metal component to which the TSC is applied will be full compensation for the thermal sprayed coating.

EXPANSION JOINT SEALS (9-30-11)

1.0 GENERAL

The work covered by this Special Provision consists of furnishing and installing the expansion joint seals as shown on the contract drawings. All materials, labor, equipment and incidentals necessary for the proper installation of the expansion joint seals are included.

2.0 MATERIAL

Provide expansion joint seals capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans.

Provide an elastomeric component for each expansion joint seal that is a continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. The minimum length of an elastomeric component before shop splicing is 20 feet. However, one piece shorter than 20 feet is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Make sure the convolution of the gland does not project above the top of the hold-down plates when the joint opening is in the most compressed condition. Use either elastic polychloroprene (neoprene) or ethyl propylene diene monomer (EPDM) for the elastomer that meets the following minimum properties:

	ASTM TEST METHOD	REQUIREMENTS
Hardness, Durometer - Shore A	D2240	60 ± 5, Neoprene (upward corrugated shape - fabric reinforced) 75 ± 5, EPDM and Neoprene (upward non-corrugated shape) 80 ± 5, EPDM (upward corrugated shape-fabric reinforced)
Tensile Strength	D412	2000 psi (min.)
Elongation at Break	D412	250% (min.)
Width of Gland in Relaxed Condition	N/A	10" ± 0.25"

Thickness of Upturned portion of gland	N/A	0.25" non-corrugated shape, -0.032" to +0.032"
Thickness of Upturned portion of gland	N/A	0.1875" corrugated shape, -0.032" to +0.032"
Thickness of Flat portion of gland	N/A	0.1563", -0.032" to +0.032"

For fabric reinforced glands, submit one unreinforced sample per lot number, up to 500 feet of Expansion Joint Seal, to the Engineer for testing.

Only field splice hold-down plates at crown points, at abrupt changes in the deck slab cross slope, and on lane lines. Splicing within travel lanes is not permitted and splicing on edge lines is not required. Field splice hold-down plates between the edge line and gutter upturn and where necessary for proper installation and alignment is permitted. Show all splice locations on the working drawings for approval. For the location of lane markings at the expansion joint seal, see the Structure plans. At the splice locations, locate the hold-down bolts 3 inches from the end of the hold-down plate. At splice locations where changes in deck slab cross slope occur, cut the ends of hold-down plates parallel to the bridge centerline for skews less than 80° and greater than 100°.

Do not use welded shop splices in hold-down plates.

3.0 SHOP DRAWINGS

Submit nine sets of working drawings to the Engineer for review, comments and acceptance. Show complete details drawn to scale and include:

- The proposed template details including the makeup of the template
- The proposed method of holding the base angle assembly in place while concrete is cast around it
- The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening
- The proposed chronology of installation including the sequence and direction of the concrete casting
- The details of cross connectors between base angles, such as steel bars with slots bolted to angles, to maintain evenness between the adjacent base angles while accommodating movement that occurs when concrete is cast. Indicate when bolts are loosened to allow movement.
- The proposed method for removing the hold-down plate
- A section detail through the joint showing horizontal offset dimensions of the base angles from the centerline joint. This detail is required when the vertical face of the joint opening is not perpendicular to the roadway surface (e.g. when the roadway grade is significant).

Have someone other than the one who prepares the drawing check all detailed drawings and include the signatures of both the drafter and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor. Provide all completed drawings well in advance of the scheduled installation time for the expansion joint seal.

4.0 INSTALLATION

Provide supports for the base angle assembly at a maximum spacing of 9 feet. Place supports near field splices of base angles to ensure that field splices are straight and even. Provide base angles with ½" diameter weep holes at 12 inch centers to allow bleeding of trapped air and/or water. Do not obstruct the weep holes with falsework. Make the bottom of the trough parallel to grade and the sides parallel to the sides of the expansion joint seal.

For damaged areas, depressions, spalls, cracks, or irregularities of curbs or decks adjacent to the expansion joint, submit a proposed method of repair and repair material specifications for approval.

If the Engineer deems any aspects of the expansion joint seals unacceptable, make necessary corrections.

5.0 INSPECTION

When concrete is cast, use a non-aluminum, 10 foot, true to line straight edge to check and grade the top of the slab on each side of the joint to ensure smooth transition between spans.

Watertight Integrity Test

- Upon completion of an expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalks, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not a sign of leakage.
- If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

- If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no extra cost to the Department.

6.0 BASIS OF PAYMENT

Basis of payment for all expansion joint seals will be at the lump sum contract price for "Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including any steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the expansion joint seal in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

MODULAR EXPANSION JOINT SEALS (9-30-11)

1.0 GENERAL

Furnish and install modular expansion joint seals within the limits indicated on the plans.

Obtain modular expansion joint seals from Fabricators that are AISC certified in Category I.

Use a modular expansion joint seal that is a waterproof system such as WABOMODULAR as manufactured by Watson Bowman and Acme Corporation of Amherst New York, BROWN/MAURER as manufactured by the D. S. Brown Company of North Baltimore, Ohio or an approved equal. Do not use aluminum components in the modular expansion joint. Use a modular expansion joint seal consisting of three or more transverse rails holding two or more elastomeric seals in place and a support mechanism that ensures the rails maintain parallel and equidistant spacing. Do not use bolts to connect the rails to the support mechanism.

Provide an elastomeric component for each modular expansion joint seal that is one continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component also. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Provide modular expansion joint seals capable of handling a total movement measured parallel to the centerline of the roadway as shown on plans. Limit clear distance between centerbeams, and edgebeams and centerbeams, to 3½". Limit centerbeam spans to approximately 48".

2.0 DRAWING AND SPECIFICATION SUBMITTAL

Submit Shop Drawings for Fabrication and Installation Procedure and Revised Contract Plan Sheets, showing revised details of the Structure contract plans.

A. Shop Fabrication and Installation Procedure Drawings

The deck slab is detailed in the contract plans with a required full depth transverse construction joint separating the main slab pour from the blockout area for the modular joint assembly. Position the modular joint assembly in the blockout area only after the main slab pours adjacent to the blockout area have been made and the girder rotation, deflection, and longitudinal movement due to slab pours have occurred.

Detail the method of positioning and securing the modular assembly in the blockout prior to the closure pour on the working drawings.

Submit two complete sets of working drawings for review. Submit these drawings well in advance of the scheduled installation time for the modular expansion joint seals. Include material requirements and installation procedures and specifications in the drawings.

After the drawings have been reviewed and, if necessary, corrections have been made, submit nine additional sets of the working drawings.

B. Revised Contract Plan Sheets

Concurrent with the submission of the working drawings, submit two sets of revised Structure plans for review. In the revised plans, include necessary changes in dimensions, reinforcing steel, and concrete blockouts to accommodate modular expansion joint seals. Have a North Carolina Registered Professional Engineer prepare and seal the revised plans. No adjustment will be made in the contract price for any bid item due to revisions necessary to accommodate the modular expansion joint seals. This cost is included in the lump sum price bid for furnishing and installing the modular expansion joint seal.

After the revised plans have been reviewed and, if necessary, corrections have been made, submit one 22" x 34" reproducible set of revised structure contract plans.

3.0 FABRICATION AND INSTALLATION

Protect the components of the modular expansion joint seal in the following manner. Upon completion of any shop fabrication, commercially blast clean (SP-6) all steel components, excluding stainless steel parts. Metallize to a minimum thickness of 8 mils on these surfaces. Metallize in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". Repair abraded or damaged coated surfaces anytime after applying the coating as specified for repair of galvanizing in the Standard Specifications. As an alternative to Metallizing, galvanizing in accordance with the Standard Specifications is permitted.

Install the modular expansion joint seals according to the procedures and recommendations of the manufacturer, except as amended in the next paragraph.

Limit modular expansion joint seal splices to crown points, abrupt changes in deck slab cross slope, lane lines, or as necessary for proper installation and alignment. All splice locations and details must be shown on the submitted working drawings and are subject to the Engineer's approval. For shop splices, full penetration welds are required for centerbeam splices. For shop splices, partial penetration welds are not allowed for centerbeam splices, except at barrier rail upturns or sidewalk upturns. For field splices, partial penetration welds are not allowed for centerbeam splices. Show and submit for approval all splice locations on the working drawings. For location of lane markings at the modular expansion joint seals, see the Structure plans.

When indicated on the plans, provide special snowplow protection, such as a snowplow blade guide or steel ribs, to prevent the blade from entering the joint recess.

If the Engineer deems any aspects of the modular expansion joint seals unacceptable, make necessary corrections.

Watertight Integrity Test

- Upon completion of each modular expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The modular expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not considered a sign of leakage.
- If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.
- If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no additional cost to the Department.

4.0 BASIS OF PAYMENT

Basis of payment for all modular expansion joint seals will be at the lump sum contract price for "Modular Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the modular expansion joint seals in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERTS (12-12-13)
AT STATIONS 792+88.12 -L-, 18+22.67 -Y5B-, 19+75.11 -Y5B-, 35+53.70 -Y15RPDREV-

1.0 GENERAL

This Special Provision covers the design, fabrication and construction of precast reinforced concrete box culverts intended for the conveyance of storm water.

If the option is indicated on the plans, the submittal for a precast reinforced box culvert in lieu of a cast-in-place culvert is permitted. Design the precast culvert sections in accordance with ASTM C1577 or the current edition of the AASHTO LRFD Bridge Design Specifications. Rate all sizes of precast reinforced concrete box culverts in accordance with the current edition of the AASHTO Manual for Bridge Evaluation. Ensure the culvert rates for the AASHTO design loads and North Carolina's legal loads (see Section 2.0 for North Carolina's legal loads). Provide the size and number of barrels as indicated on the plans. Detail the culvert with cast-in-place wings walls and footings. Precast wing walls and footings will not be allowed. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

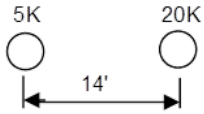
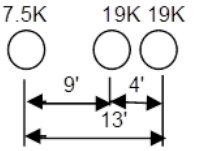
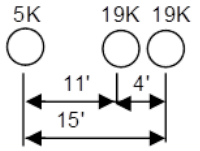
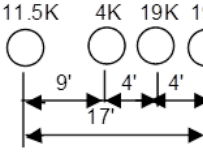
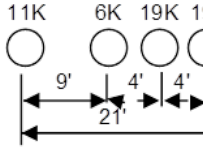
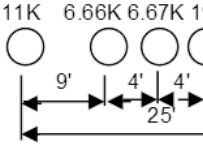
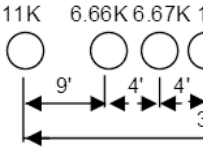
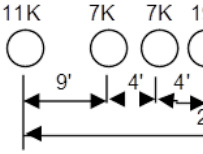
The design and rating of the precast and cast-in-place members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans and rating sheets for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box and cast-in-place members. Have a North Carolina Registered Professional Engineer check and seal the plans, rating sheets and design calculations. After the plans, rating sheets and design calculations are reviewed and, if necessary, the corrections made, submit one set of plans and rating sheets on 22" x 34" sheets to become part of the contract plans.

If the span, rise and design earth cover for the precast reinforced concrete box culvert are identical to a previously approved submittal, the Contractor may request the previously approved design calculations and plans be considered as the submittal for review and approval. However, a set of plans and rating sheets will need to be submitted to become part of the contract plans.

2.0 NORTH CAROLINA'S LEGAL LOADS

Apply the following legal loads to all structures carrying interstate traffic:

SINGLE VEHICLE(SV)

REF. #	SCHEMATIC
SH	 25K 12.5 TON
S3A	 45.5K 22.75 TON
S3C	 43K 21.5 TON
S4A	 53.5K 26.75 TON
S5A	 61K 30.5 TON
S6A	 69K 34.5 TON
S7A	 80K 40 TON
S7B	 77K 38.5 TON

TRUCK TRACTOR SEMI-TRAILER(TTST)

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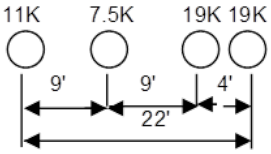
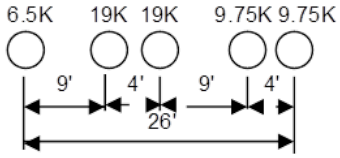
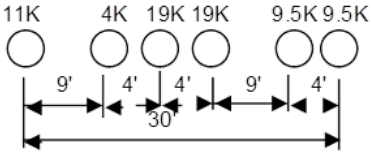
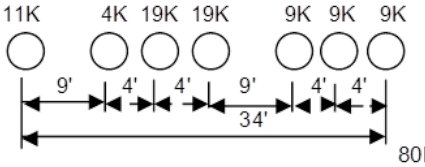
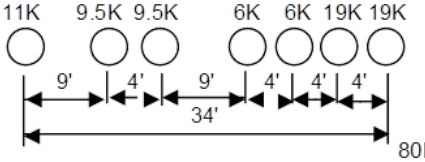
T4A	 56.5K 28.25 TON
T5B	 64K 32 TON
T6A	 72K 36 TON
T7A	 80K 40 TON
T7B	 80K 40 TON

Apply the following legal loads to all structures carrying non-interstate traffic:

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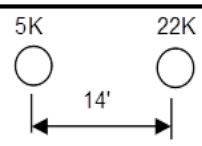
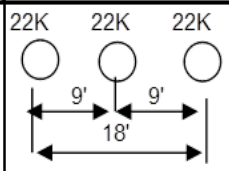
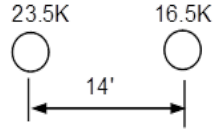
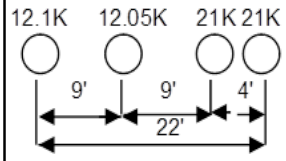
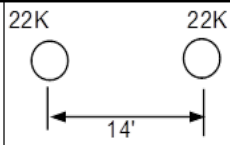
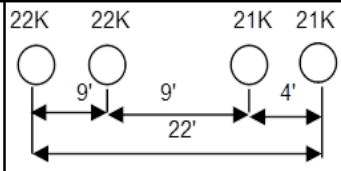
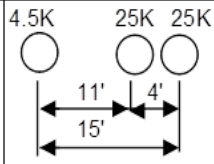
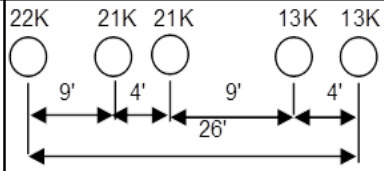
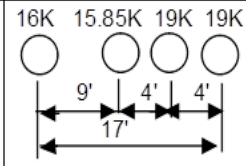
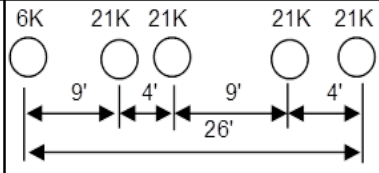
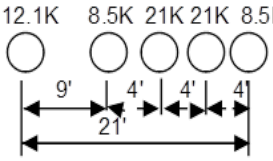
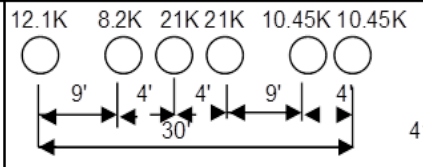
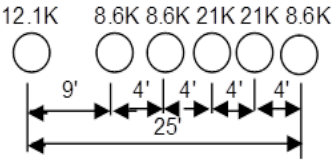
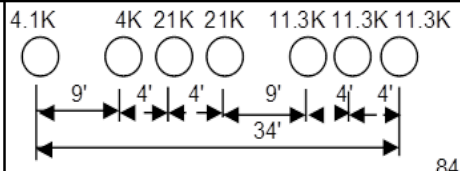
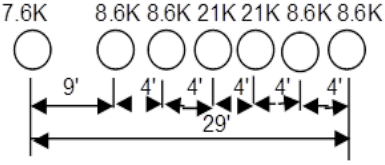
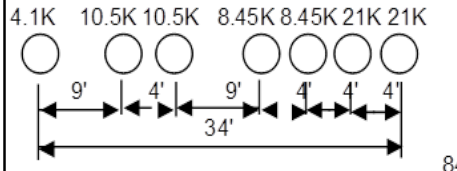
REF. #	SCHEMATIC		REF. #	SCHEMATIC	
SNSH		27K 13.5 TON	TNAGRIT3		66K 33 Ton
SNGARBS2		40K 20 TON	TNT4A		66.15K 33.075 TON
SNAGRIS2		44K 22 Ton	TNAGRIT4		86K 43 TON
SNCOTTS3		54.5K 27.25 TON	TNAGT5A		90K 45 TON
SNAGGRS4		69.85K 34.925 TON	TNAGT5B		90K 45 TON
SNS5A		71.1K 35.55 TON	TNT6A		83.2K 41.6 TON
SNS6A		79.9K 39.95 TON	TNT7A		84K 42 TON
SNS7B		84K 42 TON	TNT7B		84K 42 TON

3.0 PRECAST REINFORCED CONCRETE BOX SECTIONS

The precast reinforced concrete box culvert sections shall match the size and hydraulic opening indicated in the contract plans.

A. Design

1. Design Fill – The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the bottom of the top slab.

2. Placement of Reinforcement – Provide a 1 inch concrete cover over the reinforcement subject to the provisions of Section F. Extend the inside reinforcement into the tongue portion of the joint and the outside reinforcement into the groove portion of the joint. Detail the clear distance of the end wires so it is not less than 1/2 inch or more than 2 inches from the ends of the box section. Assemble reinforcement per the requirements of ASTM C1577 or the approved design. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.

3. Laps and Spacing – Use lap splices for the transverse reinforcement. Detail the transverse wires so that the center to center spacing is not less than 2 inches or more than 4 inches. Do not detail the longitudinal wires with a center to center spacing of more than 8 inches.

B. Joints

1. Produce the precast reinforced concrete box section with tongue and groove ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the tongue and groove ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.

2. Seal the external joint with an outside sealer wrap conforming to ASTM C877 that is at least 12 inches wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in pieces, as indicated on Figure 1 below:

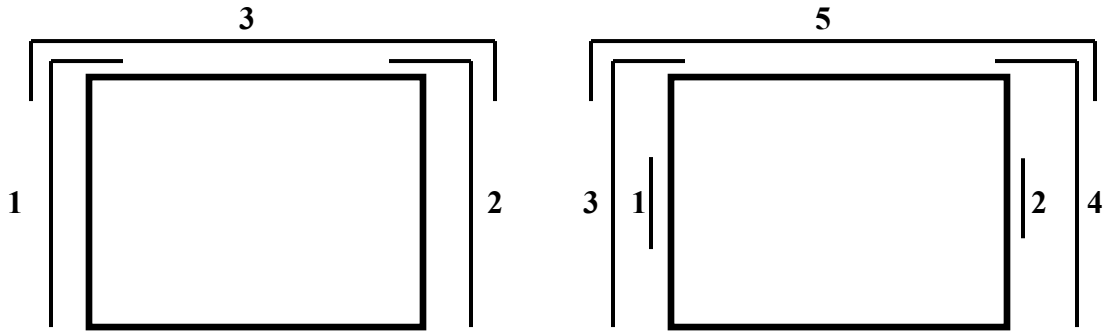


Figure 1

Cover the external joint sealer with a 3 foot strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications.

Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches. Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

C. Manufacture

Manufacture precast reinforced concrete box culvert sections by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd^3 of portland cement.

2. Strength – Concrete shall develop a minimum 28-day compressive strength of 5000 psi. Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.

3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.

4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).

5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and placing. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all

handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

D. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with ASTM C31 and ASTM C39.

E. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch in 8 feet.

2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch from the plan dimensions.

3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch.

4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches. The minimum length of the groove shall be 4 inches. The dimensions of the tongue and groove shall not vary more than 1/4 inch from the plan dimensions.

5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch, whichever is greater. A thickness more than that required on the plans is not a cause for rejection.

6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of ASTM C1577, Section 11.3.

7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch in any box section.

8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is ±3/8 inch for slab and wall thicknesses of 5 inches or less and ±1/2 inch for slab and wall thicknesses greater than 5 inches. Produce sections so that the concrete cover is never less than 5/8 inch as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.

9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

F. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, the Department will verify assembly of the first five adjacent sections or 20% of the total culvert length, whichever is greater, at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked. The producer shall document the GO-NO-GO dimensional measurements of each box culvert section produced through the post-pour inspection process.

2. Clearly mark each section of the box culvert in accordance with ASTM C1577, Section 15. The information requirements of Section 15.1 shall be clearly marked on the inner surface of each section.

G. Construction

1. Pre-installation Meeting – A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.

2. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet shall be provided between sections of fabric.

3. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.

4. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

4.0 BASIS OF PAYMENT

Any additional cost of redesigning will be paid for by the Contractor if Precast Reinforced Concrete Culvert is used in lieu of the cast-in-place culvert shown on the plans. Except for Foundation Conditioning Material and Culvert Excavation, payment for the Precast Box Culvert will be a lump sum amount equal to the payment that would be allowed for construction of a Cast-in-Place Box Culvert. Plan quantities and unit bid prices will be used to compute the lump sum amount. Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor, materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, leveling pad, end curtain walls, wings and wing footings.

SOUND BARRIER WALL (8-29-19)

1.0 DESCRIPTION

This work consists of furnishing precast panels with an architectural surface treatment, structural steel, concrete, handling, transporting, fabricating, galvanizing, storing materials, furnishing erection drawings, pile excavation, backfilling, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision.

Precast panels with an architectural surface treatment shall be constructed using form lining materials and patterns to match the appearance (size, shape, color, texture, pattern, and relief) of the textured finish as specified on the plans and approved by the Engineer.

The contractor is required to use the same form liner and coloration contractor to construct the precast panels with an architectural surface treatment.

The Standard Plans allow pile spacing of 10, 15 or 20 feet. Pile spacing greater than 15 feet will not be allowed for the precast concrete panels detailed in the standard plans. Provide consistent pile spacing for the entire length of the wall. Use odd pile spacing, if necessary, only at the ends of the wall and at turning points as approved by the Engineer. Architectural surface treatment shall not be applied to piles. Piles shall have a smooth, non-textured finish, and remain unstained in their natural color.

A maximum one foot drop or rise in elevation between wall sections is permitted. Elevation changes greater than one foot, if necessary, will be allowed only at the end of the wall. Top of wall elevation changes that result in a jagged appearance will not be allowed.

2.0 QUALIFICATIONS

Prior to beginning work the contractor shall submit the following qualifications to the Engineer for approval:

A. Architectural Surface Treatment Construction

The Contractor shall have a minimum of three years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 3 references who were responsible for supervision of similar projects. Include name, address, telephone number, and specific type of application.

B. Form Liners and Coloring System

The manufacturer of form liners for the standard textured finishes and coloring system shall have at least five years of experience making molds and color stains to create formed concrete surfaces to match the specified textured finish and colors. The Contractor shall schedule a pre-installation conference with a form liner manufacturer

representative and the Engineer to assure understanding of simulated textured finish form liner use, color application, requirements for construction of sample panel(s), and to coordinate the work. The Contractor shall be required to disclose their source of form liner manufacturer and final coloration contractor prior to the Preconstruction Conference.

3.0 ALTERNATE PILE SPACING FOR STANDARD PRECAST PANELS

As an alternate, the Contractor may submit plans for pile spacings greater than 10 feet and less than 15 feet for review and approval. The pile excavation diameter, excavation depth and reinforcing steel shall be equal to the amount shown on the existing plans for the 15 feet pile spacing. A variance in the reinforcing steel will be allowed for the length of horizontal and number of vertical reinforcement bars in the precast panel for the alternate pile spacing.

Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of required reinforcement necessary to fabricate the precast panels. Have a North Carolina registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

4.0 ALTERNATE WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for substitution to the detailed Standard Sound Barrier Wall only when noted on the plans. Alternate wall types, piles and pile spacing must meet the design and construction requirements of the project. Pile spacing greater than 20 feet will not be permitted. Alternate pile and wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications.

Prior to submittal of Working Drawings, as described herein, submit a copy of the signed NCDOT Product Status Notification Letter and two sets of preliminary plans for review and approval. Include material specifications for all components. Once preliminary plans are approved, submit Working Drawings in accordance with all applicable portions of the requirements herein, including details necessary to fabricate and construct the proposed alternate.

Have a North Carolina registered Professional Engineer check, seal and date the plans and, when requested, provide calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

5.0 WORKING DRAWINGS

Submit precast panel casting drawings in accordance with Article 1077-2 of the Standard Specifications prior to casting. Show the inserts, method of handling, and support details

used for transportation on the casting drawings. Submit fabrication drawings for approval prior to fabrication of wall components. Submit an erection plan and precast panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of forms. Submit five sets of detail drawings on 22" x 34" sheets.

Submit for review and acceptance, wall plan and elevation views and details showing overall simulated textured pattern, joint locations, and end, edge or other special conditions. The drawings should include typical cross sections of precast panels, joints, corners, texture relief, texture size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the working drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Working drawings should be of sufficient scale to show the detail of all textured finishes and joint patterns. Shop drawings shall be reviewed and approved prior to fabrication of form liners.

6.0 MATERIALS AND FABRICATION OF STANDARD PRECAST PANELS

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures. Provide precast panels 4 inches ± ¼ inch thick, excluding relief for a textured finish. Architectural surface treatment shall consist of a standard textured finish and a single color of stain applied to both faces of the precast panels as specified on the plans and approved by the Engineer. Relief of any texture is not to exceed an average depth of 1 inch. No textured finish or stain shall be applied on the uppermost foot of each wall segment and along the vertical edges of the panels. These areas shall have a smooth, non-textured finish, and remain in its natural concrete color.

Furnish three 12" x 12" samples for approval which establish the acceptable variations in color, texture, and uniformity. After the color, texture, and uniformity of the furnished samples are approved, produce a full scale panel unit meeting design requirements. This mock-up and the furnished samples establish the standard quality for determining acceptance of the panels. When producing the final installed panels, use fine and coarse aggregate, retarder, and cement from the same source as those used in the approved sample panels.

The standard textured finish shall be constructed using form lining materials. The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall conceal construction joint lines.

Prior to each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be accepted by the Engineer before being used. Form liner panels that do not perform as intended or are no longer repairable shall be replaced.

Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼ inch seam. Blend form liner butt joints into the textured surface pattern and finish off the final concrete surface. Create no visible vertical or horizontal seams or conspicuous form liner butt joint marks. At locations where the form liners are joined, carefully blend to match the balance of the textured finish.

Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects.

When the approved textured finish requires simulated grout pattern joints, construct grout pattern joints to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

The Contractor shall have a technical representative from the form liner manufacturer on site for technical supervision during the installation and removal of form liners. Unless directed by the Engineer, installation and removal of form liners shall not be permitted if the technical representative is not present.

Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product and shall be applied in accordance with the manufacturer's recommendations. The form release agent shall be compatible with the form liner material, the concrete coloring system, any special surface finish and in accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

All form defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal. Use patching materials and procedures in accordance with the manufacturer's recommendations.

Precast concrete shall be finished in accordance with the Standard Specifications, except that curing of concrete should been done to accommodate the application of coloring and surface finish treatment.

7.0 SURFACE COLORING

All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces to be accomplished by pressure washing with water set at 3,000 psi to remove laitance. The fan nozzle shall be held perpendicular to the surface at a distance of 1 to 2 feet. Sandblasting will not be permitted.

Surface coloring shall be achieved using an approved stain suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color system shall be a single color of stain in brown or gray tones as specified on the plans and approved by the Engineer. The approved sample panel shall be the basis for determining the appropriate stain application.

The coloring agent shall be a penetrating stain mix or other approved coloring system designed for exterior application on old or new concrete with field evidence of resistance to moisture, acid or alkali, mildew, mold or fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission. Final coloring system and color of stain are subject to approval by the Engineer.

Application of coloring/staining agent to finished precast concrete and patches shall occur at a minimum of 30 days after form liners are removed. Maintain the concrete temperature between 40°F and 85°F during color/stain application and for 48 hours after color/stain application. Consult the manufacturer's recommendations for preparation, application, curing, and storage of coloring agents/stains. The contractor shall provide a Color Application Artist who is experienced in producing realistic surface appearances. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption. Linear butt joints shall be carefully blended into the approved pattern and finished off the final concrete surface. No visible vertical or horizontal seams or conspicuous form marks created by butt joining will be permitted.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

8.0 CONSTRUCTION METHODS

Complete the final survey of existing ground profile after clearing the wall area but prior to submitting any working drawings. Submit the final groundline survey with the working drawings.

If the Department is responsible for the survey, the Engineer field verifies the existing ground profile along the sound barrier wall. Contact the Engineer to obtain the survey information. Otherwise, complete the existing ground survey prior to submittal of working drawings.

Excavate holes with the diameters shown on the plans. Perform pile excavation to the depths shown on the plans and install piles as shown on the plans or in the accepted submittals with a tolerance of ½ inch per foot from vertical. Backfill excavations with concrete after placing piles.

A. Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance the excavation. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the Standard Specifications and as directed by the Engineer. Drilling spoils consist of all excavated material including water removed from the excavation either by pumping or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize excavations with either slurry or steel casing. When using slurry, submit slurry details including product information, manufacturer's recommendations for use, slurry equipment information and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casing, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼ inch.

B. Concrete Placement

Before placing concrete, center and support the pile in the excavation and check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6 inches per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6 inches per half hour, propose a concrete placement procedure to the Engineer. The Engineer shall approve the concrete placement procedure before placing concrete.

Fill the excavation with Class A concrete in accordance with Section 1000 of the Standard Specifications except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner and remove all casings.

9.0 METHOD OF MEASUREMENT

The quantity of form liner textured finish and coloring stain to be paid for will be the actual square feet of architectural surface treatment that has been incorporated into the completed and accepted work. The area of architectural surface treatment will be measured by the area of treated panels. Do not include the uppermost foot of each wall segment, panel vertical edges without architectural surface treatment, or piles in the measurement. Area of sample panels shall not be included in the measurement of architectural surface treatment.

The quantity of sound barrier wall to be paid for will be the actual square feet of completed and accepted wall. In any individual section of sound barrier wall or in comparably dimensioned sections, the wall height is from the bottom of the bottom panel to the top of

the top panel and the width is the distance between the centerline of the piles at the ends of the section. Include the full width of the piles at the ends of the wall.

10.0 BASIS OF PAYMENT

The quantity of sound barrier wall and architectural surface treatment, measured as provided above, will be paid for at the contract unit price bid per square foot.

The unit price bid per square foot for "Sound Barrier Wall" will be full compensation for work covered by this Special Provision including, but not limited to, furnishing precast panels, steel or concrete piles, miscellaneous structural steel, concrete, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, backfilling, pile excavation including any casing or slurry, and erecting and installing the sound barrier wall members.

The unit price bid per square foot for "Architectural Surface Treatment" will be full compensation for the architectural treatment covered by this Special Provision including, but not limited to, furnishing architectural detail drawings, sample panels; the construction, finishing, and removal of all equipment, materials, labor, and incidentals necessary for furnishing and use of all form liners to produce approved textured finish and application of approved surface coloring.

Payment will be made under:

Sound Barrier Wall..... Square Foot

Architectural Surface Treatment (Sound Barrier Wall) ..... Square Foot

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

   Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

   The following requirements replace those of Article 3.4.8.2.

   Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

   Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

1.0 GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the contract. Make submittals that are not specifically noted in this provision directly to the Engineer. Either the Structures Management Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Engineer, Structures Management Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

2.0 ADDRESSES AND CONTACTS

For submittals to the Structures Management Unit, use the following addresses:

Via US mail:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

Submittals may also be made via email.

Send submittals to:

jlbolden@ncdot.gov (James Bolden)

Send an additional e-copy of the submittal to the following address:

eomile@ncdot.gov (Emmanuel Omile)

mrorie@ncdot.gov (Madonna Rorie)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. David Hering, L. G., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. David Hering, L. G., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

Via Email: EastGeotechnicalSubmittal@ncdot.gov

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail or other delivery service:

Mr. Eric Williams, P. E.
Western Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via Email: WestGeotechnicalSubmittal@ncdot.gov

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
(919) 250 – 4082 facsimile
jlbolden@ncdot.gov

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
ewilliams3@ncdot.gov

3.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers "Geotechnical Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structures Management Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam Joint Seals"

Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms [2] (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Disc Bearings [4]	8	0	"Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3

Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structures Management Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	1 drawings, 1 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	1 drawings, 1 calculations	2 drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.

2. Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email), US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.

3. The Pile Driving Equipment Data Form is available from:
https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx
See second page of form for submittal instructions.

4. Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY (6-20-19)

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.

C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.

D. **Certifications:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES (12-1-17)

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, decks, end bent caps, or bent caps. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

MASS CONCRETE **(6-20-19)**

This special provision applies to substructure components (footings, columns or caps) where the smallest dimension of that component is greater than or equal to six feet and less than or equal to eight feet.

The mass concrete temperature after placement shall not exceed 158°F and the temperature difference between the core and exterior surfaces shall not exceed 35°F. Mass concrete should remain covered and monitored until the difference between the core temperature and the average daily ambient temperature is below 35°F. All mass concrete pours shall remain covered and protected a minimum of 7 days unless otherwise directed by the Engineer.

Submit an analysis, for review and approval, of the anticipated thermal developments in the mass concrete based on the proposed mix design, materials and casting procedures. At a minimum the analysis shall provide: an anticipated range of peak temperatures, temperature gradients, time to peak temperature and recommended cure time. The submittal shall also describe the measures and procedures that will be taken to limit the temperature differential to 35°F or less between the core and exterior surfaces.

Methods for reducing thermal differential may involve but are not limited to a combination of the following:

A. Selecting materials that minimize the heat generated by hydration of the cement.

B. Cooling materials to reduce the temperature of the concrete in its plastic state.

C. Controlling the rate of concrete placement.

D. Insulating the concrete surface to prevent heat loss.

E. Providing supplemental heat at the concrete surface to prevent heat loss.

F. Other acceptable methods which may be developed by the Contractor.

The temperature of mass concrete at the time of placement shall not be less than 40°F nor more than 75°F.

Mass concrete shall contain an approved set-retarding, water-reducing admixture, and flyash or ground granulated blast furnace slag in the amount of 25% by weight of the total cementitious material (portland cement plus flyash). Fly ash or ground granulated blast furnace slag used in the mass concrete mix shall meet the requirements of Articles 1024-5 and 1024-6 of the Standard Specifications. Portland Cement shall meet the requirements of AASHTO M85 for Type II. The total cementitious material shall not exceed 600 lbs. per cubic yard of concrete. The Contractor shall test and submit results for the compressive strength of his proposed mix design for review and approval. The strength must be taken as the average of at least three cylinders made in the laboratory and meet the minimum 28 day strength requirements noted in the contract plans.

The Contractor shall provide and install a minimum of six temperature sensing devices in each mass concrete pour to monitor temperature differentials between the core and exterior surfaces. These devices shall have an accuracy of ±2°F within the temperature range of 40°F to 180°F. One temperature sensing probe shall be placed near the core of the pour, and the remaining temperature sensing probes shall be placed at approximately two inches clear from the surface of the concrete furthest from the core. The Engineer shall approve the locations of the temperature sensing probes.

Readings from the temperature sensing devices shall be recorded at one-hour intervals, from the time casting is complete until the maximum temperature is established. After the maximum temperature is established, record readings from temperature sensing devices at two-hour intervals until consecutive readings indicated the temperature difference between the core and all exterior surfaces is less than 35°F. At the option of the Contractor, the temperature may be recorded by an approved strip-chart recorder furnished by the Contractor.

If monitoring indicates the 35°F differential has been exceeded, the Contractor shall take immediate action to reduce the temperature differential to less than 35°F and revise the thermal plan to ensure future mass concrete pours meet the temperature limits. All revisions to the approved plan must be approved by the Engineer prior to implementation.

At the discretion of the Engineer, all temperature monitoring requirements may be waived provided the Contractor has proven to the satisfaction of the Engineer that the temperature after placement will not exceed 158°F and the temperature difference between the core and all exterior surfaces will not exceed 35°F.

Placement of mass concrete shall be continuous resulting in a footing, column or cap that is monolithic and homogeneous.

The entire cost of this work shall be included in the unit contract price bid for the class of concrete associated with the mass concrete.

ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES (12-30-15)

1.0 INSPECTION FOR ASBESTOS CONTAINING MATERIAL

Prior to conducting bridge demolition or renovation activities, the Contractor shall thoroughly inspect the bridge or affected components for the presence of asbestos containing material (ACM) using a firm prequalified by NCDOT to perform asbestos surveys. The inspection must be performed by a N.C. accredited asbestos inspector with experience inspecting bridges or other industrial structures. The N.C. accredited asbestos inspector must conduct a thorough inspection, identifying all asbestos-containing material as required by the Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants (NESHAP) Code of Federal Regulations (CFR) 40 CFR, Part 61, Subpart M.

The Contractor shall submit an inspection report to the Engineer, which at a minimum must include information required in 40 CFR 763.85 (a)(4) vi)(A)-(E), as well as a project location map, photos of existing structure, the date of inspection and the name, N.C. accreditation number, and signature of the N.C. accredited asbestos inspector who performed the inspection and completed the report. The cover sheet of the report shall include project identification information. Place the following notes on the cover sheet of the report and check the appropriate box:

___ ACM was found
___ ACM was not found

2.0 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

If ACM is found, notify the Engineer. Compensation for removal and disposal of ACM is considered extra work in accordance with Article 104-7 of the Standard Specifications.

An Asbestos Removal Permit must be obtained from the Health Hazards Control Unit (HHCU) of the N.C. Department of Health & Human Services, Division of Public Health, if more than 35 cubic feet, 160 square feet, or 260 linear feet of regulated ACM (RACM) is to be removed from a structure and this work must be completed by a contractor prequalified by NCDOT to perform asbestos abatement. RACM is defined in 40 CFR, Part 61, Subpart M. Note: 40 CFR 763.85 (a)(4) vi)(D) defines ACM as surfacing, TSI and Miscellaneous which does not meet the NESHAP RACM.

3.0 DEMOLITION NOTIFICATION

Even if no ACM is found (or if quantities are less than those required for a permit), a Demolition Notification (DHHS-3768) must be submitted to the HHCU. Notifications and Asbestos Permit applications require an original signature and must be submitted to the HHCU 10 working days prior to beginning demolition activities. The 10 working day period starts based on the post-marked date or date of hand delivery. Demolition that does not begin as originally notified requires submission of a separate revision form HHCU 3768-R to HHCU. Reference the North Carolina Administrative Code, Chapter 10A, Subchapter 41C, Article .0605 for directives on revision submissions.

Contact Information
Health Hazards Control Unit (HHCU)
N.C. Department of Health and Human Services
1912 Mail Service Center
Raleigh, NC 27699-1912
Telephone: (919) 707-5950
Fax: (919) 870-4808

4.0 SPECIAL CONSIDERATIONS

Buncombe, Forsyth, and Mecklenburg counties also have asbestos permitting and NESHAP requirements must be followed. For projects involving permitted RACM removals, both the applicable county and the state (HHCU) must be notified.

For demolitions with no RACM, only the local environmental agencies must be notified. Contact information is as follows:

Buncombe County
WNC Regional Air Pollution Control Agency
49 Mt. Carmel Road
Asheville, NC 28806
(828) 250-6777

Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101
(336) 703-2440

Mecklenburg County
Land Use and Environmental Services Agency
Mecklenburg Air Quality
700 N. Tryon Street
Charlotte, NC 28202
(704) 336-5430

5.0 ADDITIONAL INFORMATION

Additional information may be found on N.C. asbestos rules, regulations, procedures and N.C. accredited inspectors, as well as associated forms for demolition notifications and asbestos permit applications at the N.C. Asbestos Hazard Management Program website:

www.epi.state.nc.us/epi/asbestos/ahmp.html

6.0 BASIS OF PAYMENT

Payment for the work required in this provision will be at the lump sum contract unit price for "Asbestos Assessment". Such payment will be full compensation for all asbestos inspections, reports, permitting and notifications.

63" PRESTRESSED CONCERTE FLORIDA I-BEAM GIRDERS (SPECIAL)

The contractor shall provide girders in accordance with the plans and standard specifications.

Measurement and payment will be for the actual number of linear feet of prestressed concrete girders.

Payment will be made under:

63" Prestressed Concrete Florida I-Beam Girders ……Lin. Ft.

POST-TENSIONING TENDONS: **(SPECIAL)**

1.0 DESCRIPTION

1.1 General: Post-Tensioning Tendons consists of the furnishing, installing, stressing and grouting of prestressing tendons. In this process, prestressing steel consisting of strand tendons is installed through ducts in the girder webs and concrete, stressed up to a predetermined load and anchored directly against the girder webs and hardened concrete, imparting stresses through end bearing and deviations. Grout is then injected into the ducts to completely fill all remaining voids and to seal the permanently stressed tendons.

Post-Tensioning Tendons also includes furnishing and installing all the hardware and any other appurtenant items necessary for the particular prestressing system used, including but not limited to ducts, anchorage assemblies, supplementary steel, reinforcing bars, grout, and labor used for pressure grouting ducts and all associated operations.

1.2 Qualified Personnel: The installation, stressing and grouting of post-tensioning tendons shall be supervised, performed and inspected by personnel with qualifications and experience as described in Appendix B of the "Post-Tensioning Tendon Installation and Grouting Manual" published by the Federal Highway Administration. Documentation of the qualifications and experience shall be submitted to the Engineer for approval.

1.3 Working Drawings:

1.3.1 The Contractor shall submit signed and sealed Working Drawings and Calculations showing complete details and designs for the post-tensioning system to the Engineer for approval. Submittal of the Working drawings and Calculations shall meet the requirements outlined in the Special Provision "Submittal of Working Drawings." Designs and details shall be sealed by a Professional Engineer registered in the State of North Carolina.

1.3.2 The Working Drawings shall detail the installation and support of the ducts; location of grout inlets, outlets, and high point outlet inspection details; tendon geometry and locations complying with the plans and particular tendon system limitations; and other related details. The Working Drawings shall indicate the approved post-tensioning system to be used and shall include integrated drawings of the post-tensioning system. Due to the congestion around the post-tensioning anchors, integrated drawings shall include anchorages and mild reinforcing required by the design shown on the bent drawings. Show complete details of the anchorage system, anchorage protection, and any appurtenances for accommodating stressing equipment. Show anchorage inspection details and permanent grout caps, protection system materials, and application limits. Show anchorage zone reinforcement as designed by the post-tensioning supplier. The Contractor shall be responsible for

resolving conflicts between the different elements in the anchorage zone. Any shifting of the design reinforcing steel shall be approved by the Engineer.

1.3.3 The Working Drawings and Calculations shall show complete details of tendon stressing. These details shall include sequence of stressing, jacking forces, calculated tendon elongations, gauge pressures, jack calibrations, friction and wobble coefficients, and anchor set loss. All of these shall be based on the actual post-tensioning system and hardware proposed for installation in the bent caps.

1.3.4 The Working Drawings shall include complete details of grouting materials, equipment, and procedures for approval by the Engineer.

1.3.5 The Working Drawings shall include details and calculations for the temporary falsework. The details shall include temporary support or bearings for the girders, support locations and how those supports will keep the girders in proper horizontal and vertical alignment, and allow for expansion and contraction of girders. The design of the temporary falsework shall follow the AASHTO Guide Design Specifications for Bridge Temporary Works, 2017, with 2020 Interim Revisions.

2.0 TERMINOLOGY

Anchorage: An assembly of various hardware components which secures a tendon at its ends after it has been stressed, and imparts the tendon force into the concrete.

Anchor Plate or Bearing Plate: That part of the anchorage which transfers the tendon force directly into the structure.

Anticipated Set: The wedge set assumed to occur in the design calculation of the post-tensioning forces at the time of load transfer.

Bleed: The autogenous flow of mixing water within, or its emergence from, newly placed grout, caused by the settlement of the solid materials within the mass.

Coupler: A device used to transfer the prestressing force from one partial length prestressing tendon to another. (Strand couplers are not permitted.)

Duct: Material forming a conduit to accommodate prestressing steel installation and provide an annular space for the grout which protects the prestressing steel.

Fluidity: A measure of time, expressed in seconds necessary for a stated quantity of grout to pass through the orifice of a flow cone.

Grout: A mixture of cementitious materials and water, with or without mineral additives or admixtures, proportioned to produce a pumpable consistency without segregation of the constituents when injected into the duct to fill the space around the prestressing steel.

Grout Cap: A device that contains the grout and forms a protective cover sealing the post-tensioning steel at the anchorage.

Inlet: Tubing or duct used for injection of the grout into the duct.

Outlet: Tubing or duct to allow the escape of air, water, grout, and bleed water from the duct.

Post-Tensioning: A method of prestressing where tensioning of the tendons occurs after the concrete has been cast and cured. The force in the stressed tendons is transferred to the concrete by means of anchorages.

Post-Tensioning Scheme or Layout: The pattern, size, and locations of post-tensioning tendons provided by the Designer on the Contract Plans.

Post-Tensioning System: An assembly of proprietary hardware, including but not limited to anchorage assembly, local zone reinforcement, wedge plate, wedges, inlet, outlet, couplers, duct, duct connections, and grout cap, used to install a tendon of a particular size and type, and supplied by a particular manufacturer or manufacturers of post-tensioning components.

Pressure Rating: The estimated maximum pressure that water in a duct or in a duct component can exert continuously with a high degree of certainty that failure of the duct or duct component will not occur (commonly referred to as working pressure).

Set (Also Anchor Set or Wedge Set): Set is the total movement of a point on the strand just behind the anchoring wedges during load transfer from the jack to the permanent anchorages. Set movement is the sum of slippage of the wedges with respect to the anchorage head and the elastic deformation of the anchor components.

Strand: An assembly of several high strength steel wires wound together. Strands usually have six outer wires helically wound around a single straight wire of a similar diameter.

Tendon: A single or group of prestressing steel elements and their anchorage assemblies imparting prestress forces to a structural member or the ground. Also, included are ducts, grouting attachments, grout, and corrosion protection filler materials or coatings.

Tendon Size: The number of individual strands of a specified diameter in a tendon.

Tendon Type: The relative location of the tendon to the concrete shape, internal or external.

Thixotropic: The property of a material that enables it to stiffen in a short time while at rest, but to acquire a lower viscosity when mechanically agitated.

Wedge Plate: The hardware that holds the wedges of a multi-strand tendon and transfers the tendon force to the anchorage assembly. (Commonly referred to as anchor head)

Wedge: A conically shaped device that anchors the strand in the wedge plate.

3.0 ALTERNATE POST-TENSIONING DESIGNS

Alternate designs using a post-tensioning scheme other than that shown on the plans may be submitted by the Contractor for the Engineer's approval provided that the proposed alternate scheme fulfills the following requirements:

(1) The prestress system is a type described in Section 4 of this Special Provision.

(2) The net compressive stress in the concrete after all losses is no less than that provided by the post-tensioning scheme shown on the Plans, and no more than 110% greater than that provided by the scheme shown on the Plans.

(3) The distribution of individual tendons at each cross section generally conforms to the distribution shown on the Plans.

(4) The ultimate strength of the structure with the proposed post-tensioning scheme meets the requirements of Section 5 of the "AASHTO LRFD Bridge Design Specifications, Eighth Edition" and shall be equivalent to or greater than the ultimate strength provided by the original design.

(5) Stresses in the concrete and prestressing steel at all sections and at all stages of construction meet the requirements of the Design Criteria noted on the Plans.

(6) All provisions of the Design Criteria noted on the Plans shall be satisfied.

(7) The Contractor fully redesigns and details, as required, the elements where the alternate post-tensioning scheme is proposed to be used.

(8) The Special Provision of 6000 PSI Concrete shall be satisfied.

(9) The Contractor submits complete shop drawings including post-tensioning scheme and system, reinforcing steel, and concrete cover, and design calculations (including short and long term prestress losses) consistent with Section 1.3 Working Drawings for the Engineer's approval.

(10) Any alternate post-tensioning scheme or system approved by the Engineer will result in no additional costs to the Department.

(11) Any alternative post-tensioning scheme or system shall be designed and sealed by a responsible Specialty Engineer, licensed in the State of North Carolina.

4.0 MATERIALS

4.1 Prestressing Material:

4.1.1 Prestressing Steel: Unless otherwise noted on the plans, strand shall be uncoated, Grade 270, low relaxation 7-wire strands conforming to the requirements of ASTM A416.

The proper use of strand is predicated upon the use of suitable accessory materials. Details for the use of these materials shall be furnished by the manufacturer in connection with shop and working drawing submittals.

4.1.2 Tendon Couplers: Tendon couplers shall not be used. Contractor shall furnish and use tendons of appropriate length for each installation.

4.1.3 Prestress Anchorages: All prestressing steel shall be secured at the ends by anchoring devices meeting the approval of the Engineer. The anchorages shall develop at least 95% of the minimum specified ultimate tensile strength of the prestressing steel, tested in an unbonded state without exceeding the anticipated set. Certified copies of test results for the anchorage system shall be supplied to the Engineer at no additional cost. The anchorage and stressing system shall be so arranged that the prestressing force in the tendon may be verified prior to the removal of the stressing equipment.

Galvanize the embedded body of the anchorage in accordance with ASTM A123. Other components of the anchorage including wedges, wedge plate and local zone reinforcement are not required to be galvanized. Construct the bearing plate and wedge plate from ferrous metal. Equip all anchorages with a permanent grout cap that is vented and bolted to the anchorage.

Cast anchorages with grout outlets suitable for inspection from either the top or front of the anchorage. The grout outlet will serve a dual function of grout outlet and post-grouting inspection access. The geometry of the grout outlets must facilitate being drilled using a 3/8” diameter straight bit to facilitate borescope inspection directly behind the anchor plate. Anchorages may be fabricated to facilitate both inspection locations or may be two separate anchorages of the same type each providing singular inspection entry locations.

The Contractor shall furnish and use acceptable two-part or three-part wedges with appropriate anchorage plates for anchoring post-tensioning strands. Provide wedge plates with centering lugs or shoulders to facilitate alignment with the bearing plate.

The anchoring devices shall effectively distribute tendon forces to the concrete. Such devices shall conform to the following requirements:

a) Article 5.8.4.4.2 of the AASHTO LRFD Bridge Design Specifications. The nominal concrete compressive strength at time of application of the post-tensioning tendon force used to determine bearing resistance shall be limited

to 4,500 psi as the absolute maximum value, even if the actual concrete strength determined through testing is in excess of 4,500 psi at the time of transfer (load application).

b) Bending stresses in the plates or assemblies induced by the pull of the prestressing steel shall not exceed the yield point of the material or cause visible distortion of the anchorage plate when 95% of the ultimate strength of the tendon is applied. Certified test reports from an approved independent testing laboratory, verifying compliance with this requirement, shall be provided to the Engineer for each type and/or size of anchoring device.

Alternatively, anchorage devices which do not meet with either or both of the above requirements [(a) and (b)] may be accepted based upon previously approved usage in the State of North Carolina or on the basis of a new or previous test performed in accordance with and meeting the requirements of articles 10.3.2 and 10.3.2.3.10 of the AASHTO LRFD Bridge Construction Specifications, all at no cost to the Department. Also, in such cases, any additional confinement reinforcement or modification to existing reinforcement required for satisfactory performance of the anchorage devices shall be incorporated in the structure at no additional cost.

4.1.4 Inlets, Outlets, Valves and Plugs: Provide permanent grout inlets, outlets, and threaded plugs made of ASTM A240 Type 316 stainless steel, nylon or polyolefin materials. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141 (weather resistant), S-PA0231 or S-PA0401 (ultimate strength not less than 10,000 psi with UV stabilizer added). Products made from polyolefin shall contain antioxidant(s) with a minimum Oxidation Induction Time (OIT) according to ASTM D 3895 of not less than 20 minutes. Perform OIT test on samples taken from the finished product. Test the remolded finished polyolefin material for stress crack resistance using ASTM F2136 at an applied stress of 348 psi resulting in a minimum failure time of 3 hours.

All inlets and outlets will be equipped with pressure rated mechanical shut-off valves or plugs. Inlets, outlets, valves and plugs will be rated for a minimum pressure rating of 150 psi. Use inlets and outlets with a minimum inside diameter of 3/4 inch for strand and 3/8 inch for single bar tendons and four-strand duct.

All grout vents, injection and ejection pipes, and temporary items not part of the permanent structure shall be shown on working drawings.

4.1.5 Permanent Grout Caps: Use permanent grout caps made from approved polymer or ASTM A240 Type 316L stainless steel. The approved resins used in the polymer shall be nylon, Acrylonitrile Butadiene Styrene (ABS), or polyester. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141 (weather resistant), S-PA0231, or S-PA0401 (ultimate strength not less than 10,000 psi with UV stabilizer added). Seal the cap with “O” ring seals or precision fitted flat gaskets placed against the bearing plate. Place a grout vent on

the top of the cap. Grout caps must be rated for a minimum pressure rating of 150 psi. Use ASTM F593 Type 316L stainless steel bolts to attach the cap to the anchorage. When stainless steel grout caps are supplied, provide certified test reports documenting the chemical analysis of the steel. Use O-ring seals or precision fitted flat gaskets which meet the requirements of this section.

4.1.6 Ducts:

a) **General:** Unless specifically noted on the Plans or otherwise approved by the Engineer, ducts for post-tensioning shall conform to the requirements of this specification. Ducts embedded in the concrete for prestressing steel shall be corrugated galvanized ferrous metal or corrugated plastic. Ensure that all connectors, connections and components of post-tensioning system hardware are air and water tight and pass the pressure test requirements herein.

Joints in ducts shall not be used. Ducts shall be one continuous piece between connections to anchor plates.

b) **Size of Ducts:** Ducts for multi-strand tendons shall have a minimum size which provides an inside area at least 2.5 times the net cross-sectional area of the prestressing steel.

c) **Corrugated Metal Ducts:** Corrugated metal ducts shall be galvanized. Rigid metal ducts may be fabricated with either welded or interlocked seams. Ducts shall bend without crimping or flattening and shall have sufficient strength to maintain their correct alignment during placing of concrete. Make connections to anchorages with devices or methods producing a smooth interior alignment with no lips or kinks. Design all connections and fittings to be airtight. Duct tape is not permitted to join or repair duct connections.

d) **Epoxy Coated Metal Ducts:** Epoxy Coated Metal Ducts shall not be used.

e) **Corrugated Plastic Duct:** Corrugated plastic duct shall be manufactured from virgin, unfilled, non-colored polypropylene meeting the requirements of ASTM D4101 with a cell classification range of PP0340B44541 to PP0340B67884 or polyethylene fabricated from resins meeting or exceeding the requirements of ASTM D3350 with a cell classification range of PE344434D to PE445574D. Cell classification testing shall be performed by an independent laboratory and material certifications shall be submitted for each batch of material used on the project.

Corrugated plastic duct shall contain antioxidants with a minimum oxidation induction time according to ASTM D3895 of 20 minutes and containing a non-yellowing light stabilizer. Environmental stress cracking of the corrugated plastic duct shall be in accordance with ASTM F2136 at 348 psi for three hours.

Seamless fabrication methods shall be used to manufacture the duct. Ducts shall be capable of being curved to the proper configuration without crimping or flattening. The minimum wall thickness shall meet the requirements in the table below:

Duct Shape	Size (Ø), in	Wall Thickness, in
Round	$2.375 < Ø \leq 3.35$	≥ 0.10
Round	$3.35 < Ø \leq 4.0$	≥ 0.12
Round	$4.0 < Ø \leq 4.5$	≥ 0.14
Round	$4.5 < Ø \leq 5.75$	≥ 0.16

f) **Grout Vents, Injection and Ejection Pipes:** Vents shall be 19 mm (¾ in.) minimum, inside diameter standard pipe or suitable plastic pipe. Neither metallic nor plastic components, if selected and approved, shall react with the concrete or enhance corrosion of the prestressing steel. Plastic components shall be free of water soluble chlorides.

Grout injection pipes shall be fitted with positive mechanical shut-off valves. Vents and ejection pipes shall be fitted with valves or other devices capable of withstanding the grout pumping pressures.

g) **Shipping and Storage of Ducts:** Furnish duct with end caps to seal the duct interior from contamination. Ship in bundles which are capped and covered during shipping and storage. Protect ducts against ultraviolet degradation, crushing, excessive bending, dirt contamination and corrosive elements during transportation, storage and handling. Do not remove end caps supplied with the duct until the duct is incorporated into the bridge component. Store duct in a location that is dry and protected from the sun. Storage shall be on a raised platform and completely covered to prevent contamination. If necessary, wash duct before use to remove any contamination.

4.1.7 Grout:

a) General: The Contractor shall use a Department-approved pre-packaged grout that exhibits thixotropic properties and is stored in moisture-proof containers. Grout bags shall indicate application, date of manufacture, LOT number, and mixing instructions. Any change of materials or material sources requires new testing and certification of the conformance of the grout with this specification. A copy of the Quality Control Data Sheet for each lot number and shipment sent to the job site shall be provided to the Contractor by the grout supplier and furnished to the Engineer. Pre-packaged grout shall be used within a maximum of six months from the date of manufacture. It is the Contractor's responsibility to consult the manufacturer to determine if the pre-packaged grout selected is suitable for grouting post-tensioning ducts. Maintain grout fluidity in strict compliance with the grout manufacturer's recommendations and test with a flow cone.

b) Materials: Contractor shall contact the Materials and Test Unit for a list of approved pre-packaged grouts.

Water shall comply with Section 1024 of the Standard Specifications and shall be potable, clean, and free of injurious quantities of substances known to be harmful to the prestressing steel or pre-packaged grout.

Admixtures, if approved by the grout manufacturer and the Department, shall impart the properties of low water content, good flowability, minimum bleed and expansion if desired. Its formulation shall contain no chemicals in quantities that may have harmful effects on the prestressing steel or grout. Admixtures containing chlorides in excess of 0.5% by weight of admixture (assuming 1.0 lb. of admixture per sack (95 lb.) of grout), fluorides, sulfites and nitrates shall not be used.

Aluminum powder of proper fineness and quantity or other approved gas evolving material that is well dispersed through the mixture may be used to obtain expansion of the grout.

All admixtures shall be used in accordance with the instructions of the manufacturer. The date of manufacture shall be clearly stamped on each container. No admixture for which the shelf life recommended by the manufacturer has expired shall be used.

c) Requirements: The grout shall not contain aluminum or other components which produce hydrogen, carbon dioxide or oxygen gas. A testing laboratory approved by the Department shall be used to test pre-packaged grout. Provide laboratory test results for setting time, volume change, compressive strength and fluidity with the grouting of each post-tensioning duct. Submit compressive strength for at least two 50 mm (2 in.) cube specimens at the age of 3, 7, 14, and 28 days for a total of at least eight cube specimens tested. Grout shall meet or exceed the specified physical properties stated in the table below as determined by the specified standard and modified ASTM test methods conducted at normal laboratory temperature (65-78°F) and conditions. Conduct all grout tests with grout mixed to produce the minimum time of efflux. Establish the water content to produce the minimum and maximum time of efflux. Perform laboratory tests in accordance with the following:

Property	**Requirements**	**Test Method**
Total Chloride Ions	Max. 0.03% by weight of mixed grout	ASTM C1152
Hardened Height Change @ 24 hours and 28 days	0.0% to +0.5%	ASTM C1090**
Expansion	$\leq$2.0% for up to 3 hours	ASTM C940
Wet Density – Laboratory	Report maximum and minimum obtained test value 1b/cu ft	ASTM C138

Wet Density – Field	Report maximum and minimum obtained test value 1b/cu ft	ASTM C138 or D4380
Compressive Strength 28 day (Average of 3 cubes)	≥3,000 psi (7 days) ≥5,000 psi (28 days)	ASTM C942******
Initial Set of Grout	Min. 3 hours Max. 12 hours	ASTM C953
Time of Efflux*** Immediately after mixing	Min. 20 sec Max. 30 sec	ASTM C939
	or Min. 9 sec Max. 20 sec	ASTM C939****
Time of Efflux*** 30 minutes after mixing with remixing for 30 sec	Max. 30 sec	ASTM C939
	or Max. 30 sec	ASTM C939****
Bleeding @ 3 hours and 68°F	Max. 0.0%	ASTM C940*****
Pressure induced bleeding	Max. 0.0%	ASTM C1741
Inclined tube bleed test	Max. 0.3% after 3 hours at rest; all bleed water reabsorbed after 72 hours; grout below bleed water shall be resistant to indentation	EN 445
Permeability @ 28 days	Max. 2,500 coulombs at 30 V for 6 hours	ASTM C1202

**Modify ASTM C1090 to include verification at both 24 hours and 28 days.

***Adjustments to flow rates will be achieved by strict compliance with the manufacturer's recommendations. The time of efflux is the time to fill a one liter container placed directly under the flow cone.

****Modify the ASTM C939 test by filling the cone to the top instead of to the standard level.

*****Modify ASTM C940 to conform with the wick induced bleed test as follows:

1. Use a wick made of a 20 inch length of ASTM A416 seven wire 0.5 inch diameter strand. Wrap the strand with 2 inch wide duct or electrical tape at each end prior to cutting to avoid splaying of the wires when it is cut. Degrease (with acetone or hexane solvent) and wire brush to remove any surface rust on the strand before temperature conditioning.
2. Condition the dry ingredients, mixing water, prestressing strand and test apparatus overnight at 65°F to 75°F.
3. Mix the conditioned dry ingredients with the conditioned mixing water and place 800 ml of the resulting grout into the 1,000 ml graduate cylinder. Measure and record the level of the top of the grout.
4. Completely insert the strand into the graduated cylinder. Center and fasten the strand so it remains essentially parallel to the vertical axis of the cylinder. Measure and record the level of the top of the grout.
5. Store the mixed grout at the temperature range listed above in (b).
6. Measure the level of the bleed water every 15 minutes for the first hour and hourly for two successive readings thereafter.
7. Calculate the bleed water, if any, at the end of the three hour test period and the resulting expansion per the procedures outlined in ASTM C940, with the quantity of bleed water expressed as a percent of the initial grout volume. Note if the bleed

water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.

******Modify ASTM C109 (referenced by ASTM C942) to allow non-metal (plastic) 2" molds for forming grout compressive strength test cubes.

Unless otherwise required in the Contract or by the Engineer, a grout mix design submittal is not required when using an approved pre-packaged grout. The contractor shall not use the pre-packaged grout until written acceptance has been received. Acceptance of approved pre-packaged grout does not relieve the Contractor of the responsibility to furnish a product that meets the Contract requirements.

d) Accelerated Corrosion Test Method (ACTM): Perform the ACTM as outlined in Appendix B of the "Specification for Grouting of Post-Tensioning Structures" published by the Post-Tensioning Institute. Report the time to corrosion for both the grout being tested and the control sample using a 0.45 water-cement ratio neat grout.

e) A grout that shows a longer average time to corrosion in the ACTM than the control sample and the time to corrosion exceed 1,000 hours is considered satisfactory.

f) Sampling and Placement: The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. Use API RP 13B-1 for field testing grout flow and density of neat cement grout. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

The Contractor is responsible for the placement of grout in accordance with the manufacturer's recommendations unless directed otherwise by the Engineer.

Grout samples for testing shall be furnished by the Contractor at no cost to the Department.

4.2. Samples for Testing:

4.2.1 General: Testing shall conform to the applicable ASTM Specifications for the prestressing material used.

All material samples for testing shall be furnished by the Contractor at no cost to the Department.

Job site or site referred to herein shall be considered the location where the prestressing steel is to be installed whether at the bridge site or a removed casting yard.

4.2.2 Prestressing Steel and Components: Samples for testing shall be furnished as described below for each manufacturer of prestressing strand and anchorage assemblies to be used on the project.

With each sample of prestressing steel strand furnished for testing there shall be submitted a certification stating the manufacturer's minimum guaranteed ultimate tensile strength of the sample furnished.

The following samples of materials selected by the Engineer at the plant or job site from the prestressing steel used for post-tensioning operations shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

(a) For strand: two randomly selected samples, 5 ft. long, per manufacturer, per size of stand, per shipment, with a minimum of one sample for every ten reels delivered.

(b) For anchorage assemblies: two samples of each size, per manufacturer, per heat of steel.

One of each of the samples furnished to represent a lot shall be tested. The remaining sample(s), properly identified and tagged, shall be stored by the Engineer for future testing in the event of loss or failure of the component represented to meet minimum strength requirements. For acceptance of the lot represented, test results shall show that 100% of the guaranteed ultimate tensile strength has been met.

4.2.3 Lots and Identification: A lot is that parcel of components as described herein. All anchorage assemblies of each size from each mill heat of steel and all strand from each manufactured reel to be shipped shall be assigned an individual lot number and shall be tagged in such a manner that each such lot can be accurately identified at the job site. Records shall be submitted to the Engineer identifying assigned lot numbers with the heat or reel of material represented. All unidentified prestressing steel or anchorage assemblies received at the site will be rejected. Also, loss of positive identification of these items at any time will be cause for rejection.

Provide a copy of the grout Quality Control Data Sheet to the Engineer, from the manufacturer, for each lot number and shipment sent to the job site.

4.3 Approval of Materials: The approval of any material by the Engineer shall not preclude subsequent rejection if the material is damaged in transit or later damaged or found to be defective.

5.0 Testing by the Contractor

5.1 Tendon Modulus of Elasticity: This test will not be required if the Contractor can demonstrate, to the satisfaction of the Engineer, valid results for the tendon modulus of elasticity from previous projects or based on results from manufacturer tests. Such results must be for the same type of strand, size, material, and complement of strands per tendon as required for this project and must have been performed under test conditions equal to or better than those described below.

If testing is required, for the purpose of accurately determining the tendon elongations while stressing, the Contractor shall bench test two samples of each size and type of tendon to determine the modulus of elasticity prior to stressing the initial tendon.

For the purpose of this test, the bench length between anchorages shall be at least 30 feet and the tendon duct shall be at least 2 inches clear of the tendon all around. The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. The test specimen shall be tensioned to 80% of ultimate in ten increments and then detensioned from 80% of ultimate to zero in ten decrements. For each increment and decrement, the gauge pressure, elongations and load cell force shall be recorded. Elongations of the tendon shall be noted for both ends and the central 26 feet and shall be measured to an accuracy of 1/32 inch. The elongations shall be corrected for the actual anchorage set of the dead end.

The modulus shall be calculated as follows:

$$E = \frac{PL}{Adl}$$

where;
P = force in tendon,
L = distance between pulling wedges and dead end wedges or exact length in center 26 feet of the tendon.
A = cross sectional area of the tendon based on nominal area.
dl = strand elongation for load P.

The theoretical elongation shown on the post-tensioning shop or working drawings shall be reevaluated by the Contractor using the results of the test and corrected when the modulus of elasticity from the bench test varies from the modulus of elasticity used for shop or working drawings by more than 1%. Revisions to the theoretical elongations shall be submitted to the Engineer for approval.

When the observed elongations of the tendons in the erected structure fall outside the acceptable tolerances or to otherwise settle disputes, additional Tendon Modulus of Elasticity Tests may be required to the satisfaction of the Engineer.

If the source of prestressing steel changes during the project, additional test series or substantiation from previous projects, not to exceed two per source, shall be required.

The apparatus and methods used to perform the test shall be proposed by the Contractor and be subject to the approval of the Engineer. Furthermore, this test shall be conducted by the Contractor in the presence of the Engineer.

5.2 In Place Friction Test: This test is intended to demonstrate that the friction characteristics, losses, and resulting tendon forces are in agreement with the design assumptions.

For the purpose of verifying friction loss the Contractor shall test, in place, the first tendon installed of each size and type which is at least 30 feet long. Size is defined as the size and number of strands in each tendon. Type is defined as to both prestressing and duct material and to the tendon function within the structure. Function is the general category of the tendon whether it is a cantilever tendon, continuity tendon, draped external tendon or continuous profiled tendon passing through one or more spans, etc. In this respect, the function of two or more tendons may be the same even though their actual profiles and lengths differ.

The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. The test specimen shall be tensioned to 80% of ultimate tendon strength in eight equal increments and detensioned in eight equal decrements. For each increment and decrement, the gauge pressure, elongations and load cell force shall be recorded. Account shall be taken of any wedge seating in both the live end (i.e., back of jack) and the dead end (i.e., back of load cell) and of any friction within the anchorages, wedge plates, and jack as a result of slight deviations of the strands through these assemblies. For long tendons requiring multiple jack pulls with intermediate temporary anchoring, care shall be taken to keep an accurate account of the elongation at the jacking end allowing for intermediate wedge seating and slip of the jacks' wedges.

The test shall be conducted using Engineer-approved lubricants required, if any, to meet the expected friction coefficient.

If, for the Contractor's expected friction coefficients, the elongations fall outside the ±7% range, the Contractor will be required to investigate the reason and make revisions to his post-tensioning operations such that the final tendon forces are in agreement with the Plans.

In reconciling theoretical and actual elongations, the value of the expected friction and wobble coefficients shall not be varied by more than ±10%. Significant shortfall in elongations is indicative of poor duct alignments and/or obstructions which the Contractor shall be required to correct or compensate for in a manner to

be proposed by the Contractor and reviewed and approved by the Engineer at no additional cost to the Department.

One successful friction test for each type and size of tendon (tendon group) will be required for the project.

If, during the course of routine stressing operations, there are irreconcilable differences between forces and elongations, or other difficulties, the Engineer reserves the right to require additional in place friction tests.

The apparatus and methods used to perform the test shall be submitted by the Contractor to the Engineer for approval. This test shall be conducted by the Contractor in the presence of the Engineer.

Correction or adjustment of elongations as a consequence of the results of the friction test are the responsibility of the originator of the stressing and elongation calculations.

5.3 Test Reports Required: Two test reports of the "Tendon Modulus of Elasticity Test" shall be submitted to the Engineer at least 30 days prior to installing the tendon.

Two test reports of the "In Place Friction Test" shall be submitted to the Engineer within 2 weeks after successful installation of the test tendon.

5.4 Payment for Testing: Testing by the Contractor will not be paid for separately but shall be incidental to the price paid for the post-tensioning tendons.

5.5 Application of Test Results: The theoretical elongations shown on the post-tensioning shop or working drawings shall be reevaluated by the Contractor using the results of the tests for Tendon Modulus of Elasticity and In Place Friction as appropriate and corrected as necessary. Revisions to the theoretical elongations shall be submitted to the Engineer for approval.

6.0 Protection of Prestressing Steel

6.1 Shipping, Handling and Storage: All prestressing steel shall be protected against physical damage and corrosion at all times from manufacturer to final grouting or encasing in the concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. Any reel that is found to contain broken wires shall be carefully inspected during use and lengths of strand containing broken wires shall be removed and discarded. The wire shall be bright and uniformly colored, having no foreign matter or pitting on its surface.

Prestressing steel shall be packaged in containers or shipping forms for protection of the steel against physical damage and corrosion during shipping and storage and

shall be stored in a weatherproof building, shed, or container until time of use. A corrosion inhibitor which prevents rust or other results of corrosion shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or the concrete or bond strength of steel to concrete. Inhibitor carrier type packaging material shall conform to the provisions of Federal Specification MIL-P-3420. Packaging or forms damaged from any cause shall be immediately replaced or restored to the original condition.

The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, the care to be used in handling, and the type, kind, and amount of corrosion inhibitor used, including the date when placed, safety orders, and instructions for use. Low relaxation (stabilized) strand shall be specifically designated per requirements of ASTM A416. All such strand not so designated shall be rejected.

6.2 During Installation in the Structure: When acceptable prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing and if stressing and grouting are completed within 15 calendar days after the installation of the prestressing steel, light surface corrosion which may form during these 15 days will not be cause for rejection of the steel. Post-tensioning steel installed, tensioned and grouted in this manner, all within 15 calendar days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel.

Post-tensioning steel installed as above but not grouted within 15 calendar days shall be protected from corrosion. The method of protection shall be determined by the Contractor and shall be approved by the Engineer prior to the start of construction. Approved corrosion protection measures shall be applied on site prior to exceeding the stipulated time limit. Water soluble oil shall not be allowed as a corrosion inhibitor or friction reducer.

Within 30 calendar days after installation of the post-tensioning steel, ducts shall be grouted in accordance with these specifications. Except when approved by the Engineer in writing, failure to grout tendons within the 30 calendar days specified shall result in stoppage of the affected work in accordance with Article 108-7 of the Standard Specifications and no invoices shall be processed for payment of that affected work.

7.0 Fabrication

7.1 General: All post-tensioning anchorages, ducts, vent pipes, miscellaneous hardware, reinforcing bars, and other embedments shall be accurately and securely fastened at the locations shown on the Plans or on the approved Shop or Working Drawings or as otherwise approved by the Engineer.

7.2 **Ducts:** Ducts shall be accurately aligned and positioned at the locations shown on the Plans or according to the approved Shop or Working Drawings or as otherwise approved by the Engineer. All internal ducts shall be securely fastened in position at regular intervals not exceeding 1'-6" to prevent movement, displacement or damage from concrete placement and consolidation operations. The method and spacing of duct supports shall be shown on appropriate Shop Drawings.

All alignments, including curves and straight portions, shall be smooth and continuous with no lips, kinks or dents.

All ducts shall be carefully checked and repaired as necessary before the placing of any concrete commences. If a duct requires repair, the repair method shall be subject to approval by the Engineer. The use of any tape to repair or seal a duct shall not be permitted.

The tolerance on the location of the ducts for the tendons shall be as specified in Section 7.5 below.

After installing the ducts in the forms and until final tendon grouting is complete, all ends of ducts, connections to anchorages, splices, inlets, outlets, and the like shall be sealed at all times to prevent the entry of water and debris. An absolute seal of anchorage and duct termination locations shall be provided by using plumber's plugs or equal. Grout inlets and outlets shall be installed with plugs or valves in the closed position, but low point outlets may be open. Briefly open low point drains just prior to tendon installation and again just prior to grout injection to allow for drainage of any water that may be present within the duct. The use of duct tape shall not be permitted.

7.3 **Splices and Joints:** All splices, joints, couplings, connections (inlet and outlet) and valves shall be part of the approved post-tensioning system. At connections to anchorages, ducts shall be smoothly aligned and secured with no lips or kinks. They shall be joined in a manner which positively prevents the entrance of cement paste and water from the concrete or unwanted leakage of grout during subsequent grouting operations. The use of any tape shall not be permitted as a method to seal or join splices, joints, or connections.

7.4 **Grout Vents, Injection and Ejection Pipes:** All ducts or anchorage assemblies for permanent post-tensioning shall be provided with pipes or other suitable connections at each end for the injection of grout after prestressing. As a minimum, ducts shall be vented at the following positions:

a) Top of the tendon anchorage
b) Top of the grout cap
c) At the high points of the duct when the vertical distance between the highest and lowest point is more than 6 inches
d) At all low points

e) At a distance not to exceed 36” from high points in both directions
f) At other locations required by the Engineer

The Contractor may use additional injection and vent pipes when shown on the shop drawings.

Locate drains, inlets, and outlets serving as drains at the bottom of the duct section.

All connections to ducts shall be made with metallic or plastic structural fasteners.

Vent and grouting pipes shall be mortar tight and shall provide means for injection of grout through the vents and for sealing the vents. Duct tape shall not be used to join or repair ducts or make connections.

Extend grout tubes a sufficient distance out of the concrete member to allow for proper closing of the valves. Grout tubes shall be properly tagged for identification of associated tendons for grouting purposes.

Grout injection pipes shall be fitted with positive mechanical shut-off valves. Vents and ejection pipes shall be fitted with valves, caps or other devices capable of withstanding the grout pumping pressures.

All ducts shall be pressure tested before concrete is placed in the forms. In the presence of the Engineer, pressurize duct to 7.5 psi and lock-off outside air source. Record pressure loss for one minute. If the pressure loss exceeds 0.75 psi, or 10%, find and repair leaks in the duct assembly using repair methods approved by the Engineer and retest.

All grout caps used must be installed to prevent entrapment of air or water voids and must provide 100% coverage of all tendons.

7.5 **Tolerances:** Post-tensioning duct tolerance shall be ±¼ inch in the horizontal direction and ±½ inch in the vertical direction.

Entrance and exit angles of tendon paths at anchorages and/or at faces of concrete shall be within ±2 degrees of desired angle measured in any direction. Any deviations in the alignment must be accomplished with smooth transitions without any kinks.

Anchorages shall be located within ±¼ inch of desired position laterally and 1 inch along the tendon except that all minimum cover requirements must be maintained.

Anchorage confinement reinforcement in the form of spirals, multiple U shaped bars, or links, shall be positioned to start within ½ inch of the inside face of the girder web and shall be properly centered around the duct.

In the event of conflicts between the reinforcement and post-tensioning duct, in general, the position of the post-tensioning duct shall prevail, and the reinforcement shall be adjusted locally to the approval of the Engineer.

8.0 Placing Concrete

8.1 Precautions: The Contractor shall exercise great care when placing and consolidating concrete so as not to displace or damage any of the post-tensioning ducts, anchorage assemblies, connections, reinforcement, or other embedments.

8.2 Proving of Post-Tensioning Ducts: Upon completion of concrete placement the Contractor shall prove that the post-tensioning ducts are free and clear of any obstructions or damage and will be able to accept the intended post-tensioning tendons by passing a torpedo through the ducts. The torpedo shall have the same cross-sectional shape as the duct, be ¼ inch smaller all around than the clear, nominal inside dimensions of the duct. No deductions to the torpedo section dimensions shall be made for tolerances allowed in the manufacture or fixing of the ducts. For curved ducts, the length shall be determined by the Contractor such that when both ends touch the outermost wall of the duct, the torpedo is ¼ inch clear of the innermost wall; but it need not be longer than 2 feet. If the torpedo will not travel completely through the duct, the integral cap shall be rejected, unless a workable repair can be made to clear the duct, all to the satisfaction of the Engineer. The torpedo shall be passed through the duct easily, by hand, without resorting to excessive effort or mechanical assistance.

8.3 Problems and Remedies: If the ducts or any part of the integral cap work is found to be deficient, it will be rejected. No remedial or repair work will be permitted without the approval of the Engineer.

9.0 Installing Tendons

Post-tensioning strands may be pushed or pulled through the ducts to make up a tendon. Pushing shall be done with care so as to avoid snagging on any lips or joints in the ducts. The Contractor shall take precautions by rounding off the end of the strand or fitting it with a smooth protective cap for this purpose. During the installation of the post-tensioning strand into the duct, the strand shall not be intentionally rotated by any mechanical device.

Alternatively, strands may be assembled into the tendon which then may be pulled through the duct together using a special steel wire sock (“Chinese finger”) or other device attached to the end. The ends of the strands may not be electric arc welded together for this purpose. Strands may be brazed together for pulling as long as 3 feet of strand from the brazed end is removed after installation. The end of the pre-assembled tendon shall be rounded for smooth passage through the duct. Cutting shall be done with an abrasive saw or similar. Flame cutting shall not be allowed.

Installation of tendons in ducts prior to concrete placement shall not be allowed.

No permanent tendons shall be installed prior to the completion of testing as required by these specifications or Plans, except for the "In Place Friction Test" where only the tendon to be tested shall be installed prior to successful completion of the test.

10.0 Post-Tensioning Operations

10.1 General: Post-tensioning forces shall not be applied until the concrete has attained the specified compressive strength as determined by cylinder tests. Conduct all stressing operations in the presence of the Engineer.

10.2 Stressing Tendons: All post-tensioning steel shall be tensioned by means of hydraulic jacks so that the post-tensioning force shall not be less than that required by the plans or approved shop drawings, or as otherwise approved by the Engineer. Monostrand jacks shall not be utilized for stressing tendons.

10.2.1 Maximum Stress at Jacking: The maximum temporary stress (jacking stress) in the post-tensioning steel shall not exceed 81% of its specified minimum ultimate tensile strength. Tendons shall not be overstressed to achieve the expected elongation

10.2.2 Initial and Permanent Stresses: The post-tensioning steel shall be anchored at initial stresses that will result in the long term retention of permanent stresses or forces of not less than those shown on the Plans or the approved shop drawings. Unless otherwise approved by the Engineer, the initial stress in the post-tensioning steel after anchor set shall not exceed 70% of the specified minimum ultimate tensile strength at anchorages and 74% of the specified minimum ultimate tensile strength at all other locations between anchorages.

Permanent stress and permanent force are the stress and force remaining in the post-tensioning steel after all losses, including long term creep and shrinkage of concrete, elastic shortening of concrete, relaxation of steel, losses in the post-tensioning steel from the sequence of stressing, friction and unintentional wobble of the ducts, anchor set, friction in the anchorages and all other losses peculiar to the post-tensioning system.

10.2.3 Stressing Sequence: Stressing of all tendons shall take place from the same end of the bent cap. Any exception must be approved by the Engineer. The sequence of installation and stressing shall be in accordance with the Plans or approved shop drawings or as otherwise approved by the Engineer.

10.3 Stressing Equipment: Equipment for tensioning the tendons shall be furnished by the manufacturer of the post-tensioning system (tendons, hardware, anchorages, etc.).

10.3.1 **Stressing Jacks and Gauges:** Each jack used to stress tendons shall be equipped with a pressure gauge for determining the jacking pressure. The pressure gauge shall have an accurately reading dial at least 6 inches in diameter.

10.3.2 **Calibration of Jacks and Gauges:** Each jack and its gauge shall be calibrated as a unit with the cylinder extension in the approximate position it will be in at the final jacking force. Calibration shall be done when the jack is connected to the equipment (pumps and gauges) in the identical configuration as will be used on the job site, e.g. with the same length hydraulic lines. Initial calibration of the jacks and gauges shall be performed by an independent laboratory using a proven load cell. For each jack and gauge unit used on the project, the Contractor shall furnish certified calibration charts and curves to the Engineer prior to stressing the first tendon. Supply documentation denoting the load cell(s) calibration date and tractability to NIST (National Institute of Standards and Technology) along with the jack/gauge calibration.

Certified calibration charts and curves shall be provided to the Engineer prior to the start of the work and at every 6 months thereafter, or as requested by the Engineer. At the option of the Contractor, calibrations subsequent to the initial calibration with a load cell may be accomplished by the use of a master gauge. The master gauge shall be supplied by the Contractor in a protective waterproof container capable of protecting the calibration of the master gauge during shipment to a laboratory. The Contractor shall provide a quick-attach coupler next to the permanent gauge in the hydraulic lines which enables the quick and easy installation of the master gauge to verify the permanent gauge readings. The master gauge shall be calibrated by and shall remain in the possession of the Engineer for the duration of the project.

Any repair of the jacks, such as replacing seals or changing the length of the hydraulic lines, is cause for recalibration of the jacks using a load cell.

No extra compensation shall be allowed for the initial or subsequent calibrations or for the use and required calibrations of the master gauge.

10.4 **Stand-by Equipment:** During post-tensioning operations, the Contractor shall provide a stand-by stressing jack with gauges located on the job site. The stand-by stressing jack and gauges shall be calibrated as described in Section 10.3 of this Special Provision. The stand-by equipment will be provided at no additional cost to the Department.

10.5 **Elongations and Agreement with Forces:** The post-tensioning operation shall be so conducted that the forces being applied to the tendon and the elongation of the post-tensioning tendon can be measured at all times.

Elongations shall be measured to the nearest 1/16 inch.

For the required tendon force, the observed elongation shall agree within 7% of the theoretical elongation or the entire operation shall be halted, checked, and the source of error determined and remedied to the satisfaction of the Engineer before proceeding further. The tendon shall not be overstressed to achieve the theoretical elongation.

In the event that agreement between the observed and theoretical elongations at the required force falls outside the acceptable tolerances, the Engineer may, at his discretion and without additional compensation to the Contractor, require additional test for "Tendon Modulus of Elasticity" and/or "In-Place Friction" in accordance with 5.1 and 5.2 of this Special Provision.

10.6 **Friction:** The Contract Plans were prepared based on the assumed friction and wobble coefficients and anchor set noted on the Plans. The Contractor shall submit calculations and show a typical tendon force diagram, after friction, wobble and anchor set losses, on the shop drawings based upon the expected actual coefficients and values for the post-tensioning system to be used. These coefficients and values shall be given on the shop drawings.

If, in the opinion of the Engineer, the actual friction significantly varies from the expected friction, the Contractor shall revise the post-tensioning operation such that the final tendon force is in agreement with the Plans.

When friction shall be reduced, graphite may be used as a lubricant, subject to the approval of the Engineer.

10.7 **Wire Failures in Post-Tensioning Tendons:** Multi strand post-tensioning tendons having wires which failed by breaking or slippage during stressing may be accepted provided the following conditions are met:

(a) The completed structure shall have a final post-tensioning force of at least 98% of the design total post-tensioning force.

(b) Any single tendon shall have no more than 5% reduction in cross-sectional area of post-tensioning steel due to wire failure.

As an exception, any of the above conditions may be waived as approved by the Engineer, when conditions permit the Contractor to propose acceptable alternative means of restoring the post-tensioning force lost due to wire failure.

10.8 **Cutting of Post-Tensioning Steel:** Post-tensioning steel shall be cut by an abrasive saw within ¾ inches to 1½ inches away from the anchoring device. Flame cutting of post-tensioning steel is not allowed. Do not cut tendon to final length prior to acceptance by the Engineer.

10.9 **Record of Stressing Operations:** The Contractor shall keep a record of the following post-tensioning operations for each tendon installed:

a) Project name, number.
b) Contractor and/or subcontractor.
c) Tendon location, size and type
d) Date tendon was first installed in ducts.
e) Reel number for strands
f) Assumed and actual cross-sectional area.
g) Assumed and actual Modulus of elasticity.
h) Date Stressed.
i) Jack and Gauge numbers per end of tendon.
j) Required jacking force.
k) Gauge pressures
l) Elongations (anticipated and actual)
m) Anchor sets (anticipated and actual)
n) Stressing sequence (i.e. tendons before and after this).
o) Stressing mode (one end/ two ends/ simultaneous).
p) Witnesses to stressing operation (Contractor and inspector).
q) Date grouted, days from stressing to grouting, grouting pressure applied and injection end.

Any other relevant information shall also be recorded. The Contractor shall provide the Engineer with a complete copy of all stressing and grouting operations.

10.10 **Tendon Protection:** Seal all other duct openings other than installing anchorage caps within four hours after stressing. Install anchorage caps after the tendon has been accepted. If acceptance of tendon will be delayed more than four hours after stressing, immediately provide temporary weatherproofing of tendons at open ends of anchorages. If tendons and anchorages are temporarily weatherproofed, install anchorage caps within 1 day of tendon being accepted. If tendon contamination occurs and if directed by the Engineer, remove and replace the tendon.

11.0 Grouting Operations

11.1 **General:** Within 30 calendar days after installation of the post-tensioning steel, ducts shall be grouted in accordance with these specifications. Except when approved by the Engineer in writing, failure to grout tendons within the 30 calendar days specified shall result in stoppage of the affected work and no invoices shall be processed for payment of that affected work.

After stressing and prior to grouting, tendons shall be protected against corrosion or harmful effects of debris by temporarily plugging or sealing all openings and vents until the tendon is grouted.

When stressing has been completed and the stressed tendons have been accepted by the Engineer, the annular space between the tendons and the duct shall be grouted.

11.2 Grouting Operations Plan: Submit a grouting operations plan for approval at least six weeks in advance of any scheduled grouting operations. Written approval of the grouting operations plan by the Engineer is required before any grouting of the permanent structure takes place. At a minimum, the plan will address and provide procedures for the following items:

1. Names and proof of training for the grouting crew and the crew supervisor in conformance with this specification;

2. Type, quantity, and brand of materials used in grouting including all certifications required;

3. Type of equipment furnished, including capacity in relation to demand and working condition, as well as back-up equipment and spare parts;

4. General grouting procedure; Duct pressure test and repair procedures;

5. Method to be used to control the rate of flow within ducts;

6. Theoretical grout volume calculations;

7. Mixing and pumping procedures;

8. Direction of grouting;

9. Sequence of use of the inlets and outlet pipes;

10. Procedures for handling blockages;

11. Procedures for possible post grouting repair.

Before grouting operations begin, a joint meeting of the Construction Team, grouting crew and the Engineer will be conducted. At the meeting the grouting operation plan, required testing, corrective procedures and any other relevant issues will be discussed.

11.3 Grout Inlets and Outlets: Ensure the connections from the grout pump hose to inlets are free of dirt and are air- tight. Inspect valves to be sure that they can be opened and closed properly.

11.4 Supplies: Before grouting operations start, provide an adequate supply of water and compressed air for clearing and testing the ducts, mixing, and pumping the grout. Where water is not supplied through the public water supply system, a water storage tank of sufficient capacity shall be provided.

11.5 Equipment:

11.5.1 General: Provide grouting equipment consisting of measuring devices for water, a high-speed shear colloidal mixer, a storage hopper (holding reservoir) and a pump with all the necessary connecting hoses, valves, and pressure gauge. Provide pumping equipment with sufficient capacity to ensure that the post-tensioning ducts to be grouted can be filled and vented without interruption at the required rate of injection in not more than 30 minutes. The equipment shall be able to pump mix grout in a manner which will comply with all the provisions specified herein. Provide an air compressor and hoses with sufficient output to perform the required functions. Provide vacuum grouting equipment (volumetric measuring type) and experienced operators within 48 hours notice.

11.5.2 Mixer and Storage Hopper: Provide a high speed shear colloidal mixer capable of continuous mechanical mixing producing a homogeneous and stable grout free of lumps and un-dispersed cement. The colloidal grout machinery will have a charging tank for blending and a holding tank. The blending tank shall be equipped with a high shear colloidal mixer. The holding tank shall be kept agitated and at least partially full at all times during the pumping operation to prevent air from being drawn into the post-tensioning duct.

Accessory equipment which will provide for accurate solid and liquid measures shall be provided to batch all materials. Add water during the initial mixing by use of a flow meter or calibrated water reservoir with a measuring accuracy equal to one percent of the total water volume.

11.5.3 Grout Pumping Equipment: Provide pumping equipment capable of continuous operation which will include a system for circulating the grout when actual grouting is not in progress. The equipment will be capable of maintaining pressure on completely grouted ducts and will be fitted with a valve that can be closed off without loss of pressure in the duct.

Grout pumps shall be positive displacement type, shall provide a continuous flow of grout, and shall be able to produce an outlet pressure of at least 145 psi. Pumps shall have seals adequate to prevent oil, air or other foreign substances from entering into the grout and to prevent loss of grout or water. The capacity will be such that an optimal rate of grouting can be achieved.

A pressure gauge having a full scale reading of no more than 300 psi shall be placed at some point in the grout line between the pumping outlet and the duct inlet. If long hoses (in excess of 100 ft) are used, place two gauges, one at the pump and one at the inlet. The diameter and rated pressure capacity of the grout hoses shall be compatible with the pump output.

The grouting equipment shall contain a screen having clear opening of 1/8 inch maximum size to screen the grout prior to its introduction into the grout pump. If grout with an additive is used, a screen opening of 3/16 inch is satisfactory. This screen shall be easily accessible for inspection and cleaning. The grouting equipment shall utilize a gravity feed to the pump inlet from a hopper attached to and directly over it. The hopper must be kept at least partially full at all times during the pumping operation to prevent air from being drawn into the post-tensioning duct. Under normal conditions, the grout equipment shall be capable of continuously grouting the longest tendon on the project in not more than 20 minutes.

11.5.4 Vacuum Grouting Equipment: Provide vacuum grouting equipment meeting these minimum requirements:

a. Volumeter for the measurement of void volume.

b. Vacuum pump with a minimum capacity of 10 cfm and equipped with flow-meter capable of measuring amount of grout being injected.

c. Manual colloidal mixers and/or dissolvers (manual high speed shear mixers) approved by the grout manufacturer, for voids less than 5.5 gal. in volume. Mix a minimum of one full bag of grout regardless of the size void to be grouted.

d. Standard colloidal mixers, for voids 5.5 gal. and greater in volume.

11.6 Stand-by Equipment: During grouting operations, the Contractor shall provide a stand-by colloidal grout mixer and pump. Where water is not supplied through the public water supply system, a water storage tank of sufficient capacity must be provided.

Stand-by equipment shall be provided at no additional cost to the Department.

11.7 Field Trial Tests: Field trial batching and testing shall be performed with the same materials, personnel, and equipment used in production grouting. Field trial tests shall be conducted at least 1 week prior to initiation of production grouting.

11.7.1 Chloride Ion Content: Chloride ion content shall be independently tested on a trial batch to be shown it is below 0.03% by weight of the mixed grout.

All materials, including the water, shall be the same source as will be used for the production grouting.

One chloride ion concentration test shall be performed on the mixed grout per project at a minimum prior to start of grouting operations, with an additional test for each 40,000 lb. of dry weight material.

11.7.2 Grout Strength Test: Grout cube specimens shall be prepared and tested in accordance with ASTM C942 using molds compliant with ASTM C109. Minimum compressive strength shall be as specified in Section 4.1.7 (c) of this specification.

11.7.3 Volume Change Test: Volume change tests shall be performed in accordance with ASTM C1090. The vertical height change shall be within the limits specified in Section 4.1.7 (c) of this specification.

11.7.4 Pumpability and Fluidity Tests: Fluidity tests during field mockups are used to establish a target range of flow times that are preferable for the grout and particular conditions before pumping grout into the tendons. Fluidity tests shall be performed in accordance with ASTM C939 (modified). This modification is as follows: the flow cone shall be filled to the top instead of the standard level. The efflux time of grout, when thoroughly mixed, shall be measured as the time to fill a 1 liter (0.262 gal.) container, placed directly under the flow cone. A working time shall be measured after 30 minutes and then remixed for 30 seconds. This flow shall be within 10 second of the originally established flow. Efflux time shall be within the limits specified in Section 4.1.7 (c) of this specification.

11.7.5 Schupack Pressure Bleed Test: Perform test per ASTM C1741. Acceptable bleed values for Class C (packaged) grout is 0.0%

Vertical Rise, x (ft)	Gelman Pressure, psi	Max % Bleed (% of sample value)
$0 \leq x \leq 2$	20	4
$2 < x \leq 6$	30	2
$6 < x \leq 20$	50	0
$X > 20$	100	0

11.8 Mixing: The material shall be mixed in accordance with the manufacturer's recommendations. A metered amount of water shall be added to the mixer first, followed by pre-packaged grout and admixture, or as required by the admixture manufacturer. Mixing shall be of such duration as to obtain a uniform thoroughly blended, homogenous grout, without excessive temperature increase or loss of properties of the admixture. The grout shall be continuously agitated until it is pumped. Water shall not be added to increase flowability that has decreased by delayed use of the grout. Proportions of the materials shall be based on

manufacturer's recommendations. The water content shall be the minimum necessary for proper placement and shall not exceed the water-cement ratio of 0.45 or approximately 5 gal. of water per sack (95 lb.) of grout. The pumpability of the grout may be determined by the Engineer in accordance with ASTM C939 "Standard Test Method for Flow of Grout." When this method is used, the efflux time of the grout sample immediately after mixing should be within the limits specified in Section 4.1.7 (c) of this specification. The flow cone test may not be suitable for a grout that incorporates a thixotropic additive.

Reject all bags of grout that contain clumps.

The weight of the grout bags shall be verified prior to beginning grouting operations and monitored throughout. After initial approval of an average weight by the Engineer, grout bags may be monitored at the frequency of one bag per day of grouting operations. If irregularities are determined during the initial weighing or monitoring, the water content of the grout should be adjusted accordingly. If the weight of a grout bag varies by more than 1%, then weigh another bag from the same pallet. If that bag varies by more 1% then weigh every bag used in that day's production; if not, then reject that single bag and continue the operation.

11.9 Grout Production Tests: The testing of production grout shall be performed with the minimum number of tests as described in the following subsections.

11.9.1 Bleed Tests: A minimum of one bleed test shall be performed per project during field trial testing. Additional tests are required for each truck load of prepackaged grout. The sample of grout for the test is to be taken at the mixer after it is mixed with water.

11.9.2 Wet Density Tests: A wet density test shall be performed for the initial batch of grout and every 2 hours at the mixer, and at the last outlet of each tendon. The value shall be within the limits prescribed by the grout manufacturer.

11.9.3 Fluidity Tests: A minimum of two fluidity tests (flow cone) – one at the mixer and one at the duct outlet – shall be performed in accordance with ASTM C939 (modified) as described in previous sections of this specification. This testing shall be repeated every 2 hours of grouting operations. The efflux time shall be within 5 seconds of the values established during laboratory testing.

11.9.4 Chloride Ion Tests: A minimum of one chloride ion test shall be performed per project during field trial testing. Additional tests are required for each truck load of prepackaged grout. The sample of grout for the test is to be taken at the mixer, after it is mixed with water.

11.10 Preparation for Grouting: Immediately prior to grouting, ducts shall be blown with oil-free compressed air to remove water and debris blockages that may interfere with the injection. All inlets and outlets shall be checked to ensure they are capable of accepting injection of the grout by blowing through the system with oil-free compressed air and proving each inlet and outlet in turn.

11.11 Grout Injection: All grout vents and high point vent openings shall be open and drains closed when grouting starts. Injection and ejection vents shall be provided with positive shut-offs. Grout shall be injected from the tendon lowest point or lowest end of the tendon in an uphill direction. Grout shall be allowed to flow from the first vent after the injection vent until any residual water or entrapped air has been removed, at which time the vent shall be closed. Remaining vents shall be closed in sequence in the same manner.

A continuous, one-way flow of grout shall be maintained within a grouting stage and grouting of a tendon shall be performed in one operation. The grout shall be used within 30 minutes of the first addition of water to ensure the flowability of the grout.

The grout injection shall be performed at a rate between 16 ft and 49 ft of duct per minute. The grouting rate shall be slow enough to avoid air entrapment and segregation of the grout and ensure complete filling of the duct.

The pumping pressure at the injection vent shall not exceed 145 psi. Normal operations shall be performed at approximately 75 psi. If the actual grouting pressure exceeds the maximum allowed, the injection vent shall be closed and the grout shall be injected at the next vent which has been, or is ready to be, closed as long as a one-way flow is maintained. Grout shall not be injected into a succeeding vent from which grout has not yet flowed. If this procedure is used, then the vent which is to be used for injection shall be fitted with a positive shut-off. When one-way flow of grout cannot be maintained as outlined above, or when grouting is interrupted, the grouting must be stopped and continued immediately from the next available drain or outlet with adequate grout flow. Flushing of the PT system with water is not permitted.

Grout shall be pumped through the duct and continuously wasted at the ejection vent until no visible slugs of water or air are ejected. The outlet at the end of the tendon shall not be permanently closed until the wet density passes the previously established wet density range. To ensure that the tendon remains filled with grout, the ejection and injection vents shall be closed in sequence, respectively, under pressure when the tendon duct is completely filled with grout. If no leaks are present, bleed the pressure to 5 psi and wait a minimum of ten minutes for any entrapped air to flow to the high points. After the minimum ten minute period has expired, increase the pressure as needed and discharge grout at each high point outlet to eliminate any entrapped air or water. The ejection and injection vents shall

then be reclosed in sequence. The positive shut-offs at the injection and ejection vents shall not be removed or opened until the grout has set.

11.12 Temperature Restrictions: Cold climate conditions shall be in effect whenever the ambient temperature is 40ºF and falling; in these conditions mixing and protection measures shall be employed. In temperatures below 32ºF, ducts shall be kept free of water to avoid damage due to freezing. When the ambient temperature may be expected to fall below 40 ºF, accurate temperature records shall be kept covering maximum and minimum air temperatures and the temperatures of the concrete element containing ducts to be grouted. No materials in which frost or ice is present shall be used and ducts and equipment shall be kept completely free of frost and ice.

Grouting operations shall be postponed if frost is expected or ambient temperatures are anticipated to fall below 35ºF within the next 48 hours. If grouting has been performed, the temperature of the grout and concrete shall be kept above 35ºF for 3 consecutive days after grouting or until job-cured 2 in. cubes of grout reach a minimum compressive strength of 800 psi. All methods of heating or insulating shall be subject to the approval of the Engineer.

Grout shall not be above 90ºF during mixing or pumping. If necessary, a thermal insulation or cooling circulation system may be installed or the grout may be batched using cold water.

11.13 Finishing: Valves, caps and vent pipes shall not be removed or opened until the grout has set. The ends of steel vents shall be removed at least 1 in. below the concrete surface after the grout has set. Ends of plastic vents shall be removed to the surface of the concrete after the grout has set. All miscellaneous material used for sealing grout caps shall be removed prior to carrying out further work to protect end anchorages or filling in concrete anchorage blockouts and the like. Miscellaneous materials include paper, tie wire, etc.

11.14 Post-Grouting Operations and Inspection: Do not remove or open inlets and outlets until the grout has cured for 24 to 48 hours. Remove all outlets located at anchorages and high points along the tendon to facilitate inspection and perform inspections within one hour after the removal of the inlet/outlet. Drill and inspect all inlets or outlets located at the anchorages. Depending on the geometry of the grout inlets, drilling may be required to penetrate to the inner steel surface of the trumpet or duct. Use drilling equipment that will automatically shut-off when steel is encountered. Unless grout caps are determined to have voids by sounding, do not drill into the cap. Perform inspections in the presence of the Engineer using borescopes or probes. If unsuitable grout is observed by the Engineer, the Contractor shall submit a repair procedure for approval by the Engineer. Within four hours of completion of the inspections or repairs, fill all duct and anchorage voids using the volumetric measuring vacuum grouting process. Seal and repair all anchorage and inlet/outlet voids that are produced by drilling for inspection purposes using repair methods approved by the Engineer. Remove inlets and outlets to a minimum depth of 1 inch below the surface of the concrete and permanently

seal and fill with epoxy flush to the concrete surface using procedures approved by the Engineer.

If tendon grouting operations were prematurely terminated prior to filling the tendon, drill into inlets, outlets, and/or drains to explore the voided areas with a borescope. Probing is not allowed. Determine the location and extent of all voided areas. Install grout inlets as necessary using a method approved by the Engineer and fill the voids using volumetric measuring vacuum grouting equipment.

Post-grouting inspection shall be performed for all tendons.

11.15 Grouting Report: Provide a grouting report signed by the contractor within 72 hours of each grouting operation for review by the Engineer.

Report the theoretical quantity of grout anticipated as compared to the actual quantity of grout used to fill the duct. Notify the Engineer immediately of shortages or overages.

Information to be noted in the records shall include but not necessarily be limited to the following: identification of the tendon; date grouted; number of days from tendon installation to grouting; type of grout; injection end and applied grouting pressure, ratio of actual to theoretical grout quantity; number of bags of grout mixed; total quantity of water used to mix the grout; summary of any problems encountered and corrective action taken.

12.0 PROTECTION OF END ANCHORAGES (POST-TENSIONING ENCASEMENT)

After tendons have been stressed, inspected, grouted, and approved, exposed end anchorages, strands and other metal accessories, and girder web and flange surfaces within the limits of the post-tensioning encasement shall be cleaned of rust, misplaced mortar, grout and other such materials. All cleaned surfaces shall be dried as part of the cleaning operation. Immediately following the cleaning operation, a heavy unbroken coating of an epoxy bonding compound shall be applied to all such metal surfaces. The cleaning of the girder surfaces and application of epoxy bonding compound to the girder surfaces shall be done in neat lines matching the final dimensions of the encasement. Epoxy bonding compound shall conform to AASHTO M 235, Type III. Within 24 hours following the cleaning and application of epoxy bonding compound, and within the recommended tack-time of the epoxy bonding compound application, encapsulate anchorage with post-tensioning encasement pour-back using an approved, high-strength, high-bond, low-shrinkage, sand-filled epoxy grout. Only non-chloride bearing non-shrink grout mixes shall be used for anchorage protection.

13.0 BASIS OF PAYMENT

13.1 Unless otherwise specified on the Plans, post-tensioning tendons will be paid for at the contract unit price for "Post-Tensioning Tendons" - lump sum, of steel tendon, complete and in place. Payment shall be full compensation for furnishing, installing, stressing and grouting all post-tensioning tendons. Payment shall also include anchorage assemblies and any other post-tensioning system hardware required to complete the work, grout and grouting, all testing, and all labor, materials, tools, equipment and incidentals necessary for completing the work in accordance with these specifications and the Plans. This payment shall also include Engineer-approved lubricants in the tendon ducts for friction control and flushing the lubricant from the tendon ducts after stressing.

Post Tensioning Tendons **Lump Sum**

13.2 Payment for "Post-Tensioning Encasement" shall be full compensation for all labor, materials, tools and equipment necessary for the work listed in the section "Protection of End Anchorages (Post-Tensioning Encasement). Payment will be made under:

Post-Tensioning Encasement **Lump Sum**

6000 PSI CONCRETE (SPECIAL)

6000 PSI concrete shall be in accordance with the Sections 1000 and 1078 of the Standard Specifications.

Payment will be made under:

6000 PSI Concrete	**Cu. Yds.**

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 3-21-17)) Z-1a

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DEQ State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by ***** are the responsibility of the Department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-13 of the *2018 Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the restricted waters, wetlands or buffer zones, provided that activities outside those areas is done in such a manner as to not affect the restricted waters, wetlands or buffer zones.

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

February 10, 2021

Regulatory Division

Action ID No. SAW-2017-02112

Philip S. Harris III, P.E., C.P.M.
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, NC, 27699-1598

Per 2/11/2011 tel. conv. w/ Bill Barrett NCDOT, this is a typo. Should be 'Section AB'. E. Alford

Dear Mr. Harris:

Reference the Department of the Army (DA) phased permit issued on January 22, 2018, to the North Carolina Department of Transportation (NCDOT), for impacts associated with the new location project (TIPs No. R-2247 and U-2579), the Winston-Salem North Beltway, in Forsyth County, North Carolina.

On December 2, 2020, the U.S. Army Corps of Engineers (Corps) received your request to modify the standard permit for Section B phase of the U-2579 project. The request included final design drawings, including final design for utility relocations, and a mitigation proposal. The total waters of the U.S., including wetland, impacts, for the U-2579AB final design are: 1.43 acres of permanent wetland impacts, 0.01 acre of temporary wetland impacts, 9,180 linear feet of permanent stream impacts, of which 219 linear feet are bank stabilization, 948 linear feet of temporary stream impacts, and 3.61 acres of permanent pond impacts.

The Corps has completed the evaluation of your request and has determined that it is appropriate and reasonable, and no public notice is required for this modification. Therefore, the permit is modified as requested and as shown on the revised PERMIT DRAWINGS, Sheets 1 through 78 (U-2579AB), received on December 2, 2020.

For your information, the following special conditions from the original authorization have been updated to include the new compensatory mitigation requirements (enclosed), and the new modified permit drawings:

Special Conditions

1. All work authorized by this permit shall be performed in strict compliance with the following sets of plans: ~~"U-2579DEF: PERMIT MODIFICATION PACKAGE" Sheets 1-97, dated December 18, 2018, with revisions to Sheets 60, 61, 72, 73, 74, 75, 96, & 97, received on November 5, 2020; Sheets 1-34, dated September 16, 2019; and~~ PERMIT DRAWINGS Sheets 1 through 78 (U-2579AB), received on December 2, 2020; which are part of this permit. The Permittee shall ensure 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.

* 25. In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent versions of the Compensatory Mitigation Responsibility Transfer Form. The requirements of these forms, including any special conditions listed on these forms, are hereby incorporated as special conditions of this permit.

26. You must comply with the following conditions specified in the February 9, 2021 water quality certification:

Condition(s) of Certification

1. This approval is only valid for the purpose and design that you submitted in your application for a modification dated December 2, 2020. All the authorized activities and conditions associated with the phased permit Water Quality Certification issued on November 14,2017, along subsequent modifications, and revisions, still apply except where superseded by this Certification.

* *2. Off-Site Stream Mitigation*. Compensatory mitigation for 5,222 linear feet of impact to 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 (OMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in a letter dated September 29, 2017 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the DMS Mitigation Banking Instrument signed July 28, 2010.

* 3. Off-Site Wetland Mitigation. Compensatory mitigation for impacts to 1.43 acres of riverine wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Division of Mitigation Services (DMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. DMS has indicated in a letter dated September 29, 2017 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with DMS's Mitigation Banking instrument signed July 28, 2010.

All other conditions of the permit, including the permit expiration date of December 31, 2028, 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

Monte Matthews Date: 2021.02.10 11:35:59 -05'00'

Monte Matthews
Lead Project Manager
Wilmington District

Enclosure

Electronic Copies Furnished with Enclosure:

Ms. Beth Harmon
NC Division of Mitigation Services
beth.harmon@ncdenr.gov

Mr. Bill Barrett
NCDOT
wabarrett@ncdot.gov

P-5

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

February 9, 2021

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: **Modification to 401 Water Quality Certification** (WQC004131) for Section U-2579AB of the Winston Salem Northern Beltway (Eastern Section of Future I-74) from I-40 to I-40 Business/US 421, pursuant to Section 401 of the Federal Clean Water Act, for the Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 north (U-2579C Phase 2, D, E, and F) and from I-40 Business to US 311 south (U-2579AA and AB). This will be NCDWR Project No. 19980260 (version 7).

Note: On January 26, 2021, NCDOT requested a revision to the modification issued on January 25, 2021. There were a few minor edits needed and a Table 5 describing wetland utility impacts was inadvertently left out of the original. Therefore, the Certification issued on January 25, 2021 is to be replaced by this Certification dated February 9, 2021.

Dear Mr. Harris:

Attached hereto is a copy of modified Certification No. WQC004131 for TIP U-2579AB (v7-revised) issued to The North Carolina Department of Transportation (NCDOT) dated February 9, 2021.

For reference, WQC004131 was initially issued on November 14, 2017, revised on November 27, 2017, December 21, 2017 and on February 7, 2019. Revised version 4 (modification for TIP R-2247EB) was issued on August 13, 2019. Modification 5 (for U-2579 D, E & F) was dated November 14, 2019. Modification 6 (for U-2579 D, E & F) was issued on November 30, 2020; and, In-Field Modification issued for U-2579 D, E & F on January 14, 2021.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

DocuSigned by:
Amy Chapman
9C9886312DCD474...

S. Daniel Smith, Director
Division of Water Resources

Electronic copy only distribution:
Eric Alsmeyer, US Army Corps of Engineers, Raleigh Field Office
Bill Barrett, NC Department of Transportation
Amy Euliss, DEO, NC Department of Transportation, Division 9
Beth Harmon, Division of Mitigation Services
Amanetta Somerville, US Environmental Protection Agency
Janet Mizzi, US Fish and Wildlife Service
Marla Chambers, NC Wildlife Resources Commission
File Copy

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact an additional 1.43 acres of wetlands, 9,180 linear feet of permanent impacts and 824 linear feet of temporary impacts to jurisdictional streams in Forsyth County. The project shall be constructed pursuant to the modification application dated December 2, 2020. The authorized impacts are as described below:

Table 1. Wetland (Riverine/Riparian) Impacts in the Yadkin Pee Dee River Basin U-2579AB.

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Impacts Requiring Mitigation (ac)
4A	0.13	-	-	0.13
5A	-	-	<0.01	<0.01
6A	0.03	-	-	0.03
7A	0.36	-	-	0.36
12A	0.08	-	0.17	0.25
13A	0.08	-	-	0.08
14A	0.03	-	0.07	0.10
17A	0.06	-	-	0.06
17B	0.09	-	-	0.09
17C	0.03	-	-	0.03
23A	0.22	0.02	0.06	0.30
Total	**1.11**	**0.02**	**0.29**	**1.43***

* Mitigation totals are rounded.

Table 2. Stream Impacts in the Yadkin Pee Dee River Basin, U-2579AB

Site	Stream Designation	Description of Impacts	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	Intermittent	Pipe	48	-	-
		Ditch	76	18	-
2	Perennial	Pipe	51	-	-
		Dissipator Basin	20	-	-
		Bank Stabilization	14	-	-
		Detour	-	76	-
3	Intermittent	Pipe	137	12	-
4		Fill	74	-	-
5		Ditch	28	32	-
6	Perennial	Culvert	589	-	589
		Bank Stabilization	26	41	-
		Outlet Protection	81	88	81
6B	Intermittent	Pipe	-	19	-
7	Perennial	Pipe	92	-	92
		Ditch	84	10	84
		Riprap Pad	16	25	16
8		Pipe	342	-	342
		Bank Stabilization	17	10	-
	Intermittent	Pipe	102	-	-
9	Perennial	Inlet Protection	66	10	66
		Culvert	226	-	226
		Outlet Protection	22	-	22
		Ditch	149	-	149
		Inlet Protection	18	-	18
		Culvert	354	-	354
		Ditch	195	10	195

Table 2. Stream Impacts in the Yadkin Pee Dee River Basin, U-2579AB

Site	Stream Designation	Description of Impacts	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
10	Intermittent	Pipe	556	-	-
	Perennial	Pipe	60	-	-
		Ditch	52	-	-
12	Perennial	Culvert	372	-	372
	Intermittent	Ditch/Stabilization	277	-	-
13		Pipe	136	-	-
	Perennial	Pipe	368	-	368
		Bank Stabilization	28	10	-
14		Pipe	44	-	-
		Pipe cleanout	-	43	-
		Bank Stabilization	22	14	-
15		Pipe	36	10	-
		Riprap Pad	23	48	-
16		Pipe Extension	44	26	-
16A		Pipe	170	10	-
		Bank Stabilization	33	10	
17		Culvert	427	-	427
		Channel Protection	35	-	35
18		Fill	900	102	900
		Bank Stabilization	44	11	-
19		Fill	80	-	-
		Ditch	50	-	-
		Pipe	14	-	-
		Pipe	16	-	-
		Ditch	65	-	-
		Pipe	18	-	-
		Channel Protection	6	6	-

Table 2. Stream Impacts in the Yadkin Pee Dee River Basin, U-2579AB

Site	Stream Designation	Description of Impacts	Permanent Impacts (linear ft)	Temporary Impacts (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
20	Perennial	Pipe	100	-	-
		Ditch	55	10	-
		Pipe	20	-	-
21	Intermittent	Ditch	548	10	
		Ditch	180	50	-
22	Perennial	Ditch	67	-	-
23		Ditch	62	10	
24		Ditch	0	10	-
25		Culvert	92	-	92
		Bank Stabilization	35	5	-
		Outlet Protection	48	13	48
26		Culvert	56	-	-
		Inlet Protection	18	14	-
		Outlet Protection	33	-	-
27	Intermittent	Pipe	14	-	-
		Riprap Pad	12	10	
28	Perennial	Culvert	84	-	
	Intermittent		30	-	
29	Perennial	Ditch	1,023	10	1,023
30		Ditch	0	41	-
Totals			**9,180**	**824**	**5,222**

Table 3. Open Water (Pond) Impacts in the Yadkin Pee Dee River Basin U-2579AB.

Site	Permanent Fill	Impacts Requiring Mitigation
4B	0.89	-
12B	2.37	-
24	0.35	-
Totals	**3.61**	**-**

Table 4. Utility Stream Impacts in the Yadkin Pee Dee River Basin U-2579AB.

Site	Impact Type	Temporary Impact (linear feet)	Impacts Requiring Mitigation
	Gravity Sewer Line (inches)		
U-1	8	6	-
U-2	16	8	-
U-3	8	8	-
U-4	8	78	-
U-5	8	24	-
Totals		**124**	-

Table 5. Utility Wetland Impacts in the Yadkin Pee Dee River Basin U-2579AB.

Site	Impact Type	Temporary Impacts (ac)	Impact Requiring Mitigation
U-4	Gravity Sewer Line (8 inch)	0.01	-
U-5		<0.01	-
Totals		**0.01**	-

Table 6. Culverts/Pipes to be Buried in the Yadkin Pee Dee River Basin U-2579AB.

Site	Culvert/Pipe Size
6	RCBC 12’ x 10’ (2 barrels)
9	RCBC 6’ x 7’
14	RCP III 72”
17	RCBC 8’ x 7’
25	RCBC 12’ x 7’ (3 barrels)
26	RCBC 7’ x 8’

The modification application provides adequate assurance that the discharge of fill material into the waters of the Yadkin Pee Dee River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application for a modification dated December 2, 2020. All the authorized activities and conditions associated with the phased permit Water Quality Certification issued on November 14, 2017 and subsequent modifications and revisions, still apply except where superseded by this Certification.

Should your project change, you are required to notify 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 perennial stream impacts, for this project (now or in the future) exceed one acre or 300 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other

federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification

1. This approval is only valid for the purpose and design that you submitted in your application for a modification dated December 2, 2020. All the authorized activities and conditions associated with the phased permit Water Quality Certification issued on November 14, 2017, along subsequent modifications and revisions, still apply except where superseded by this Certification.

∗ 2. *Off-Site Stream Mitigation*. Compensatory mitigation for 5,222 linear feet of impact to 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) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in a letter dated September 29, 2017 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the DMS Mitigation Banking Instrument signed July 28, 2010.

∗ 3. *Off-Site Wetland Mitigation.* Compensatory mitigation for impacts to 1.43 acres of riverine wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Division of Mitigation Services (DMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. DMS has indicated in a letter dated September 29, 2017 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with DMS's Mitigation Banking Instrument signed July 28, 2010.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided that the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919) 431-3000, Facsimile: (919) 431-3100

A copy of the petition must also be served on DEQ as follows:

Mr. Bill F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center

This the 9th day of February 2021

DIVISION OF WATER RESOURCES

DocuSigned by:
Amy Chapman
9C9886312DCD474...

S. Daniel Smith, Director

WQC No. 004131

EXHIBIT A

Environmental Quality

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

LINDA CULPEPPER
Interim Director

December 21, 2017

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for Proposed Winston Salem Northern Beltway from I-40 to US 52 (TIP Nos. R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC); and from US 52 to US 311 north (U-2579C Phase 2, D, E, and F); and, from I-40 Business to US 311 South (U-2579AA, and AB) in Forsyth County. State Project Nos. 6.628001T and 8.2625101. NCDWR Project No. 19980260 v2. *Revision 2.*

Dear Mr. Harris:

Attached hereto is a copy of Certification No. WQC004131 issued to The North Carolina Department of Transportation (NCDOT) dated December 21, 2017.

The original Certification dated November 14, 2017 was revised (Revision 1) to include Table 7. Revision 1 was signed and dated November 27, 2017.

This hereto is a revision to the November 27, 2017 Certification. This revision clarifies Condition No. 4 of Condition(s) of Certification below with respect to culvert burial at Sites 2 and 3A of U-2579C Phase 2; adds a General Condition 1 relative to culvert burial practices; clarifies the type of permanent impacts at Sites 4 and 5 of R-2247CD as footnoted in Table 3 below; designates mitigation requirements to Sites 4 and 5 in Table 3; and, accounts for additional mitigation in Condition 1 of Condition(s) of Certification relative to Sites 4 and 5.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Amy Chapman for

Linda Culpepper, Interim Director
Division of Water Resources

Attachments

Electronic copy only distribution:
James Lastinger, US Army Corps of Engineers, Raleigh Field Office
Amy Euliss, Division 9 Environmental Officer
Carla Dagnino, NC Department of Transportation
Bill Barret, NC Department of Transportation
Chris Militscher, US Environmental Protection Agency
Marella Buncick, US Fish and Wildlife Service
Marla Chambers, NC Wildlife Resources Commission
Beth Harmon, Division of Mitigation Services
File Copy

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact 1.03 acres of jurisdictional wetlands and 5,519 linear feet of jurisdictional streams in Forsyth County as summarized in Tables 1 through 6 below. This portion of the phased project shall be constructed pursuant to the application dated received October 2, 2017.

This certification also authorizes future wetland and stream impacts for other Sections as summarized in Table 7 below.

Table 1. Stream Impacts in the Yadkin Pee Dee River Basin (U-2579C Phase 2)

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)		Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
	Roadway Fill		Roadway Fill/Culvert	Bank Stabilization			
1	-	-	1,148	40	31	1,219	1,148
2	-	-	552	45	35	632	552
3A	-	-	914	33	55	1,002	914
4	-	-	405	-	40	445	405
5	390	-	-	-	-	390	-
Total	**390**	-	**3,019**	**118**	**161**	**3,688**	**3,019**

Total Stream Impacts for this Section: 3,688 linear feet

Table 2. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (U-2579C Phase 2)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	0.57	-	-	0.57	0.57
3B	0.02	0.01	0.01	0.04	0.04
3C	0.06	-	-	0.06	0.06
5	0.02	-	-	0.02	0.02
Total	**0.66**	**0.01**	**0.01**	**0.68**	**0.68**

Total Wetland Impacts for this Section 0.68 acres.

Table 3. Stream Impacts in the Yadkin Pee Dee River Basin (R-2247CD)

Site	Permanent Fill in Perennial Stream (linear ft)				Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
	Fill	Ditch	Channel Change/Fill	Bank Stabilization/ RipRap			
2	-	75	-	-	7	82	-
4	-	-	56*	-	4	60	56
5	160	-	15*	72*	-	247	247
6	-	-	-	-	45	45	-
7	17	-	216	-	26	259	-
8	-	-	-	16	10	26	-
9	-	-	-	55	15	70	-
10	-	-	-	17	14	31	-
Total	**177**	**75**	**287**	**160**	**121**	**820**	**303**

**Note: Impacts at Sites 4 and 5 include riprap in the stream bed which will require mitigation.*

Total Stream Impacts for this Section: 820 linear feet

Table 4. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (R-2247CD)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	<0.01	-	<0.01	<0.01	<0.01
2	<0.01	<0.01	-	<0.01	<0.01
3	0.01	-	-	0.01	0.01
7	-	-	0.01	0.01	0.01
Total	**0.02**	**<0.01**	**0.02**	**0.04**	**0.04**

Total Wetland Impacts for this Section: 0.04 acres.

Table 5. Stream Impacts in the Yadkin Pee Dee River Basin (R-2247EC)

Site	Permanent Fill in Intermittent Stream (linear ft)		Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)		Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
	Pipe	Channel Change		Channel Change	Bank Stabilization			
1	-	-	-	112	15	20	147	-
2	-	-	-	156	21	25	202	156
3	-	-	-	165	15	19	199	165
4	54	-	10	-	-	-	64	-
6	-	275	44	-	-	-	319	-
7	-	-	-	22	-	11	33	-
8	-	-	-	30	-	17	47	-
Total	**54**	**275**	**54**	**485**	**51**	**92**	**1,011**	**321**

Total Stream Impacts for this Section: 1,011 linear feet

Table 6. Wetland (Riverine) Impacts in the Yadkin Pee Dee River Basin (R-2247EC)

Site	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1	<0.01	<0.01	<0.01	<0.01	<0.01
4	0.04	-	0.02	0.06	0.06
5	0.22	-	0.01	0.24	0.24
Total	0.26	<0.01	0.04	0.31	0.31

Total Wetland Impacts for this Section: 0.31 acres.

Table 7. Summary of Preliminary Stream and Wetland Impacts for Future Sections

Section	Stream Impacts (linear feet)	Wetland Impacts (acres)	Impacts Requiring Mitigation	
			Streams (linear feet)	Wetlands (acres)
U-2579AA	3,019	1.43	3,019	1.43
U-2579AB	10,351	1.50	10,351	1.50
U-2579D	5,043	0.08	5,043	0.08
U-2579E	4,864	0.99	4,864	0.99
U-2579F	2,544	0.24	2,544	0.24
R-2247EA	6,536	0.57	6,536	0.57
R-2247EB	6,593	0.09	6,593	0.09
R-2247B Phase 2	862	0.27	862	0.27
R-2247CA	3,056	0.71	3,056	0.71
R-2247CB	5,674	1.98	5,674	1.98
R-2247D	5,762	0.52	5,762	0.52
Total	**54,304**	**8.38**	**54,304**	**8.38**

Notes: Mitigation totals are estimates. Mitigation is not required for intermittent streams. Final mitigation requirements will be determined once permit is modified and preliminary impacts are finalized for other Sections.

The application provides adequate assurance that the discharge of fill material into the waters of the Yadkin Pee Dee River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received October 2, 2017. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 300 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

* 1. Compensatory mitigation for 3,643 linear feet of impacts to streams and 1.03 acres of wetlands is required for Sections R-2247EC, R-2247CD and U-2579C Phase 2. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Division of Mitigation Service (DMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in a letter dated September 29, 2017 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the DMS Mitigation Banking Instrument signed July 28, 2010.

* 2. When final design plans are completed for other Sections (in Table 7) of this phased project, a modification to the 401 Water Quality Certification shall be submitted with five copies and fees to the NC Division of Water Resources. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters, and buffers. No construction activities that impact any wetlands, streams or surface waters, other than those referenced above in Tables 1 through 6 for U-2579C Phase 2, R-2247 CD and R-2247EC, shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality from the NC Division of Water Resources. [15A NCAC 02H. 0506(b)]

3. As discussed in Merger and restated in the above reference permit application, NCDWR will not require burial of pipes/culverts in the streambed at impact sites for R-2247CD and EC. However, design and placement of culverts and other structures shall be constructed in such a manner that the original stream profiles are not altered (i.e., the depth of the channel must not be reduced by a widening of the streambed). Existing stream dimensions (including pattern and profile) are to be maintained above and below locations of each culvert. The structures shall be designed and installed to allow for fish and other wildlife movement as well as prevent headcutting of the stream. The applicant may be required to provide evidence that the equilibrium has been maintained if requested in writing by the NCDWR. [15A NCAC 02H.0506(b)(2)]

* 4. For U-2579C Phase 2, the inlet invert of the 60-inch pipe crossing at Site 2 will not be buried to prevent head cutting. However, the outlet will be buried one foot. At Site 3A, the culvert will be buried 0.75 feet. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by the NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required. [15A NCAC 02H.0506(b)(2)]

5. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species. [15A NCAC 02H .0506(b)(2)

6. Bridge demolition and construction must be accomplished in strict compliance with the most recent version of NCDOT's Best Management Practices for Construction and Maintenance Activities. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]

7. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]

General Conditions

1. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required. [15A NCAC 02H.0506(b)(2)]

2. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills. [15A NCAC 02B.0200]

3. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers. [15A NCAC 02H.0506(b)(2)]

4. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions. [15A NCAC 02H.0506(b)(2)]

5. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage. [15A NCAC 02H.0506(b)(2)]

* 6. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval. [15A NCAC 02H .0507(c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

7. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water. [15A NCAC 02H.0506(b)(3) and (c)(3)]

8. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream. [15A NCAC 02H.0506(b)(3)]

9. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials. [15A NCAC 02H.0506(b)(3)]

10. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification. [15A NCAC 02H.0506(b)(3)]

11. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]

12. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If the NCDWR determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the NCDWR may reevaluate and modify this certification. [15A NCAC 02B.0200]

13. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification. [15A NCAC 02H.0506(b)(2)]

14. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager. [15A NCAC 02H .0507(c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

15. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing/flagging prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification. [15A NCAC 02H.0501 and .0502]

16. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having

jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

17. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery. [15A NCAC 02B.0506(b)(2)]

* 18. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer (or appointee) shall complete and return the enclosed "Certification of Completion Form" to notify the NCDWR when all work included in the 401 Certification has been completed. [15A NCAC 02H.0502(f)]

19. Native riparian vegetation must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction. [15A NCAC 02H.0506(b)(2)]

20. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities. [15A NCAC 02H.0506(b)(3) and (c)(3)]

21. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards [15A NCAC 02H.0506(b)(3) and (c)(3]):

    a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual.*
    b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
    c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*
    d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

22. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification. [15A NCAC 02H.0506(b)(3) and (c)(3)]

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919) 431-3000, Facsimile: (919) 431-3100

A copy of the petition must also be served on DEQ as follows:

Mr. Bill F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center

This the 21st day of December 2017

DIVISION OF WATER RESOURCES

By Chapman for:

Linda Culpepper, Interim Director

WQC No. WQ004131

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

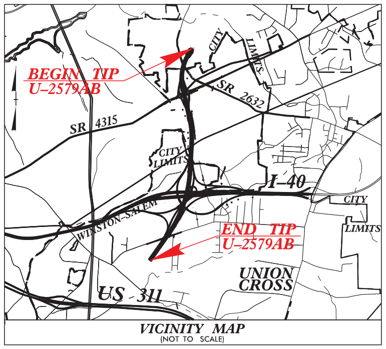
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AB	1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
34839.1.8		P.E.	

FORSYTH COUNTY

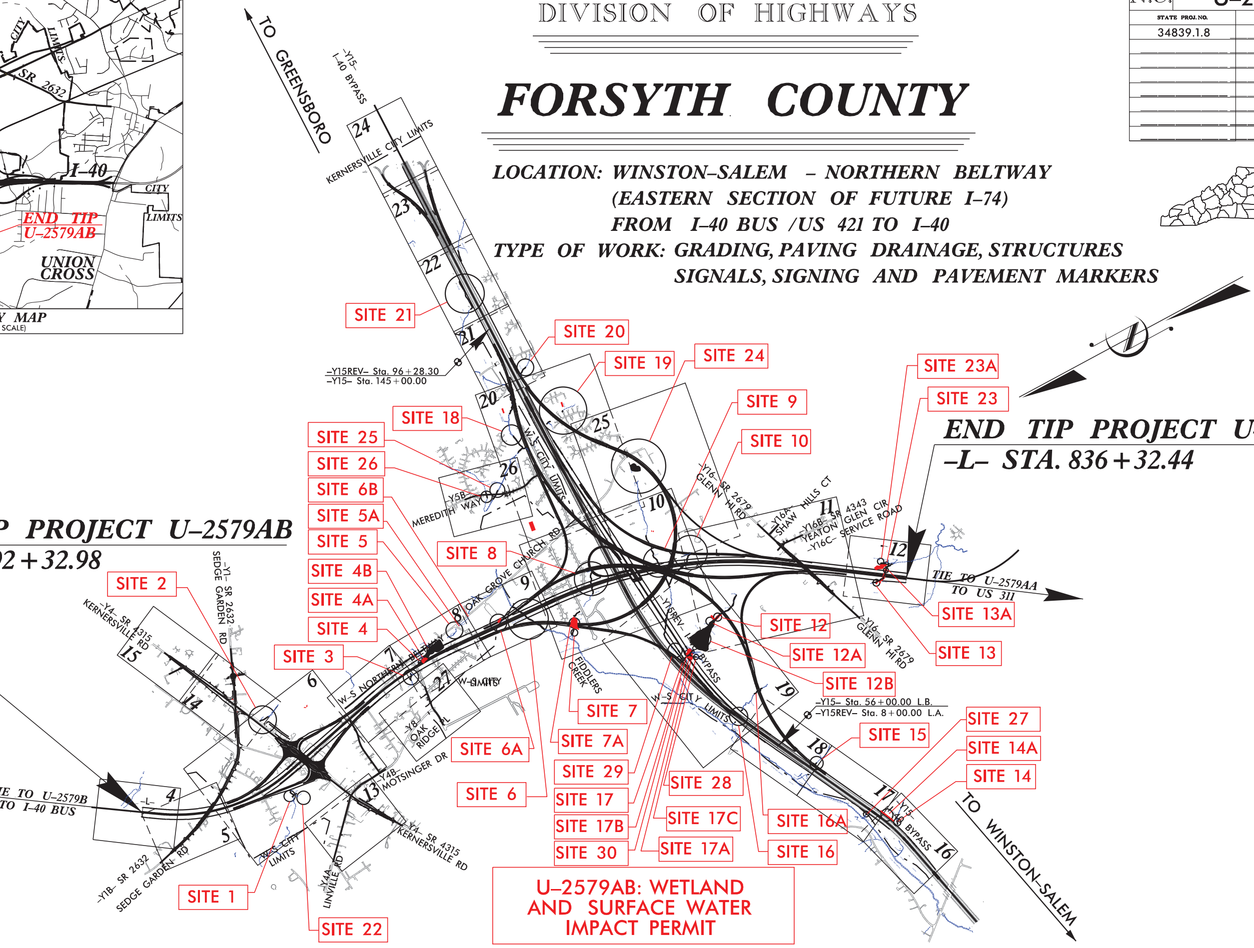
LOCATION: WINSTON-SALEM – NORTHERN BELTWAY (EASTERN SECTION OF FUTURE I-74) FROM I-40 BUS /US 421 TO I-40

TYPE OF WORK: GRADING, PAVING DRAINAGE, STRUCTURES SIGNALS, SIGNING AND PAVEMENT MARKERS

See Sheet 1-A For Index of Sheets



VICINITY MAP (NOT TO SCALE)



PERMIT DRAWING SHEET 1 OF 78

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100 — PLANS

50 25 0 50 100 — PROFILE (HORIZONTAL)

10 5 0 10 20 — PROFILE (VERTICAL)

DESIGN DATA

ADT 2018 = 14,700
ADT 2040 = 20,200
K = 9 %
D = 70 %
T = 7 % *
V = 70 MPH
* TTST = 4% DUAL = 3%
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-2579AB = 2.727 MILES
TOTAL LENGTH TIP PROJECT U-2579AB = 2.727 MILES

Prepared In the Office of:
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: TBD

LETTING DATE: TBD

PHILLIP E. ROGERS, PE — PROJECT ENGINEER

CASEY E. HARRIS, PE — PROJECT DESIGN ENGINEER

TATIA L. WHITE, PE, PLS — NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION

CONTRACT:

TIP PROJECT: U-2579AB

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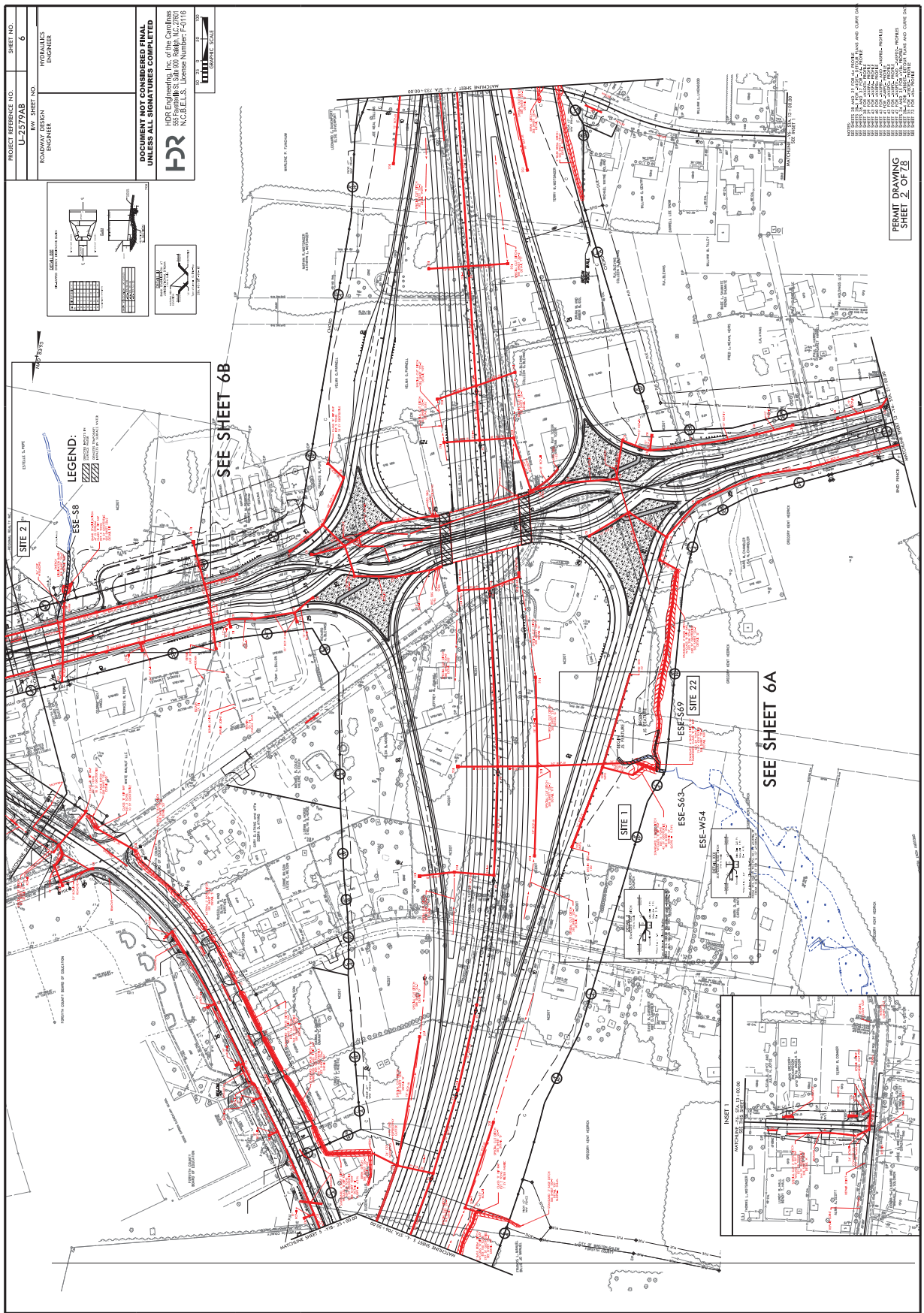
09/08/99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U-2579AB
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
6
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 900 Charlotte, N.C. 28202
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
PERMIT DRAWING SHEET 2 OF 78
LEGEND:
SEE SHEET 6B
SEE SHEET 6A
SITE 1
SITE 2
SITE 22
ESE-S8
ESE-563
ESE-W54
ESE-569
INSET 1
REVISIONS
ROW REV. – SEPTEMBER 10, 2018 – ROW LINE ON PARCEL 45 MODIFIED TO ELIMINATE DUE AND ENCOMPASS ENTIRE PARCEL IN ROW. DUE AND ROW LINE MODIFIED ON PARCEL 46 TO TIE TO NEW ROW LINE. CEH
ROW REV. – AUGUST 12, 2019 – PROPERTY LINE WAS ADDED TO PARCEL 39 FOR DRIVEWAY ACCESS ADDITION OF PARCEL 39A. CEH.
ROW REV. – MARCH 25, 2020 – PERMANENT UTILITY EASEMENT ADDED TO PARCEL 14A (NEW CLAIM). SMP.
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PROJECT REFERENCE NO.
U-2579AB
RW SHEET NO.
ROADWAY DESIGN ENGINEER
SHEET NO.
6
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
1616 East Millbrook Road, Suite 210
Raleigh, NC 27609
N.C.B.E.A.S. License Number: F-0116
GRAPHIC SCALE
PERMIT DRAWING SHEET 3 OF 78
LEGEND:
SEE SHEET 6B
SEE SHEET 6A
SITE 1
SITE 2
SITE 22
ESE-S8
ESE-569
ESE-563
ESE-W54
INSET 1
REVISIONS
ROW REV. – SEPTEMBER 10, 2018 – ROW LINE ON PARCEL 45 MODIFIED TO ELIMINATE DUE AND ENCOMPASS ENTIRE PARCEL IN ROW. DUE AND ROW LINE MODIFIED ON PARCEL 46 TO TIE TO NEW ROW LINE. CEH
ROW REV. – AUGUST 12, 2019 – PROPERTY LINE WAS ADDED TO PARCEL 39 FOR DRIVEWAY ACCESS ADDITION OF PARCEL 39A. CEH.
ROW REV. – MARCH 25, 2020 – PERMANENT UTILITY EASEMENT ADDED TO PARCEL 14A (NEW CLAIM). SMP.
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LEGEND:

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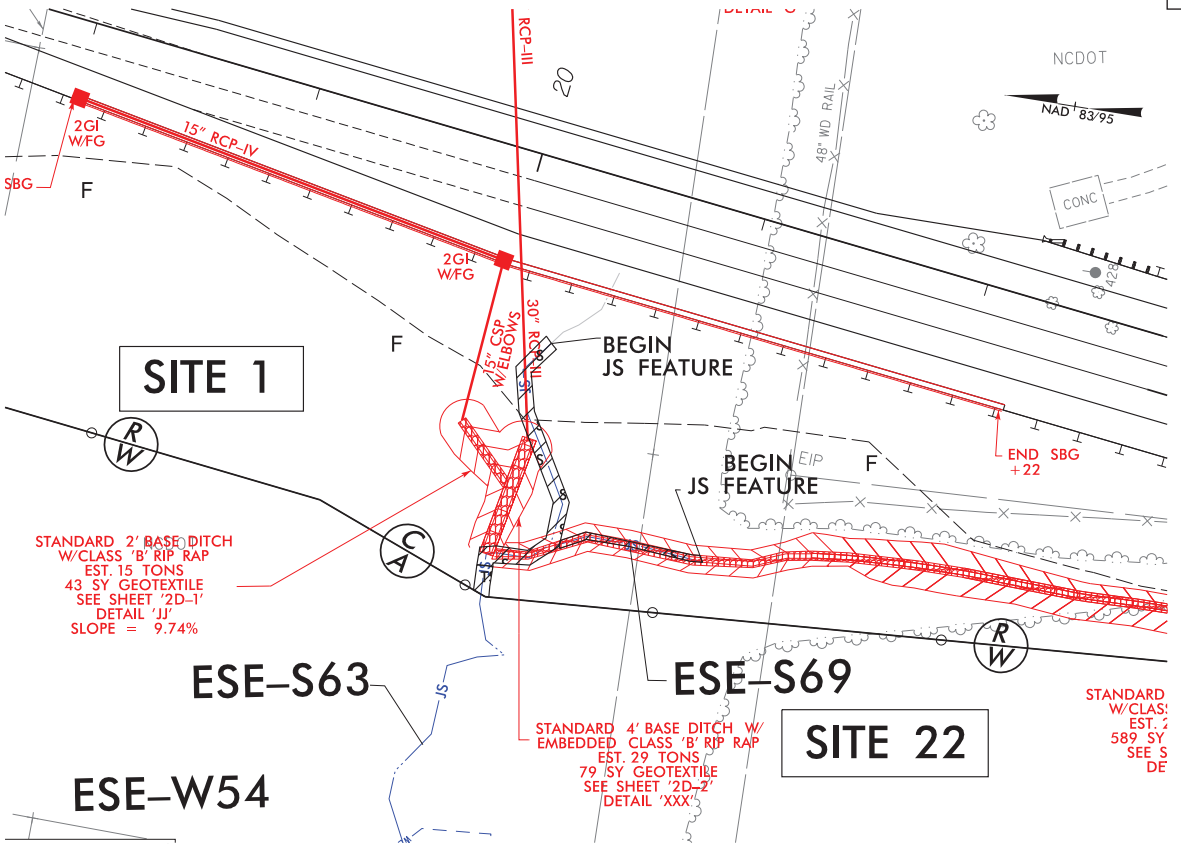
TS / TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER



DETAIL JJ
STANDARD BASE DITCH
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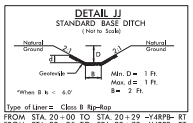

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FROM STA. 22+25 TO STA. 22+79 -Y4RPB- RT

DETAIL XXX
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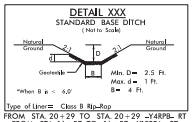
(Not to Scale)



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FROM STA. 16+57 TO 16+57 -Y15RPA- RT

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	6A
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

12.5 0 12.5 25
GRAPHIC SCALE

PERMIT DRAWING
SHEET 4 OF 78

P-24

REVISIONS

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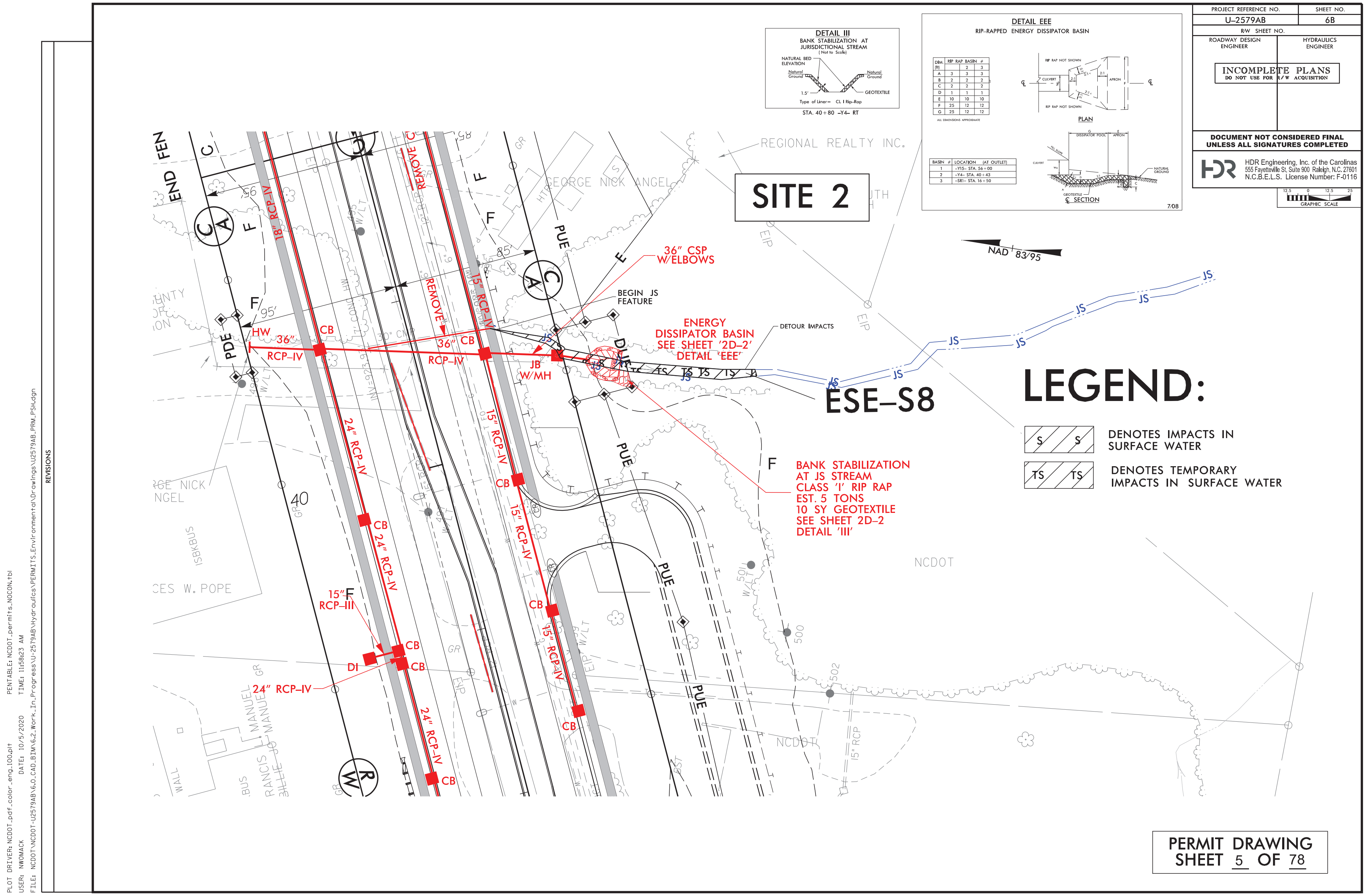

PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
6B
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
DETAIL EEE
RIP-RAPPED ENERGY DISSIPATOR BASIN
PLAN
SECTION
DETAIL III
BANK STABILIZATION AT JURISDICTIONAL STREAM
STA. 40+80 -Y4- RT
SITE 2
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
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DETOUR IMPACTS
BANK STABILIZATION AT JS STREAM CLASS 'I' RIP RAP EST. 5 TONS 10 SY GEOTEXTILE SEE SHEET 2D-2 DETAIL 'III'
JB W/MH
36" RCP-IV
15" RCP-IV
24" RCP-IV
18" RCP-IV
15" RCP-III
REMOVE
CB
DI
HW
PUE
PDE
DUE
REGIONAL REALTY INC.
GEORGE NICK ANGEL
NCDOT
END FEN
PERMIT DRAWING
SHEET 5 OF 78
REVISIONS
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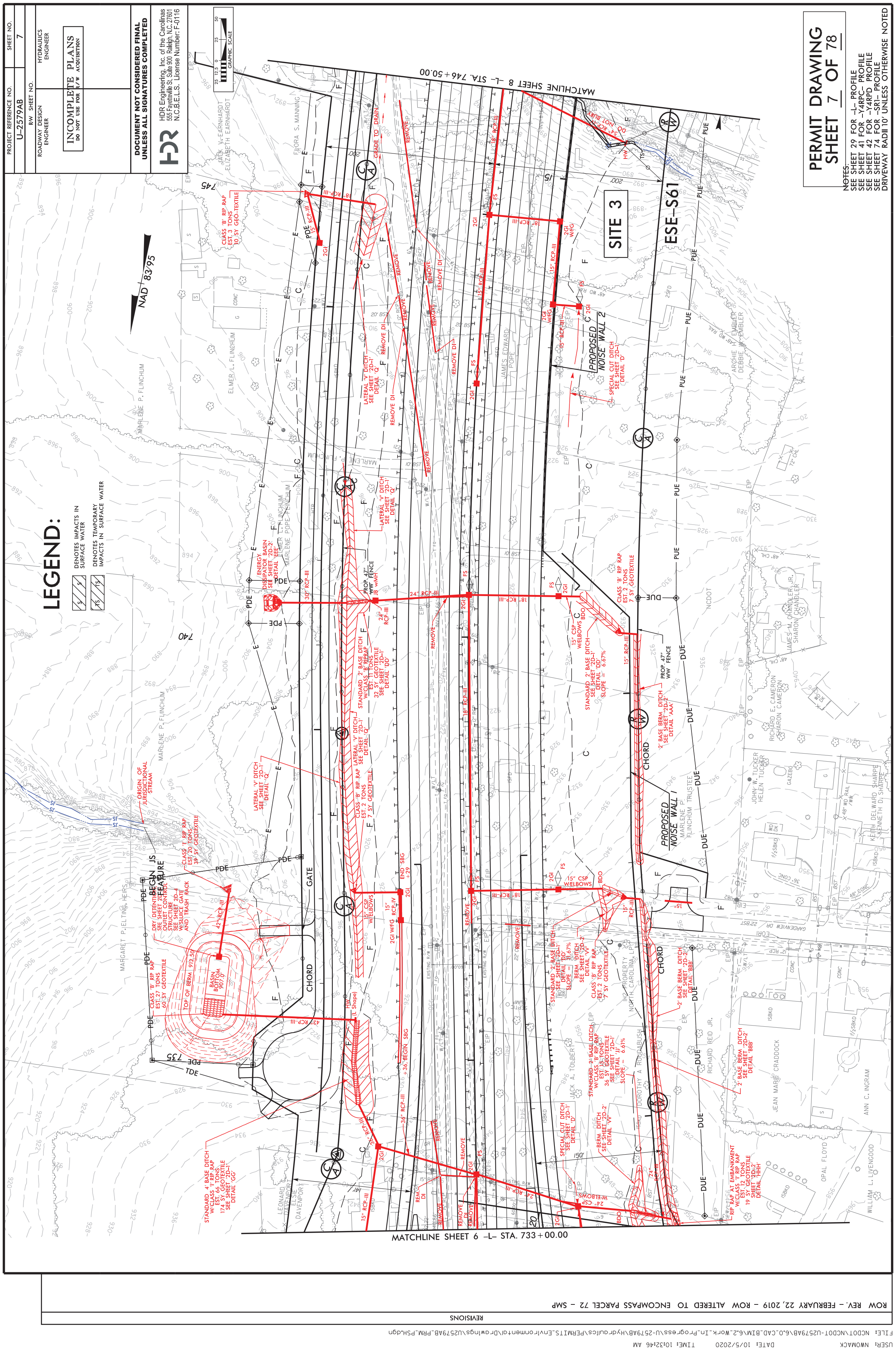
P-26


PROJECT REFERENCE NO. U-2579AB
SHEET NO. 7
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900, Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
PERMIT DRAWING SHEET 6 OF 78
NOTES:
SEE SHEET 29 FOR -L- PROFILE
SEE SHEET 41 FOR -Y4RPC- PROFILE
SEE SHEET 42 FOR -Y4RPD- PROFILE
SEE SHEET 74 FOR -SR1- PROFILE
DRIVEWAY RADII 10' UNLESS OTHERWISE NOTED
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/95
MATCHLINE SHEET 8 -L- STA. 746+50.00
MATCHLINE SHEET 6 -L- STA. 733+00.00
SITE 3
ESE-S61
PROPOSED NOISE WALL 2
PROPOSED NOISE WALL 1
ROW REV. - FEBRUARY 22, 2019 - ROW ALTERED TO ENCOMPASS PARCEL 72 - SMP
REVISIONS

P-27



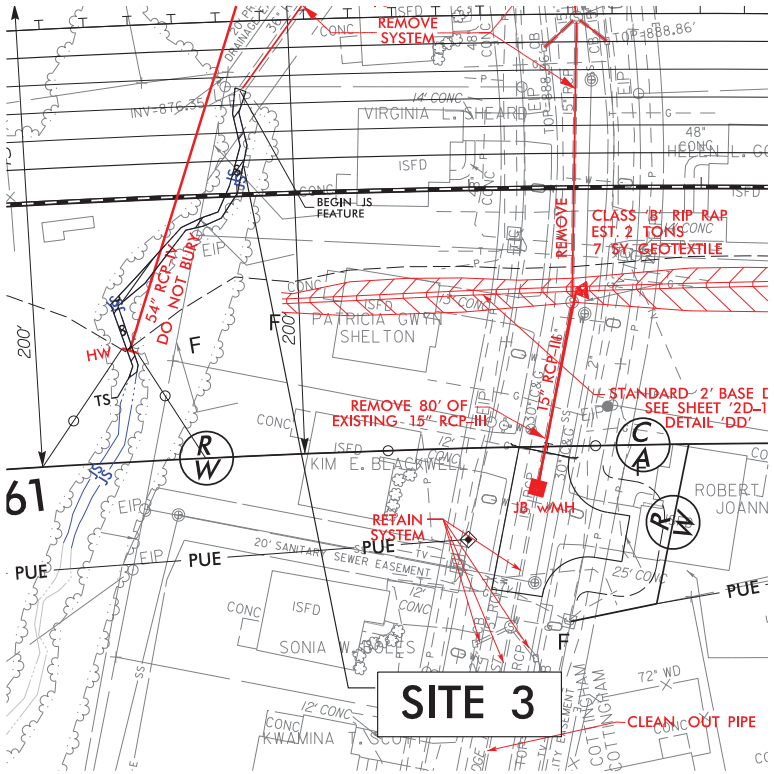
PERMIT DRAWING
SHEET 7 OF 78
NOTES:
SEE SHEET 29 FOR -L- PROFILE
SEE SHEET 41 FOR -Y4RPC- PROFILE
SEE SHEET 42 FOR -Y4RPD- PROFILE
SEE SHEET 74 FOR -SR1- PROFILE
DRIVEWAY RADII 10' UNLESS OTHERWISE NOTED
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
7
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
NAD 83/95
SITE 3
ESE-S61
MATCHLINE SHEET 8 -L- STA. 746+50.00
MATCHLINE SHEET 6 -L- STA. 733+00.00
PROPOSED NOISE WALL 2
PROPOSED NOISE WALL 1
ROW REV. - FEBRUARY 22, 2019 - ROW ALTERED TO ENCOMPASS PARCEL 72 - SMP
REVISIONS

LEGEND:

S S — DENOTES IMPACTS IN SURFACE WATER

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83/95



PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	7A
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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N.C.B.E.L.S. License Number: F-0116

GRAPHIC SCALE

REVISIONS

PERMIT DRAWING SHEET 8 OF 78

P-28

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HDR Engineering, Inc. of the Carolinas
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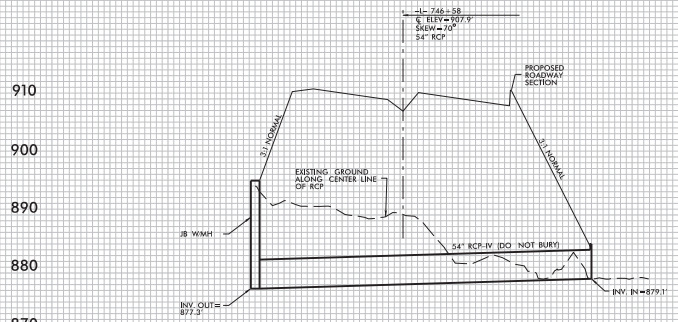
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

150 100 50 0 50 100 150 200

U-2579AB – SITE 3



PROFILE ALONG ℄ OF PIPE

PERMIT DRAWINGS
SHEET 9 OF 78

P-29

5/14/99

REVISIONS

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FILE: U2579AB_PRM_CSR_PSH

REVISIONS

ROW REV. – FEBRUARY 22, 2019 – ROW ALTERED TO ENCOMPASS PARCEL 22 – SMP

ROW REV. – JUNE 26, 2019 – DRIVEWAY ADDED TO PARCEL 84– SMP

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REVISIONS

ROW REV. – FEBRUARY 22, 2019 – ROW ALTERED TO ENCOMPASS PARCEL 72 – SMP

ROW REV. – JUNE 26, 2019 – DRIVEWAY ADDED TO PARCEL 84– SMP

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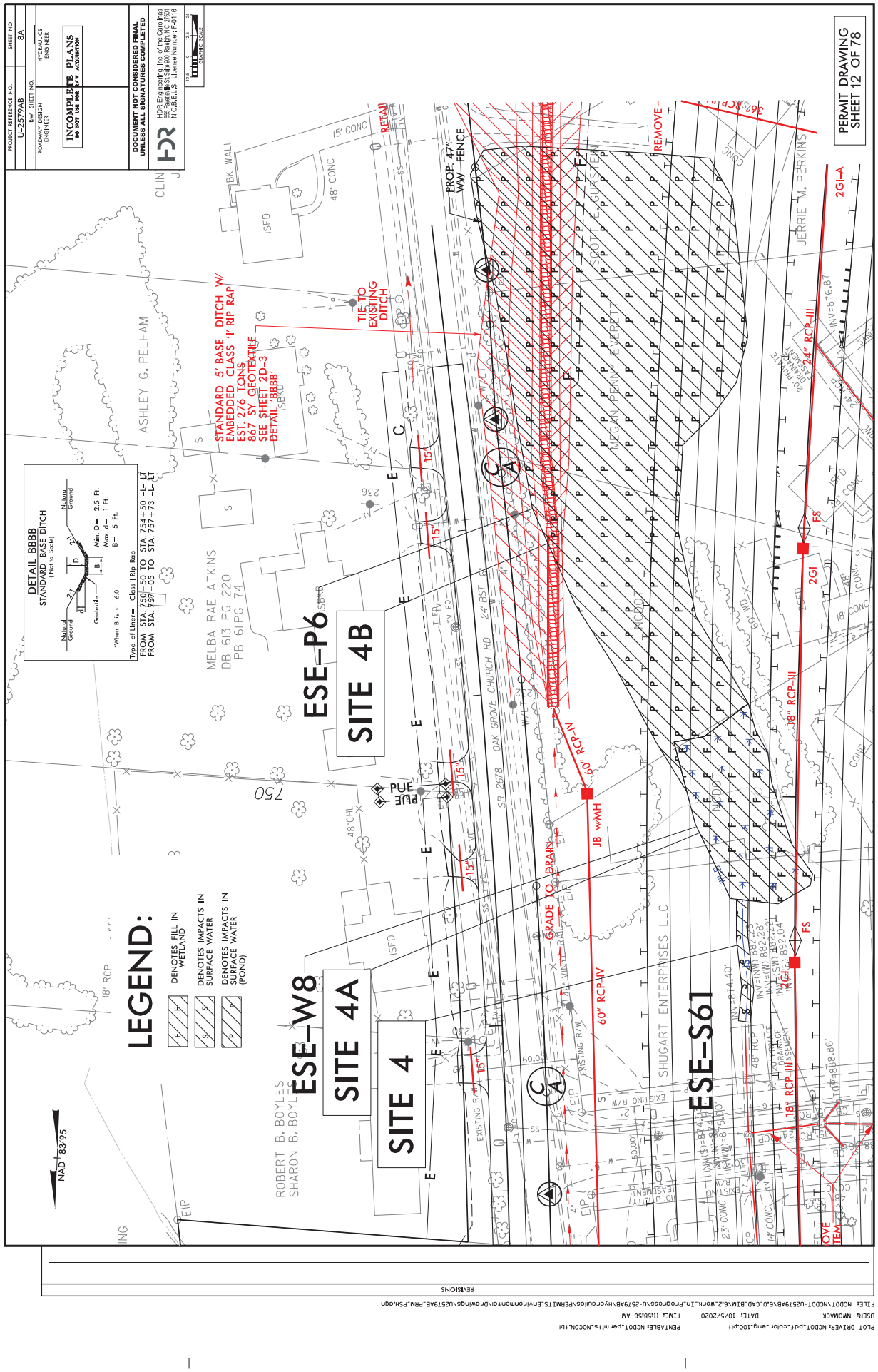

REVISIONS

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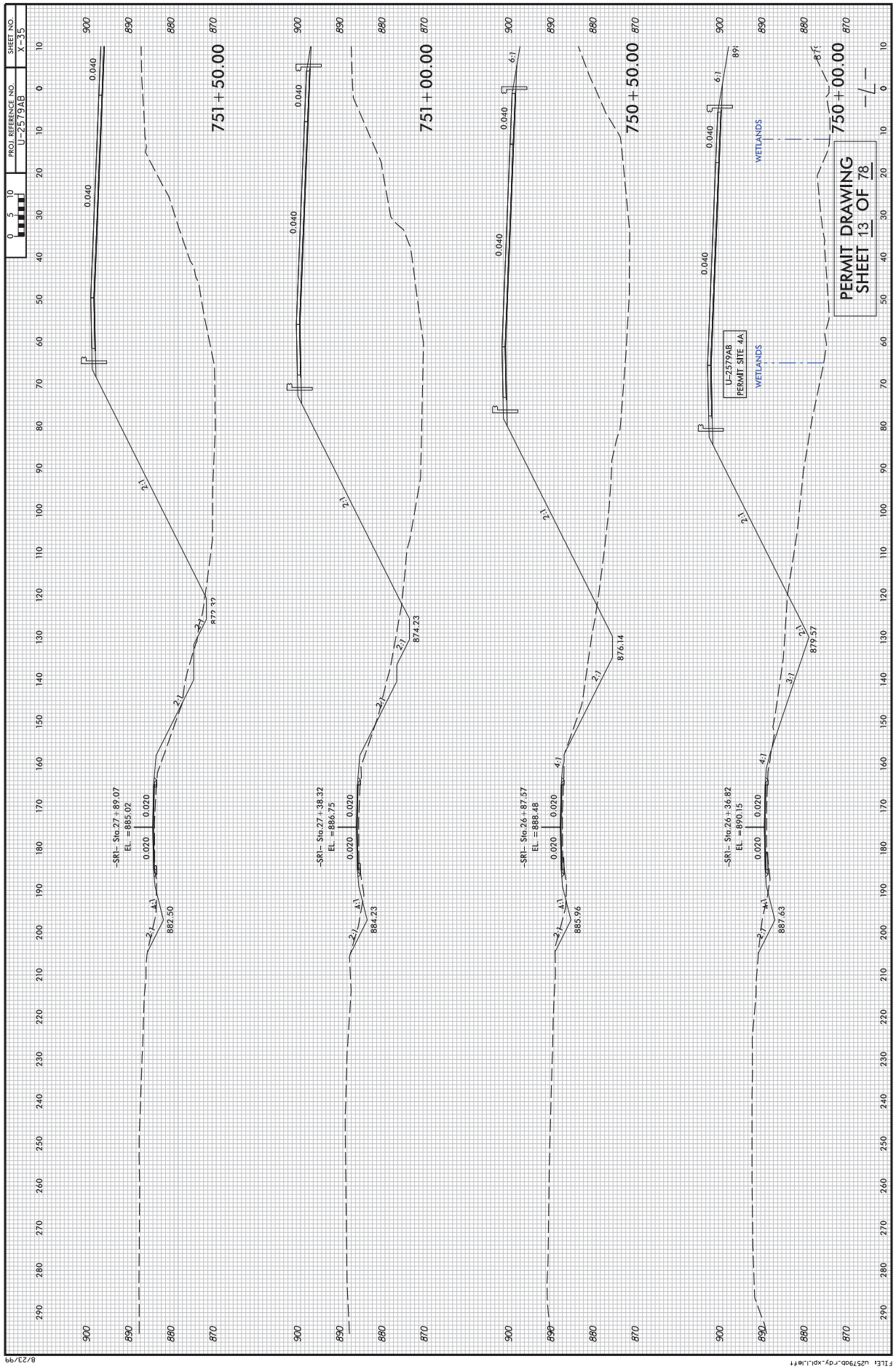

8/23/99

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LEGEND:

DENOTES MECHANIZED CLEARING

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	8B
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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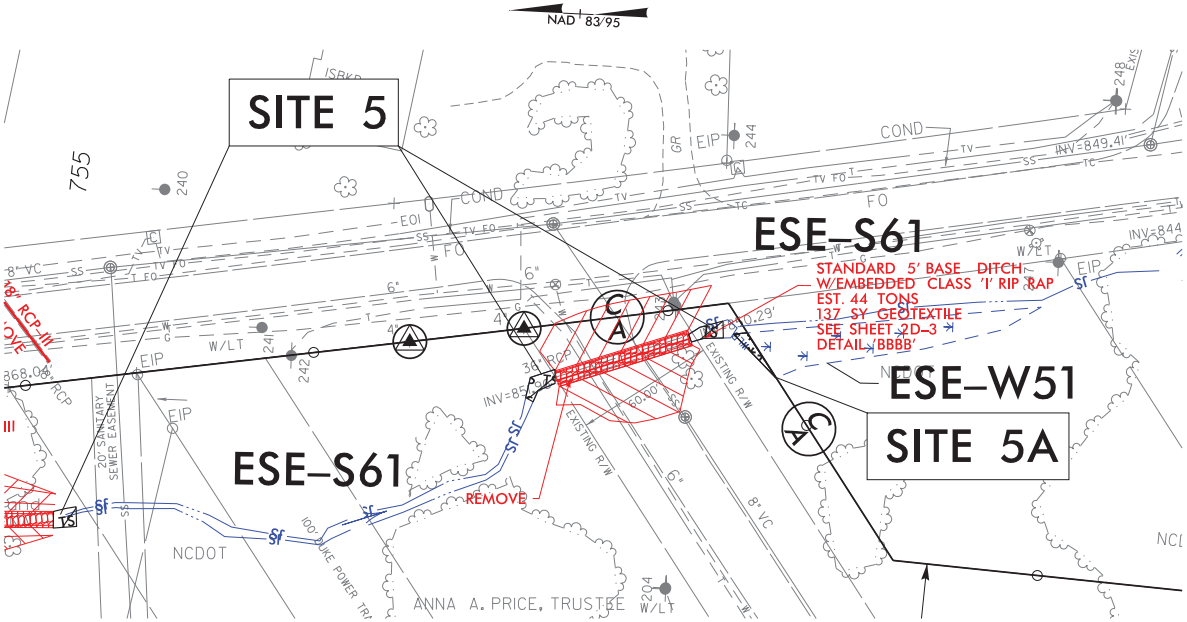
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

GRAPHIC SCALE



PERMIT DRAWING
SHEET 14 OF 78

P-34

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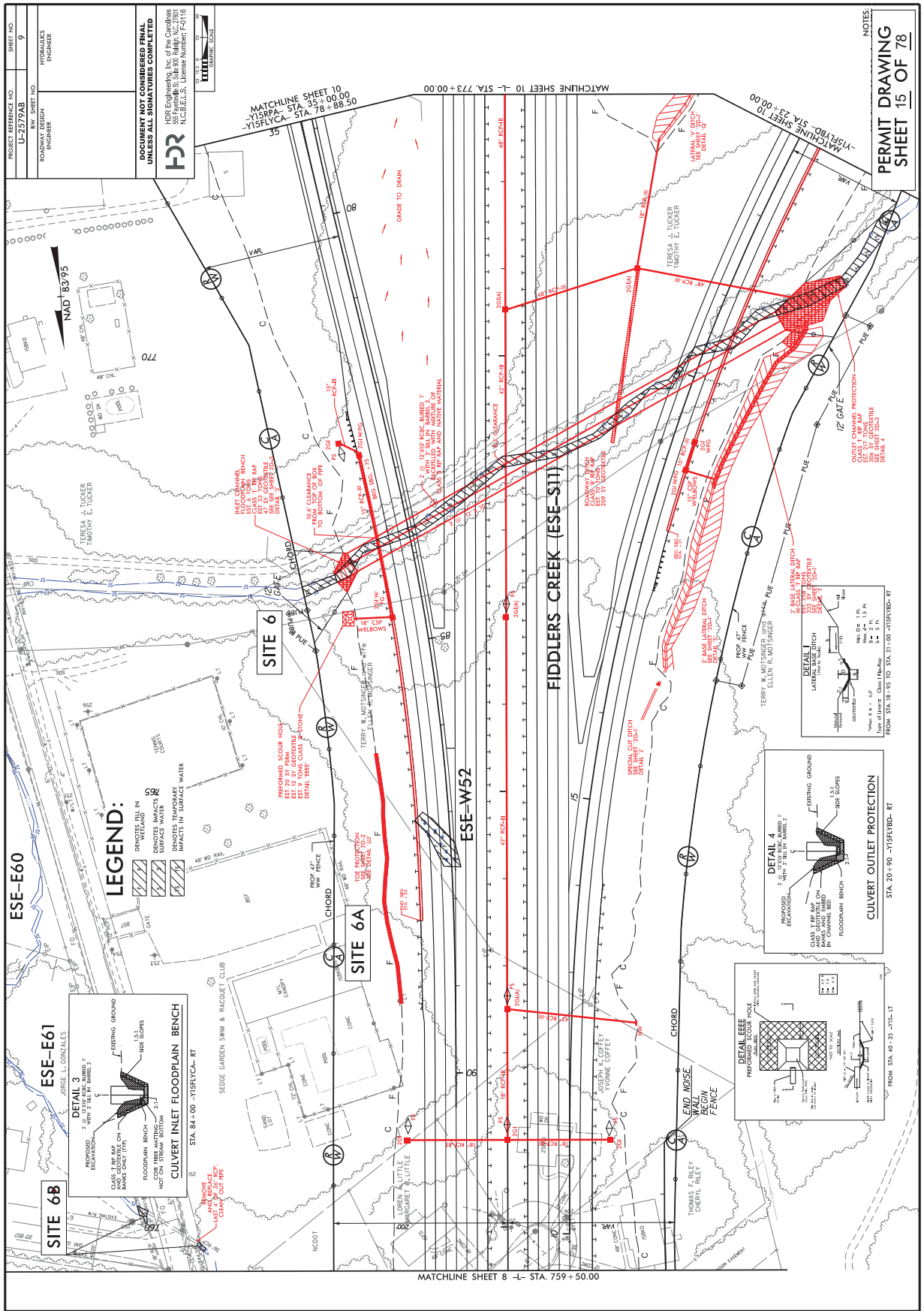
DATE: 10/5/2020

REVISIONS


PERMIT DRAWING
SHEET 15 OF 78
NOTES:
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
1616 E. Millbrook Road, Suite 210
Raleigh, NC 27609
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
MATCHLINE SHEET 10 -L- STA. 773+00.00
MATCHLINE SHEET 10 -Y15FLYBD- STA. 23+00.00
MATCHLINE SHEET 10 -Y15GRPA- STA. 35+00.00
-Y15FLYCA- STA. 78+88.50
MATCHLINE SHEET 8 -L- STA. 759+50.00
NAD 83/95
FIDDLERS CREEK (ESE-S11)
ESE-W52
ESE-E60
ESE-E61
SITE 6
SITE 6A
SITE 6B
LEGEND:
DENOTES FILL IN WETLANDS
DENOTES IMPACTS TO SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DETAIL 3
CULVERT INLET FLOODPLAIN BENCH
STA. 84+00 -Y15FLYCA- RT
DETAIL 4
CULVERT OUTLET PROTECTION
STA. 20+90 -Y15FLYBD- RT
DETAIL I
LATERAL BASE DITCH
DETAIL EEEE
PERFORMED SCOUR HOLE
END NOISE WALL BEGIN FENCE
SEDGE GARDEN SWIM & RACQUET CLUB
TERESA J. TUCKER
TIMOTHY E. TUCKER
TERRY W. MOTSINGER
ELLEN R. MOTSINGER
JOSEPH H. COFFEY
YVONNE COFFEY
LOREN A. LITTLE
MARGARET B. LITTLE
THOMAS F. RILEY
CHERYL RILEY
JORGE L. GONZALES
NCDOT
REVISIONS
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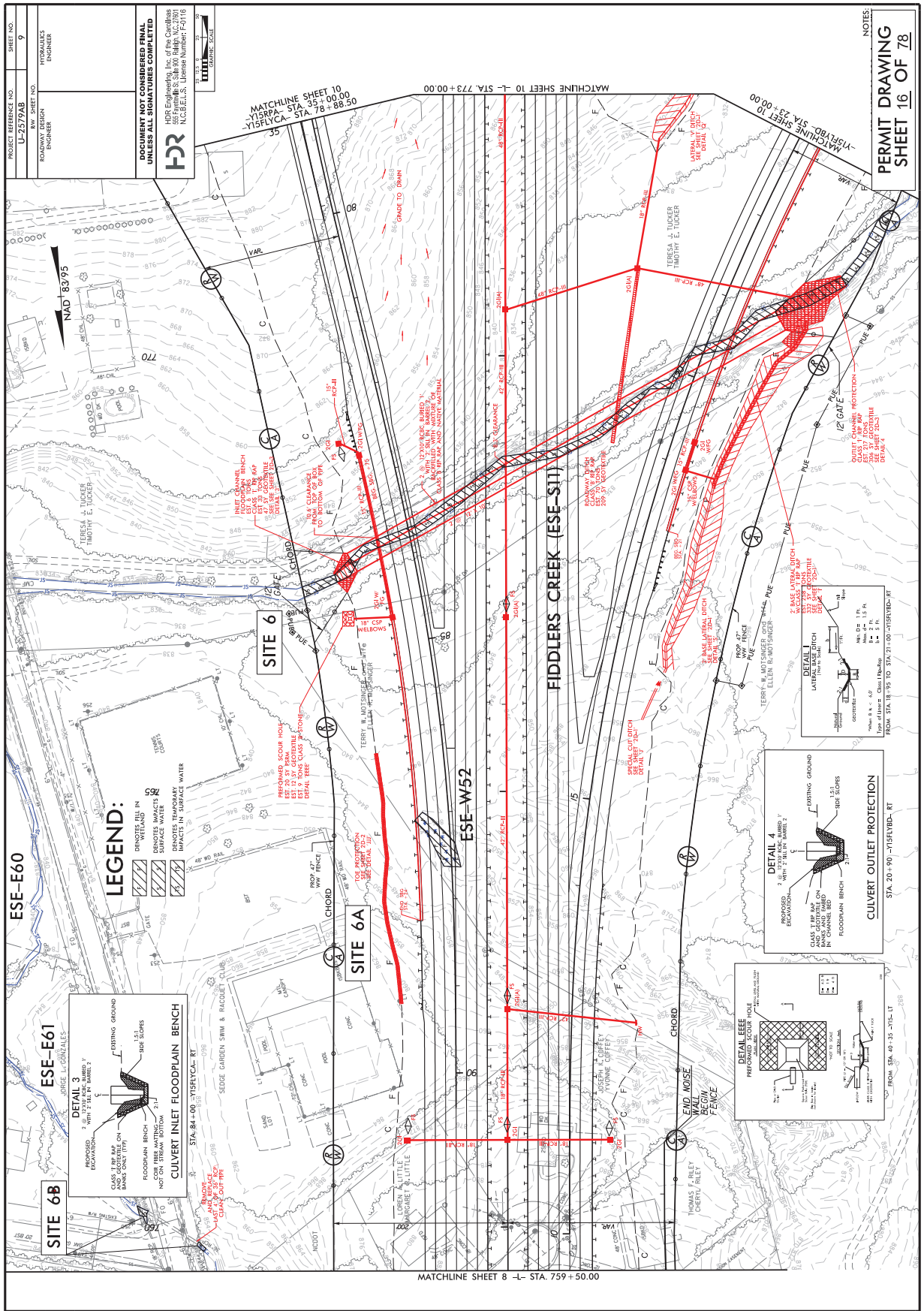
PERMIT DRAWING
SHEET 16 OF 78
NOTES:
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 1400
Charlotte, NC 28202
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
MATCHLINE SHEET 10 -L- STA. 773+00.00
MATCHLINE SHEET 10 -Y15GRPA- STA. 35+00.00
-Y15FLYCA- STA. 78+88.50
-Y15FLYBD- STA. 237+00.00
MATCHLINE SHEET 8 -L- STA. 759+50.00
NAD 83/95
LEGEND:
DENOTES FILL IN WETLANDS
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
FIDDLERS CREEK (ESE-S11)
ESE-W52
ESE-E60
ESE-E61
SITE 6
SITE 6A
SITE 6B
DETAIL 3
CULVERT INLET FLOODPLAIN BENCH
STA. 84+00 -Y15FLYCA- RT
DETAIL 4
CULVERT OUTLET PROTECTION
STA. 20+90 -Y15FLYBD- RT
DETAIL I
LATERAL BASE DITCH
FROM STA. 18+95 TO STA. 21+00 -Y15FLYBD- RT
DETAIL FEEFE
PERFORMED SCOUR HOLE
END NOISE WALL BEGIN FENCE
TERESA J. TUCKER
TIMOTHY E. TUCKER
TERRY W. MOTSINGER
ELLEN R. MOTSINGER
JOSEPH A. CUFFEY
YVONNE CUFFEY
LOREN A. LITTLE
MARGARET B. LITTLE
THOMAS F. RILEY
CHERYL RILEY
JORGE L. GONZALES
SEDGE GARDEN SWIM & RACQUET CLUB
NCDOT
REVISIONS
PLOT DRIVER: NCDOT_pdf_color_eng_100dpi
PENTABLE: NCDOT_permits_CON.tbl
USER: CWEBS
DATE: 10/20/2020
TIME: 1:15:05 PM
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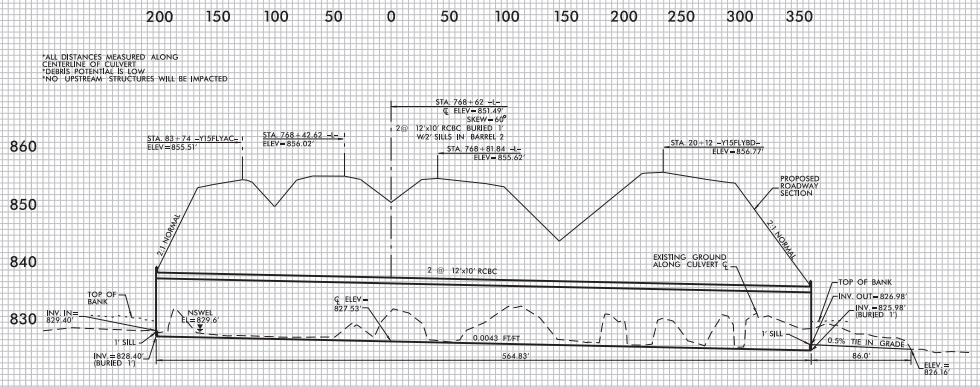
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U-2579AB – SITE 6



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 17 OF 78

P-37

5/14/99

REVISIONS

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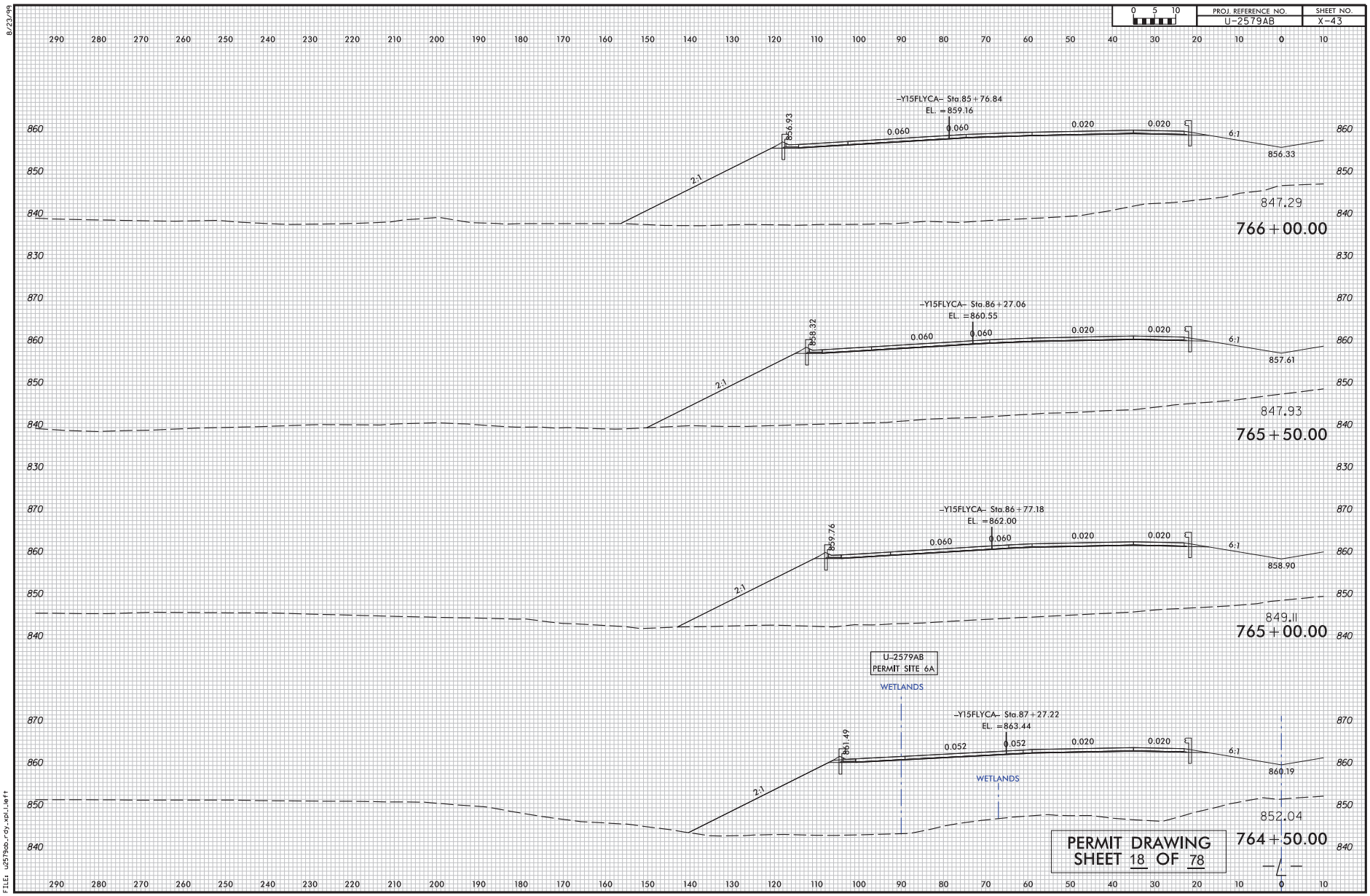
DATE: 5/5/2020



8/23/99

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DATE: 5/5/2020
TIME: 12:03:53 PM

P-38


PROJECT REFERENCE NO.
U-2579AB
RW SHEET NO.
ROADWAY DESIGN ENGINEER
SHEET NO.
10
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1000, Charlotte, NC 28202
N.C.B.E.L.S. License Number: C-2116
GRAPHIC SCALE
PERMIT DRAWING
SHEET 19 OF 78
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
SEE SHEET 10D
SEE SHEET 10C
SEE SHEET 10B
SEE SHEET 10A
SITE 10
SITE 9
SITE 8
SITE 7
SITE 7A
ESE-S13
ESE-S12
ESE-S59
ESE-W48
ESE-W47
ESE-W63
FIDDLERS CREEK (ESE-S11)
REVISIONS
ROW REV. FEBRUARY 24, 2020 SHIFTED CUL DE SAC ON OAK GROVE CHURCH RD TO PROVIDE BETTER INGRESS & EGRESS FOR THE MOTSINGER PROPERTY. LINE ON PARCEL 677 CHANGED TO CA TO ILLUSTRATE ENTIRE PARCEL PURCHASED FOR RW. CEH.
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P-40

REVISIONS

ROW REV. FEBRUARY 24, 2020 SHIFTED CUL DE SAC ON OAK GROVE CHURCH RD TO PROVIDE BETTER INGRESS & EGRESS FOR THE MOTSINGER PROPERTY. LINE ON PARCEL 677 CHANGED TO CA TO ILLUSTRATE ENTIRE PARCEL PURCHASED FOR RW. CEH.

PLOT DRIVER: NCDOT_pdf_color_eng_100.pltPENTABLE: NCDOT_permits_CON.tbl
USER: MMOMACKDATE: 10/19/2020TIME: 14:46:35 PM
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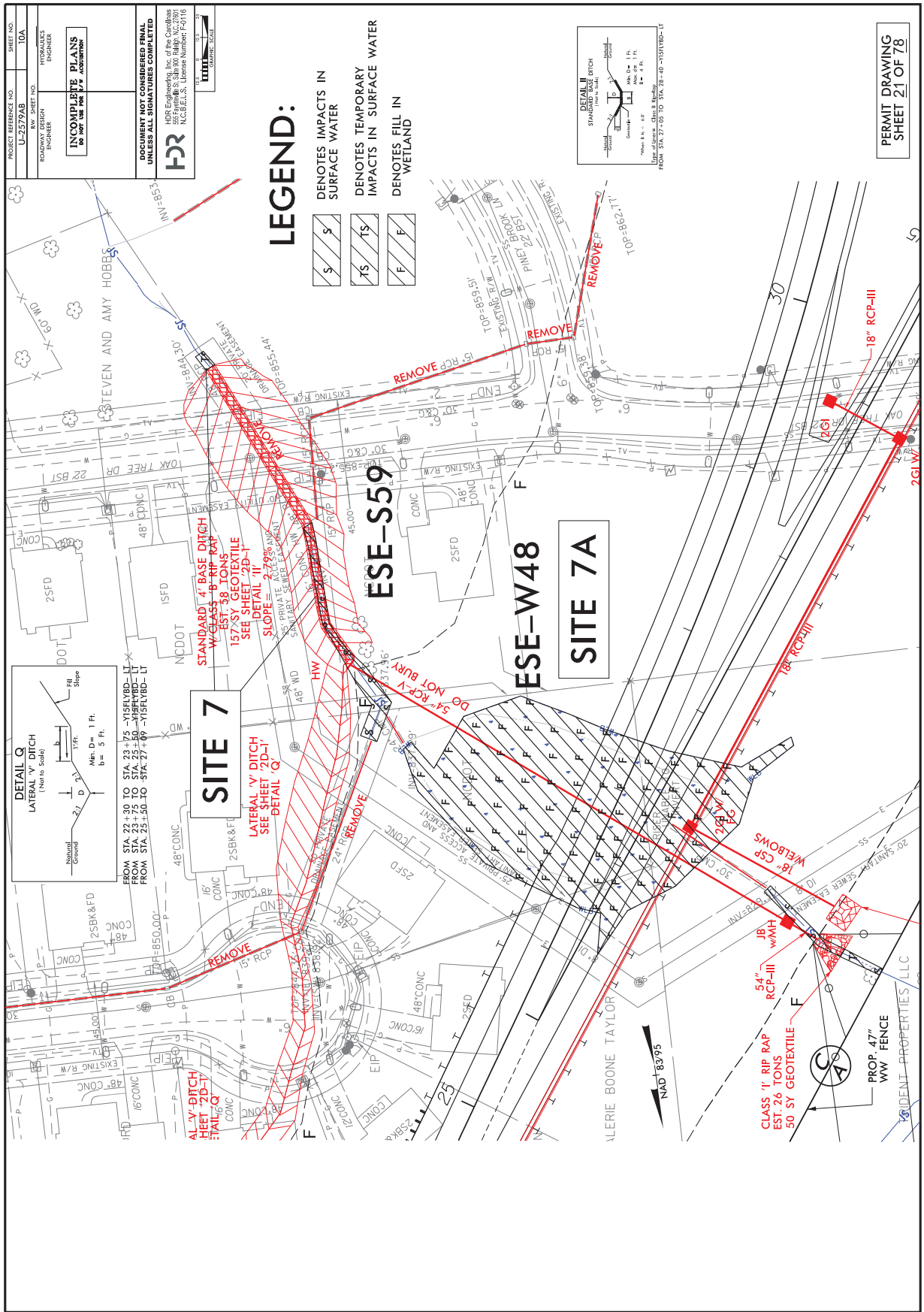

REVISIONS

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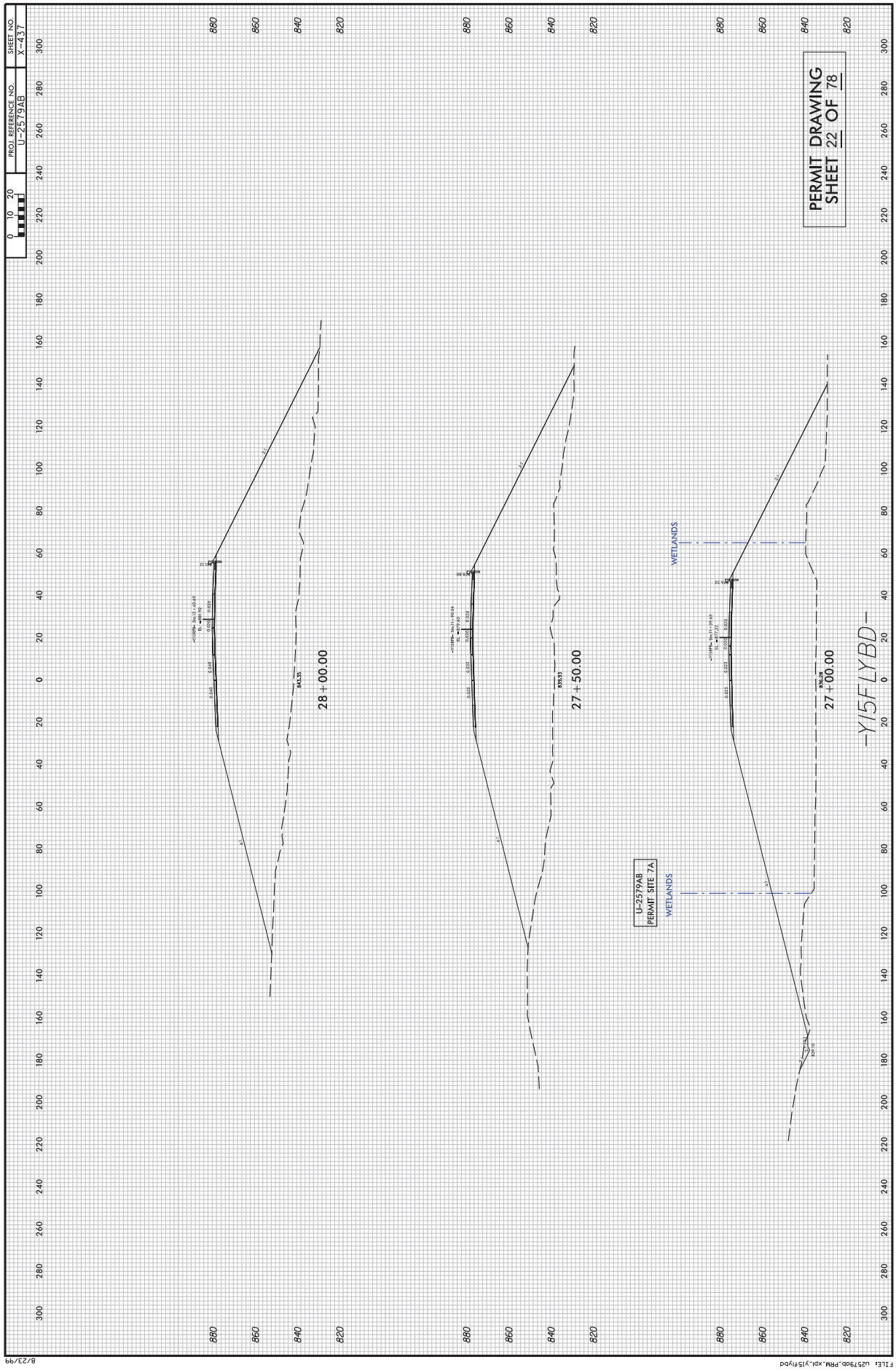

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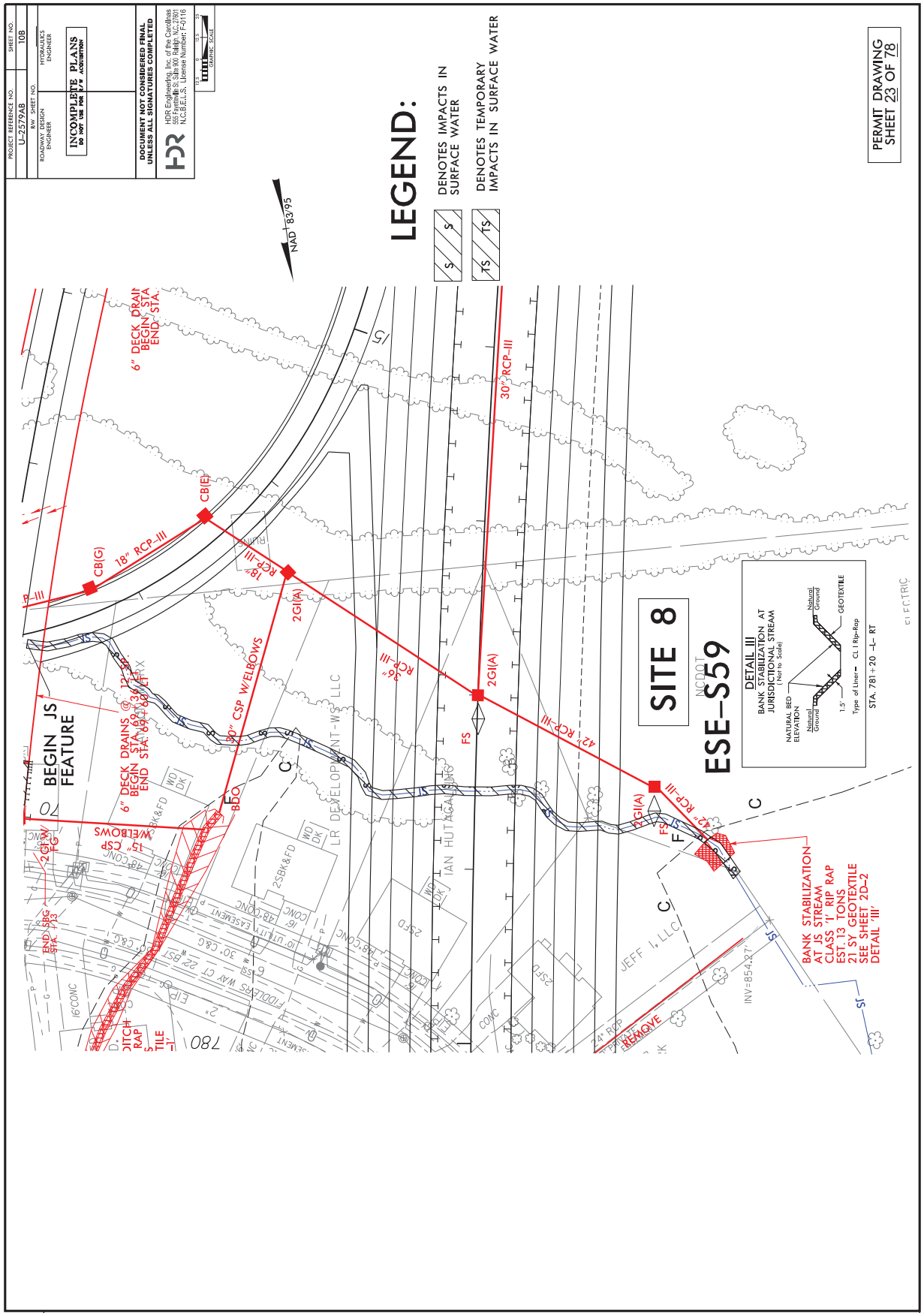
8/23/99


PROJECT REFERENCE NO.
U-2579AB
RW SHEET NO.
ROADWAY DESIGN ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
SHEET NO.
10B
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
1616 Rumbough Place, Suite 210, Fuquay-Varina, NC 27526
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PERMIT DRAWING SHEET 23 OF 78
SITE 8
ESE-S59
NCDOT
DETAIL III
BANK STABILIZATION AT JURISDICTIONAL STREAM
(Not to Scale)
NATURAL BED ELEVATION
Natural Ground
GEOTEXTILE
1.5'
Type of Liner – CL I Rip-Rap
STA. 781+20 –L– RT
BEGIN JS FEATURE
6" DECK DRAINS @ 3'-0" CTRS
BEGIN STA. 781+36 –L– RT
END STA. 781+84 –L– RT
6" DECK DRAIN BEGIN STA.
END STA.
30" CSP W/ELBOWS
18" RCP-III
24" RCP-III
30" RCP-III
42" RCP-III
CB(E)
CB(G)
2GI(A)
FS
BB
C
F
LR DEVELOPMENT-WS LLC
IAN HUTCHINS
JEFF I, LLC
2SBK&FD
WD DK
CONC
INV=854.27'
24" RCP REMOVE
BANK STABILIZATION AT JS STREAM
CLASS 'I' RIP RAP
EST. 13 TONS
21 SY GEOTEXTILE
SEE SHEET 2D-2
DETAIL 'III'
END SBG STA. 1+13
2GI(A)
FG
780
REVISIONS
PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
PENTABLE: NCDOT_permit6_NOCON.tbl
USER: MMONACK
DATE: 10/5/2020
TIME: 11:59:38 AM
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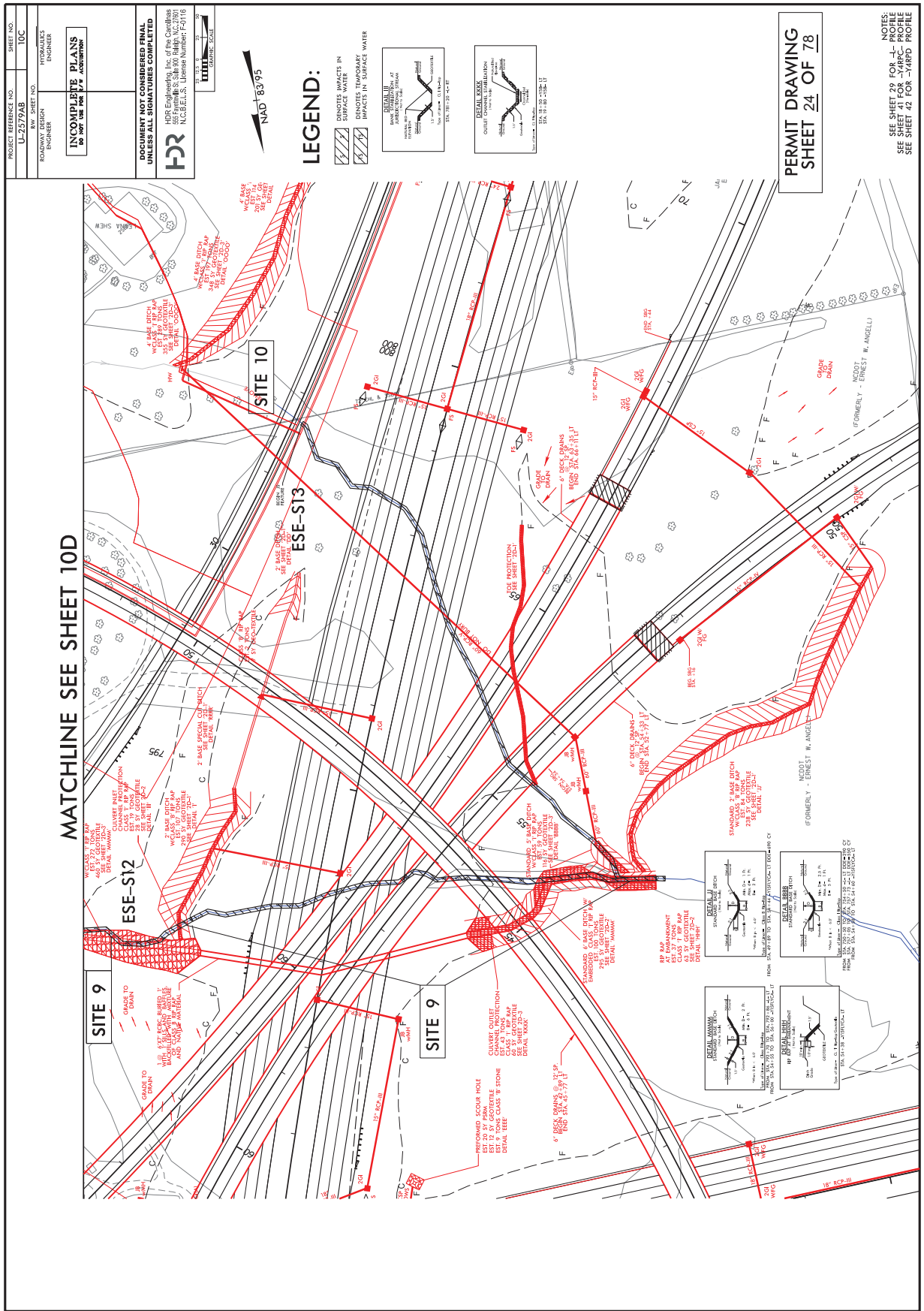
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
10C
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1400, Charlotte, NC 28202
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DETAIL LL
DETAIL KKKK
PERMIT DRAWING SHEET 24 OF 78
NOTES:
SEE SHEET 29 FOR PROFILE
SEE SHEET 41 FOR PROFILE
SEE SHEET 42 FOR YARD PROFILE
MATCHLINE SEE SHEET 10D
SITE 9
SITE 10
ESE-S12
ESE-S13
NCDOT (FORMERLY - ERNEST W. ANGELL)
REVISIONS
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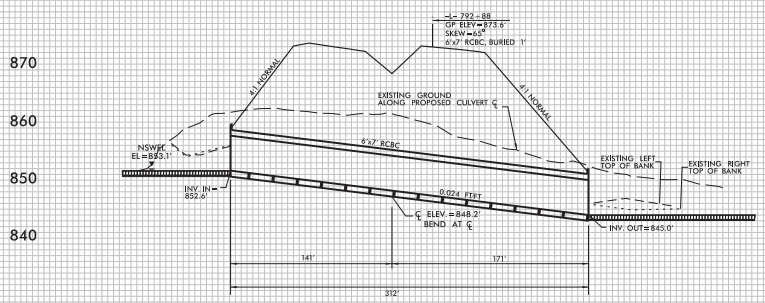
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U-2579AB – SITE 9



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 25 OF 78

REVISIONS

5/14/99

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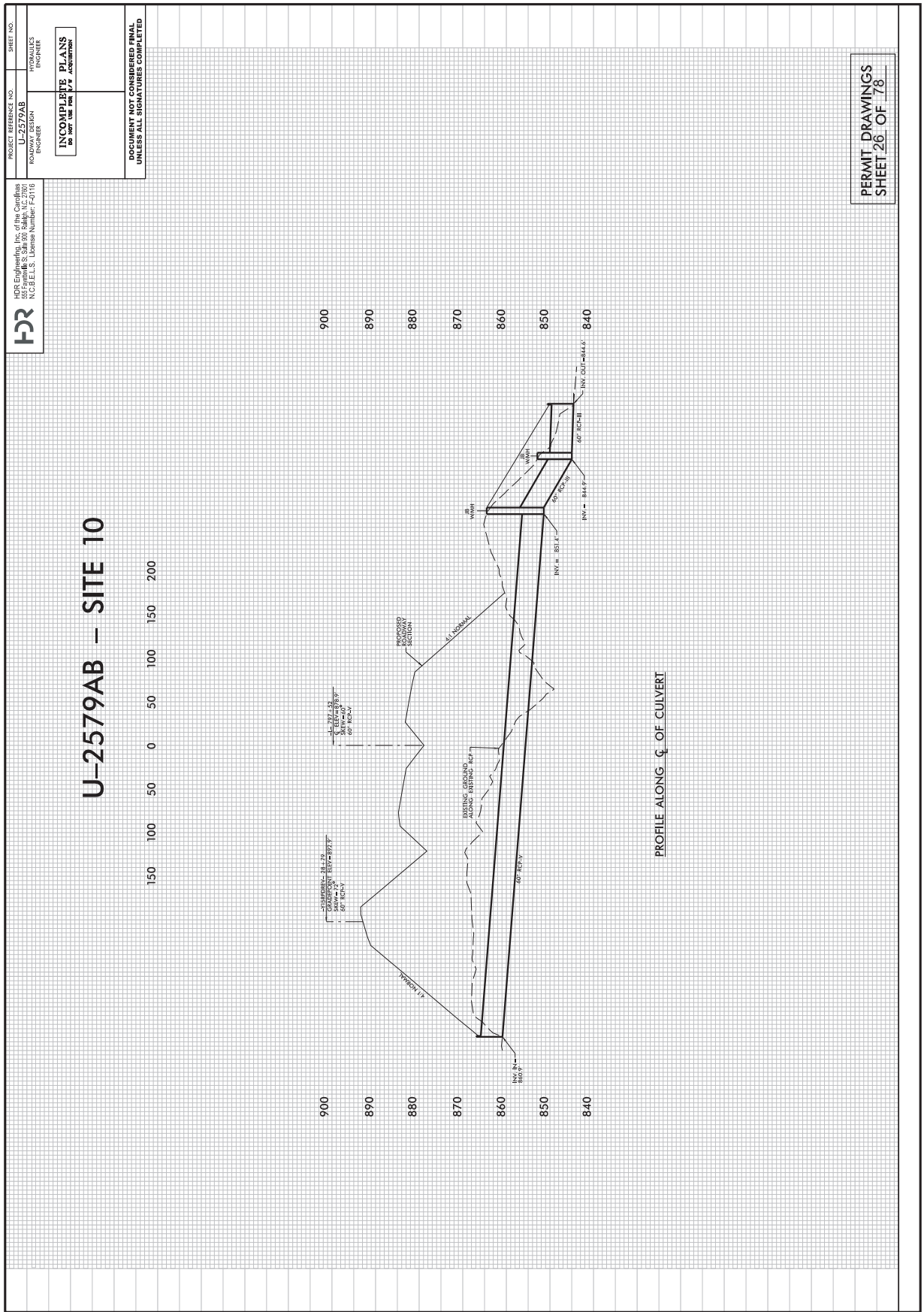
U-2579AB – SITE 10
PROFILE ALONG ℄ OF CULVERT
PERMIT DRAWINGS
SHEET 26 OF 78
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900, Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
REVISIONS
5/14/99
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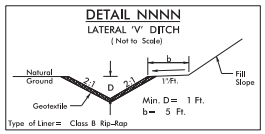
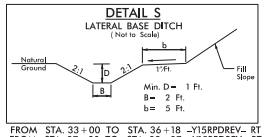
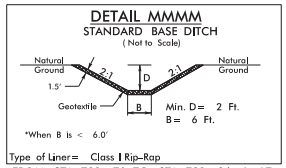


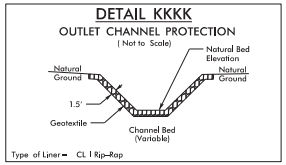
FROM STA. 36+93 TO STA. 39+40 –Y15RPDREV– RT
FROM STA. 25+67 TO STA. 28+32 –Y15RPDREV– RT



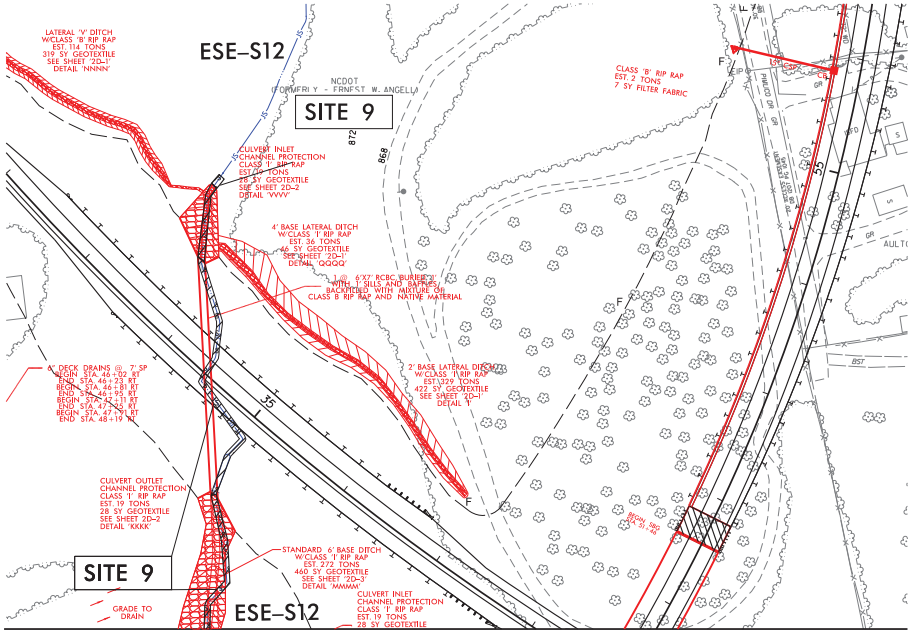
FROM STA. 33+00 TO STA. 36+18 –Y15RPDREV– RT
FROM STA. 37+00 TO STA. 39+37 –Y15RPDREV– RT



FROM STA. 792+70 TO STA. 792+86 –L– LT



STA. 35+55 –Y15RPDREV– LT



MATCHLINE SEE SHEET 10C

PROJECT REFERENCE NO.	SHEET NO.
U–2579AB	10D
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

GRAPHIC SCALE

NAD 83/95

LEGEND:

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PERMIT DRAWING
SHEET 27 OF 78

NOTES:
SEE SHEET 29 FOR –L– PROFILE
SEE SHEET 41 FOR –Y4RPC– PROFILE
SEE SHEET 42 FOR –Y4RPD PROFILE

REVISIONS

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DATE: 10/5/2020
TIME: 11:59:51 AM

P-47

REVISIONS

ROW REV. – DECEMBER 5, 2018 – REVISED TCE ON PARCELS 182, 183, 184, 190 AND 191. CEH
ROW REV. – FEBRUARY 8, 2019 – REVISED TCE ON PARCELS 157 AND 158 TO AVOID SEPTIC TANK. SMP
ROW REV. – MARCH 29, 2019 – PARCEL 159 COMBINED WITH PARCEL 160 FOR JANICE & BOYD STAFFORD. SMP
ROW REV. – FEBRUARY 26, 2020 – REMOVED TYLC AND DRI ALIGNMENTS. CLAIMS ELIMINATED ON PARCELS 180, 181, 192 AND 193.
ROW REV. – MARCH 13, 2020 – ELIMINATED TCE ON PARCEL 185 THEREBY ELIMINATING THE CLAIM. CEH.

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PENTABLE: NCDOT_permit6_NCCON.tbl

USER: NWOMACK
DATE: 10/5/2020
TIME: 11:59:59 AM

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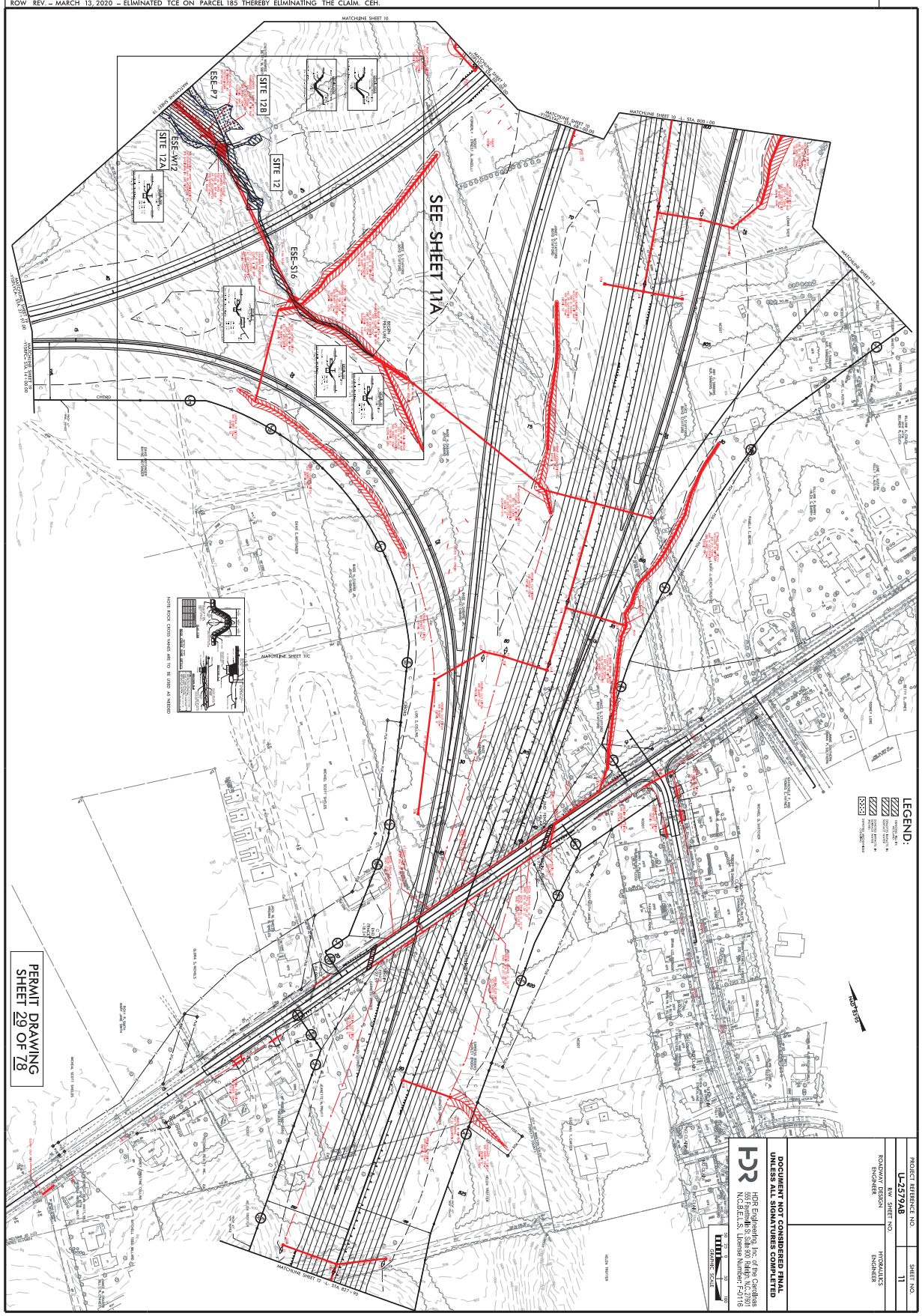
REVISIONS
ROW REV. – DECEMBER 5, 2018 – REVISED TCE ON PARCELS 182, 183, 184, 190 AND 191. CEH
ROW REV. – FEBRUARY 8, 2019 – REVISED TCE ON PARCELS 157 AND 158 TO AVOID SEPTIC TANK. SMP
ROW REV. – MARCH 29, 2019 – PARCEL 159 COMBINED WITH PARCEL 160 FOR JANICE & BOYD STAFFORD. SMP
ROW REV. – FEBRUARY 26, 2020 – REMOVED Y16C AND DR1 ALIGNMENTS. CLAIMS ELIMINATED ON PARCELS 182, 183, 184, 190 AND 191. ROW AND TCE REDUCED AND/OR ADJUSTED ON PARCELS 180, 181, 192 AND 193. PUE EXTENDED TO TIE TO ROW ON PARCEL 181. CEH.
ROW REV. – MARCH 13, 2020 – ELIMINATED TCE ON PARCEL 185 THEREBY ELIMINATING THE CLAIM. CEH.



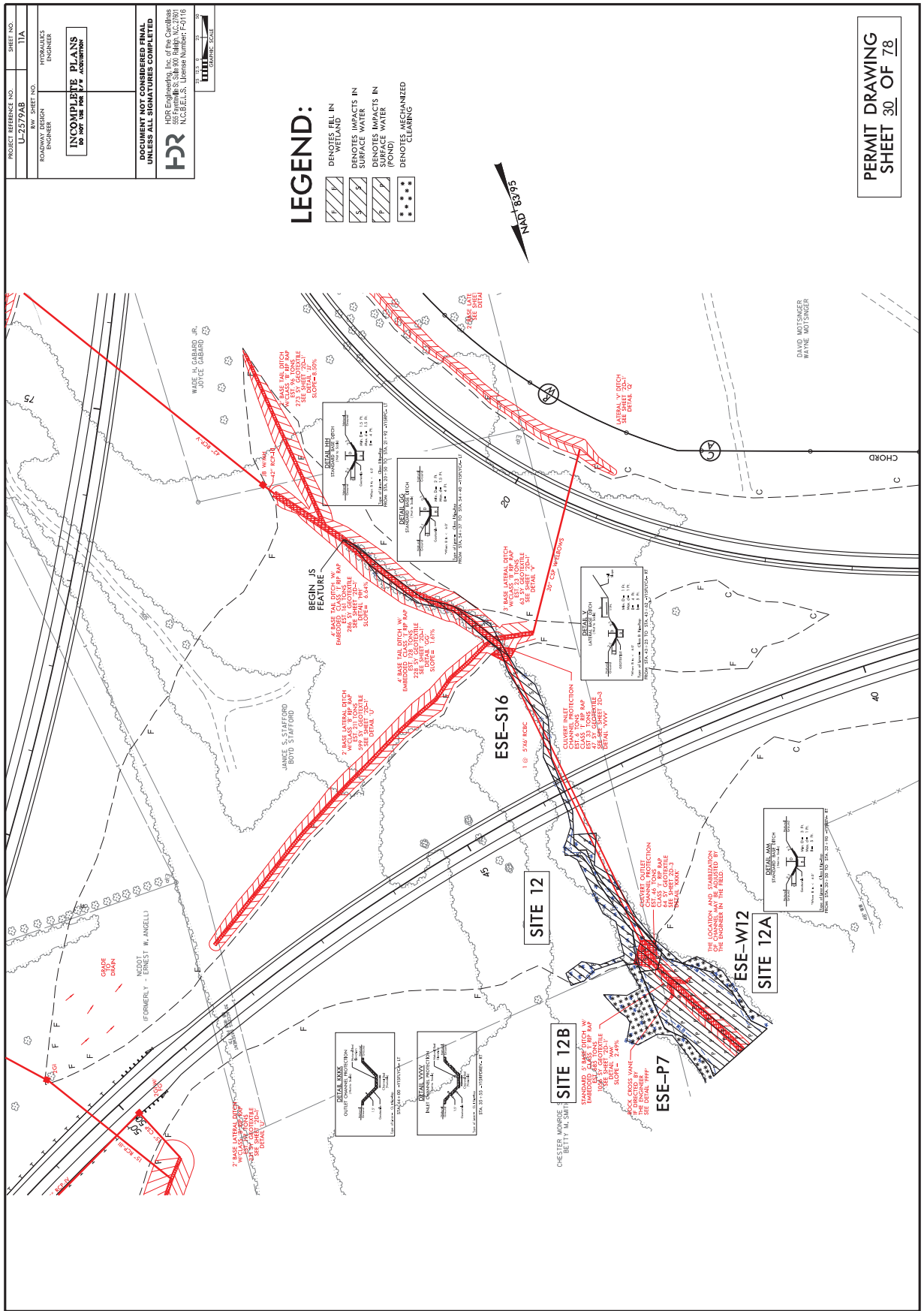
PERMIT DRAWING
SHEET 29 OF 78

PROJECT REFERENCE NO. U-2579AB
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, NC 27601
N.C.B.E.L.S. License Number: F-0116

GRAPHIC SCALE


PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
11A
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 900, Charlotte, NC 28202
N.C.B.E.A.S. License Number: P-0116
GRAPHIC SCALE
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
NAD 83/95
PERMIT DRAWING
SHEET 30 OF 78
ESE-S16
SITE 12
SITE 12B
ESE-P7
ESE-W12
SITE 12A
BEGIN JS FEATURE
CHORD
WADE H. GABARD JR.
JOYCE GABARD
JANICE S. STAFFORD
BOYD STAFFORD
CHESTER MONROE
BETTY M. SMITH
DAVID MOTSINGER
WAYNE MOTSINGER
NCDOT
(FORMERLY - ERNEST W. ANGELL)
GRADE
DRAIN
REVISIONS
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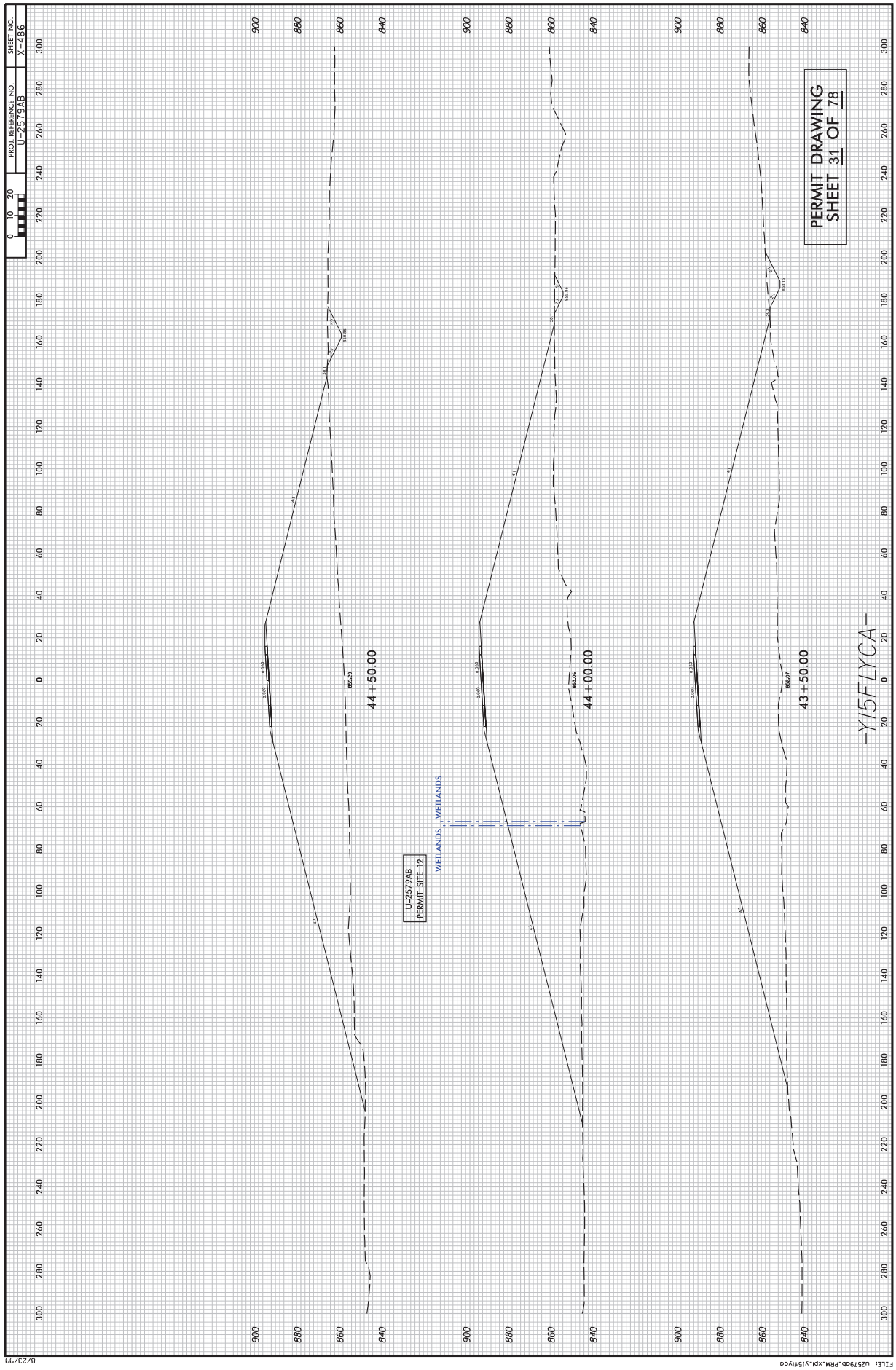
0 10 20
PROJ. REFERENCE NO.
U-2579AB
SHEET NO.
X-486
PERMIT DRAWING
SHEET 31 OF 78
44+50.00
44+00.00
43+50.00
WETLANDS
WETLANDS
U-2579AB
PERMIT SITE 12
-Y15FLYCA-
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FILE: u2579ab_PRM_xpl_y15flyca
8/23/99

5/14/99

REVISIONS

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FILE: U2579AB_PRM_CSR_PSH

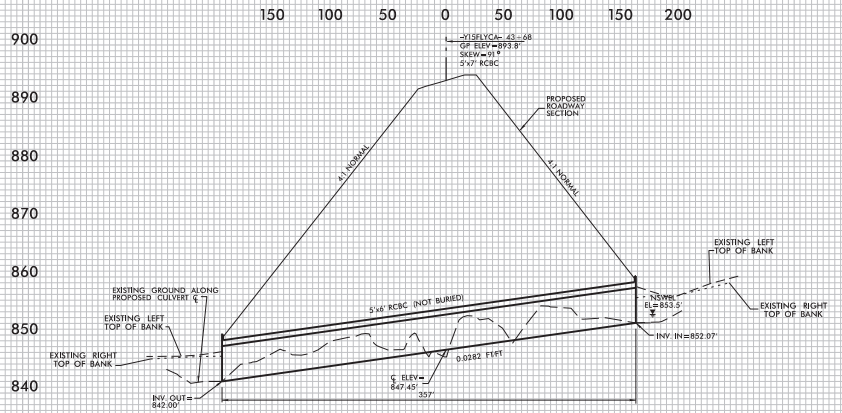
PENTABLE: NCDOT_PEN_VSC.tbl
TIME: 12:04:33 PM
DATE: 5/5/2020

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

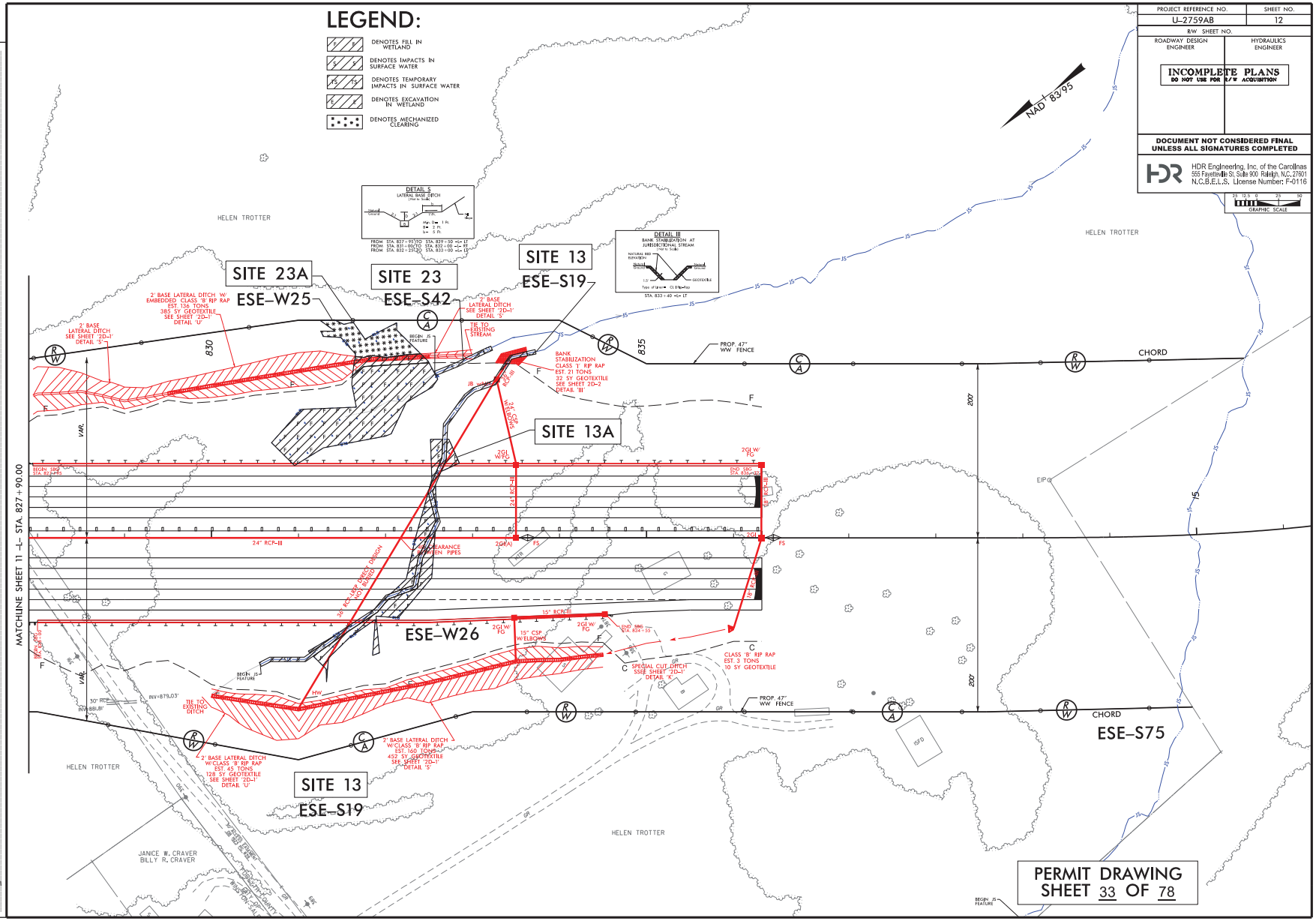
U–2579AB – SITE 12



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 32 OF 78

P-52


LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/95
SITE 23A
ESE-W25
SITE 23
ESE-S42
SITE 13
ESE-S19
SITE 13A
ESE-W26
ESE-S75
SITE 13
ESE-S19
HELEN TROTTER
JANICE W. CRAVER
BILLY R. CRAVER
MATCHLINE SHEET 11 -L- STA. 827+90.00
PROP. 47" WW FENCE
CHORD
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
PROJECT REFERENCE NO. U-2759AB
SHEET NO. 12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
GRAPHIC SCALE
PERMIT DRAWING SHEET 33 OF 78
REVISIONS
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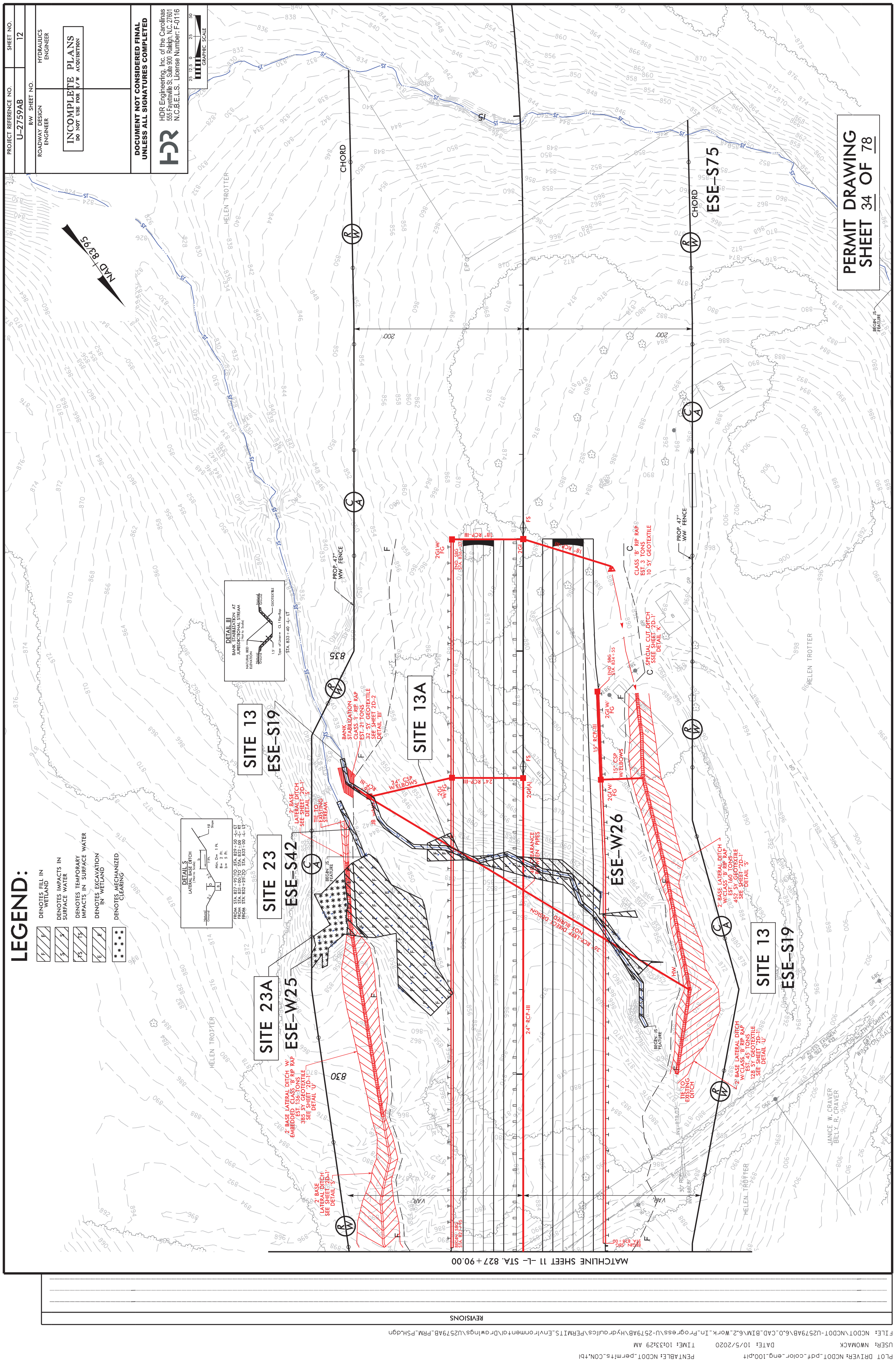
TIME: 12:00:15 PM

P-53

P-54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U-2759AB
SHEET NO.
12
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
SITE 13
ESE-S19
SITE 13A
SITE 23
ESE-S42
SITE 23A
ESE-W25
ESE-W26
ESE-S75
PERMIT DRAWING
SHEET 34 OF 78
HELEN TROTTER
JANICE W. CRAVER
BILLY R. CRAVER
MATCHLINE SHEET 11 -L- STA. 827+90.00
REVISIONS
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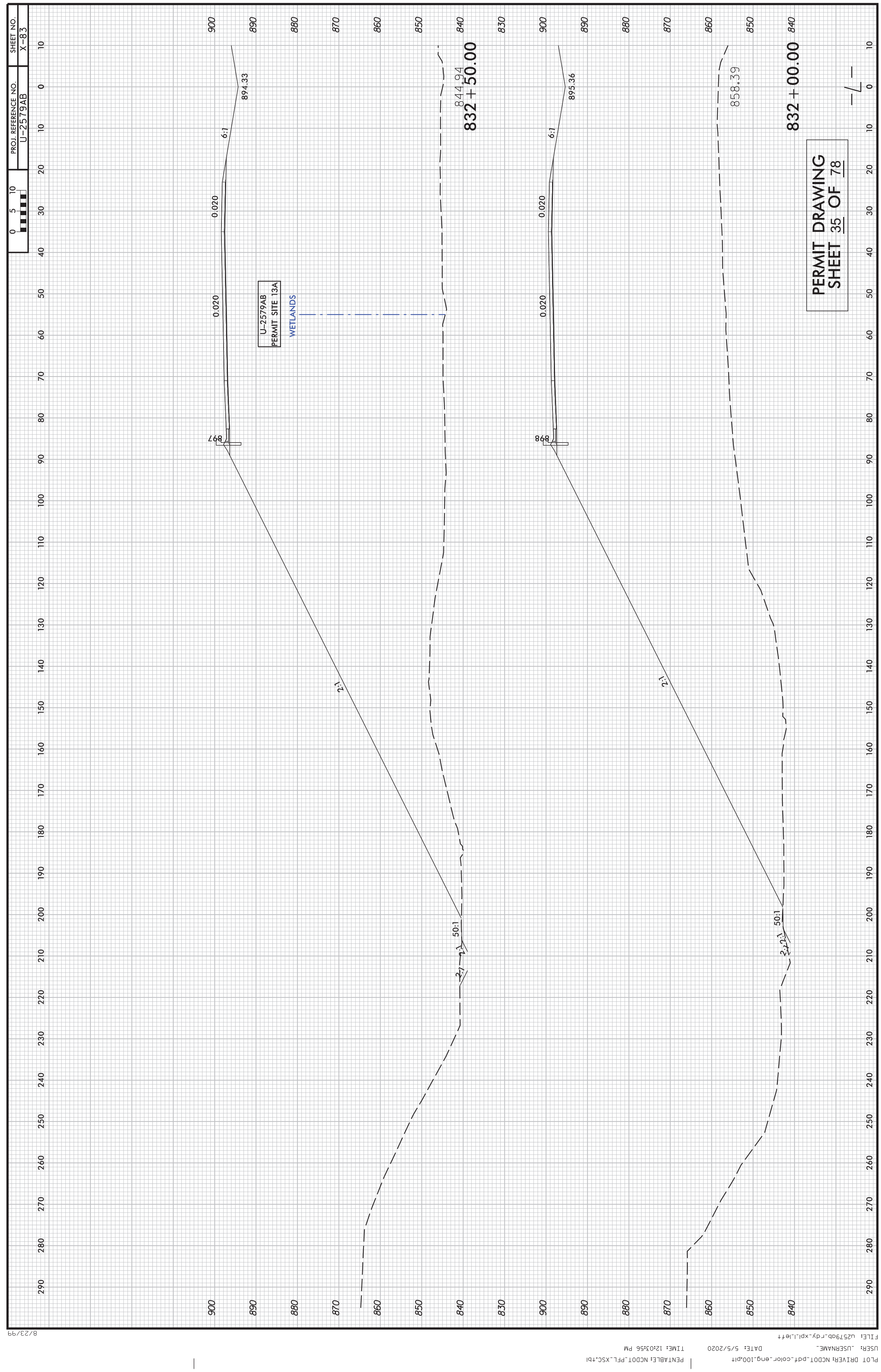
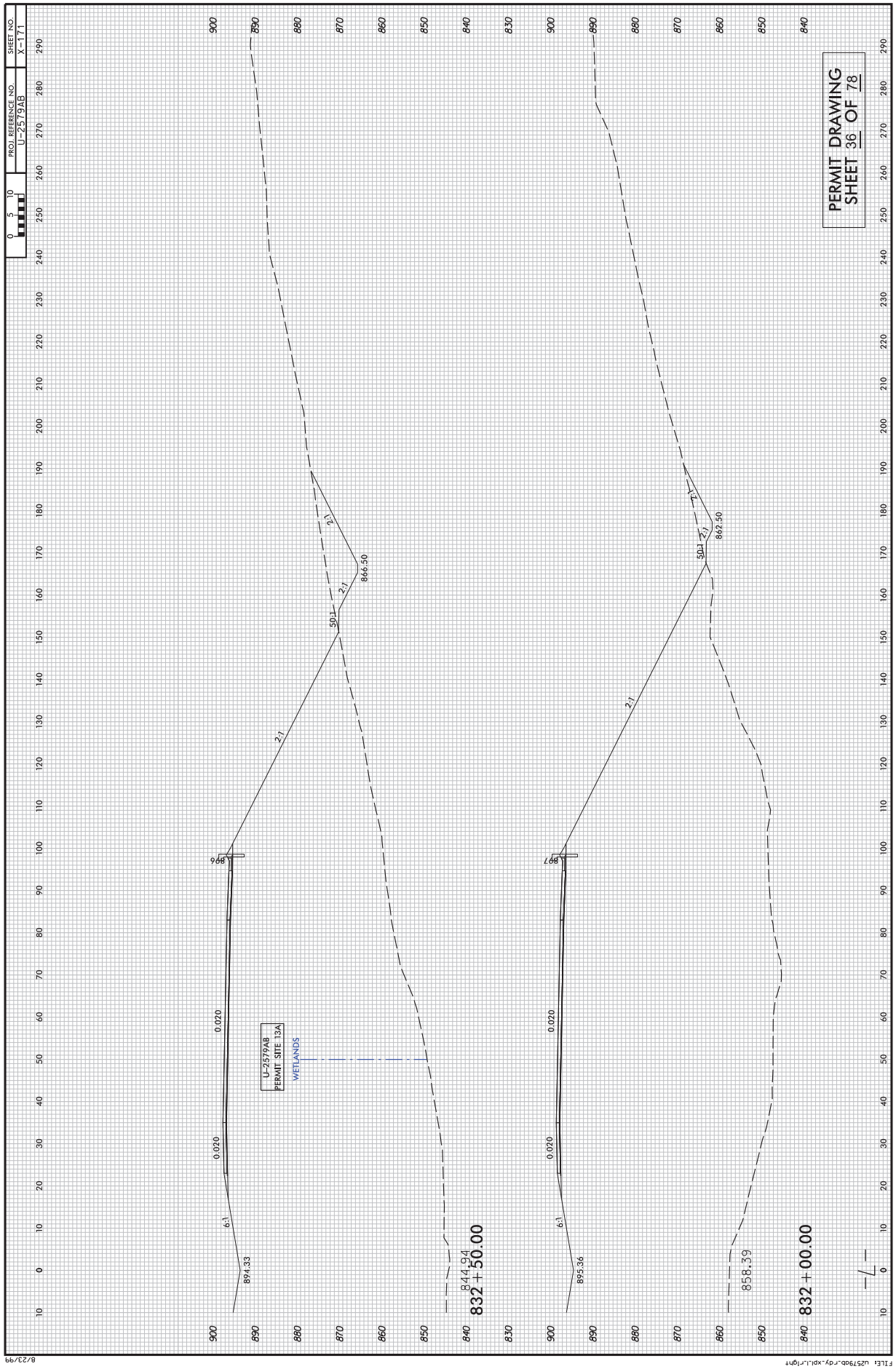


PROJ. REFERENCE NO.
U-2579AB
SHEET NO.
X-83
PERMIT DRAWING
SHEET 35 OF 78
U-2579AB
PERMIT SITE 13A
WETLANDS
832+50.00
844.94
894.33
897
832+00.00
858.39
895.36
898
6:1
0.020
2:1
50:1


PERMIT DRAWING
SHEET 36 OF 78
PROJ. REFERENCE NO.
U-2579AB
SHEET NO.
X-171
0 5 10
U-2579AB
PERMIT SITE 13A
WETLANDS
2:1
50:1
6:1
0.020
894.33
895.36
858.39
866.50
862.50
844.94
832+50.00
832+00.00
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8/23/99

8/23/99

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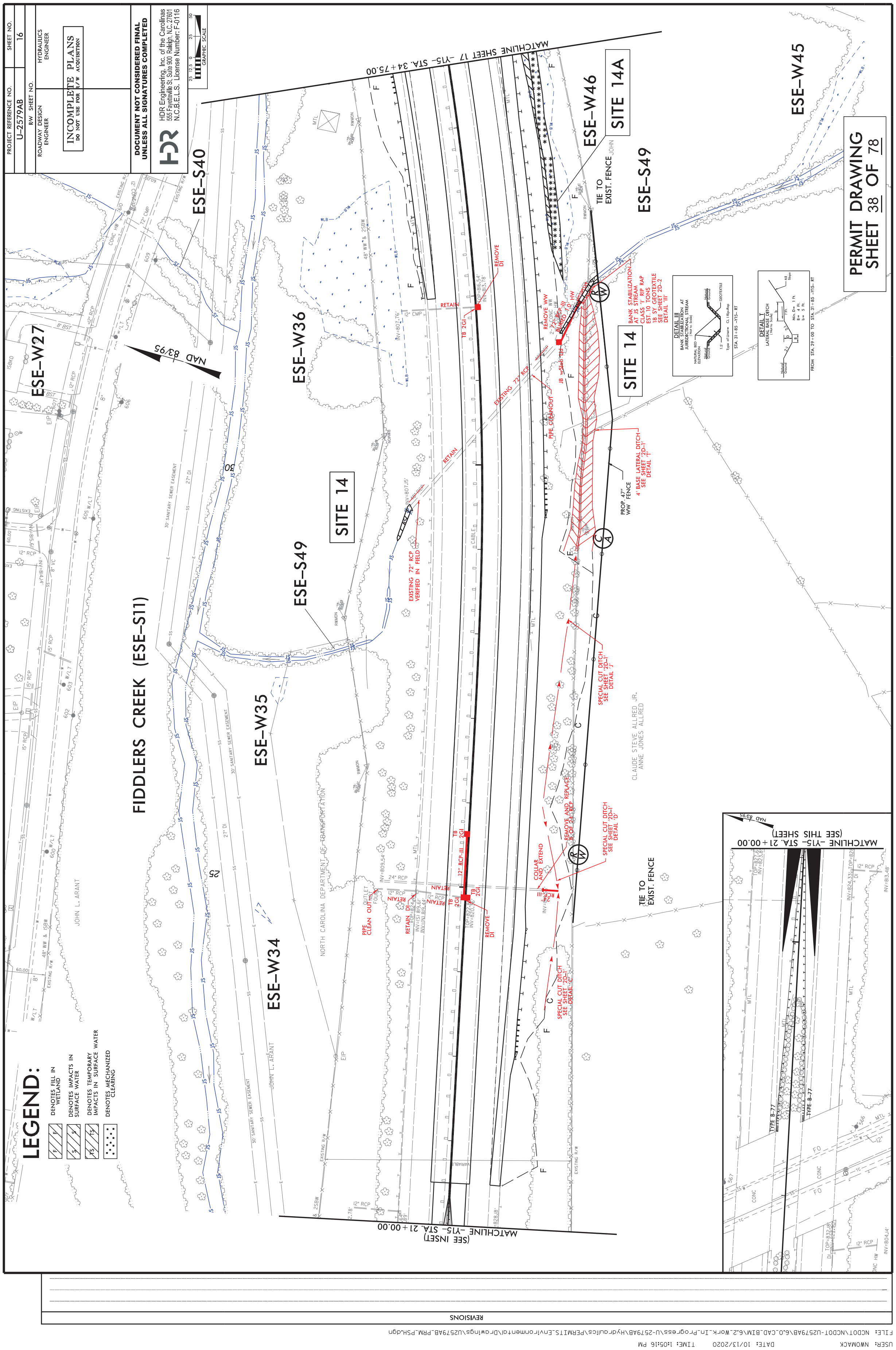
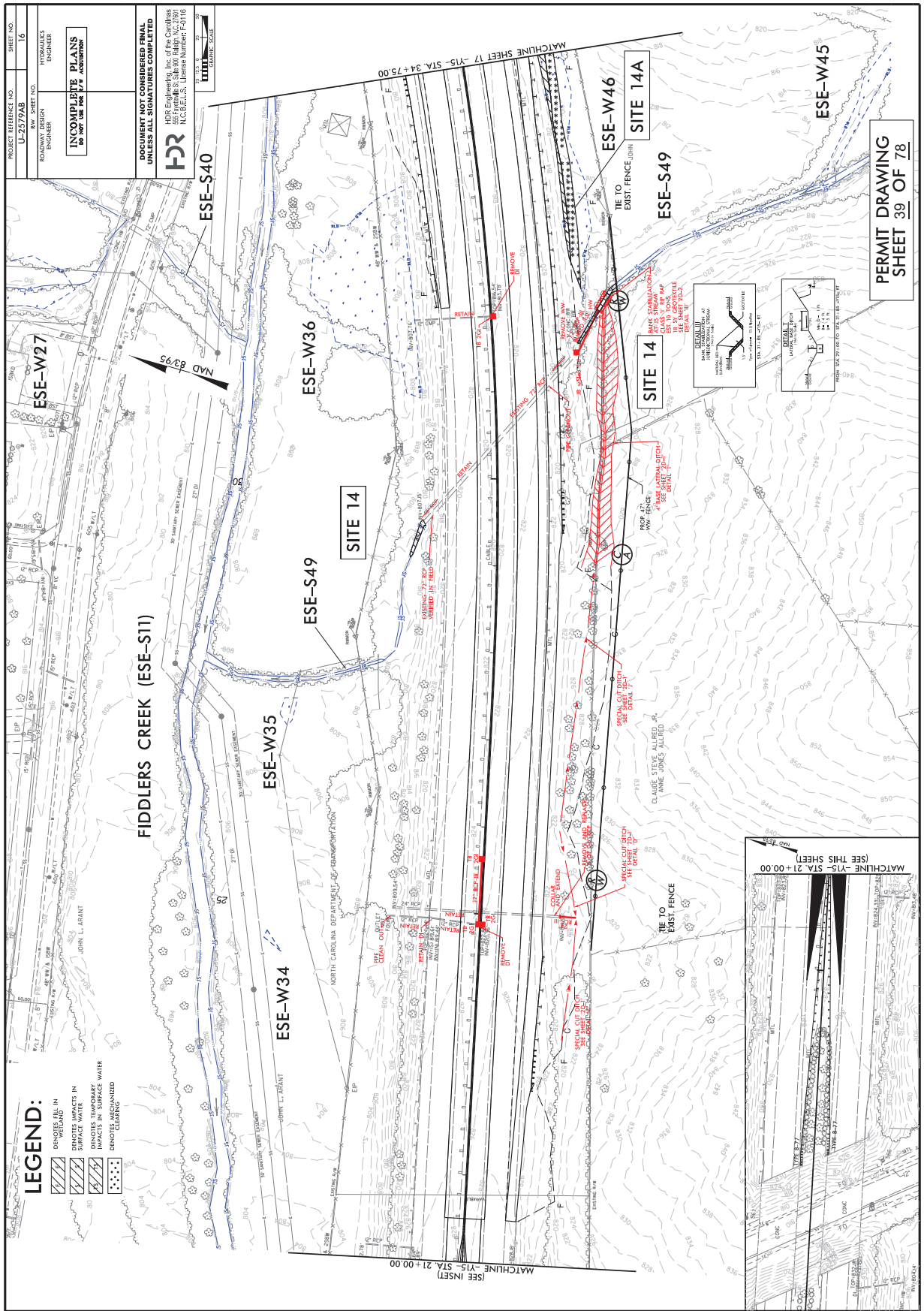
P-58



PROJECT REFERENCE NO. U-2579AB
SHEET NO. 16
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
MATCHLINE SHEET 17 -Y15- STA. 34+75.00
MATCHLINE -Y15- STA. 21+00.00 (SEE INSET)
MATCHLINE -Y15- STA. 21+00.00 (SEE THIS SHEET)
NAD 83/95
FIDDLERS CREEK (ESE-S11)
ESE-S40
ESE-W27
ESE-W36
ESE-S49
ESE-W35
ESE-W34
ESE-W46
ESE-W45
SITE 14
SITE 14A
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
JOHN L. ARANT
CLAUDE STEVE ALLRED JR. ANNE JONES ALLRED
TIE TO EXIST. FENCE
PERMIT DRAWING SHEET 38 OF 78
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
REVISIONS


PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
16
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 S. Church St., Suite 900, Charlotte, NC 28202
N.C.B.E.A.S. License Number: F-0116
GRAPHIC SCALE
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
FIDDLERS CREEK (ESE-S11)
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
JOHN L. ARANT
CLAUDE STEVE ALLRED JR.
ANNE JONES ALLRED
TIE TO EXIST. FENCE
ESE-S40
ESE-S27
ESE-W27
ESE-W34
ESE-W35
ESE-W36
ESE-S49
ESE-W45
ESE-W46
SITE 14
SITE 14A
MATCHLINE SHEET 17 -Y1S- STA. 34+75.00
MATCHLINE -Y1S- STA. 21+00.00 (SEE INSET)
MATCHLINE -Y1S- STA. 21+00.00 (SEE THIS SHEET)
NAD 83/95
PERMIT DRAWING SHEET 39 OF 78
REVISIONS
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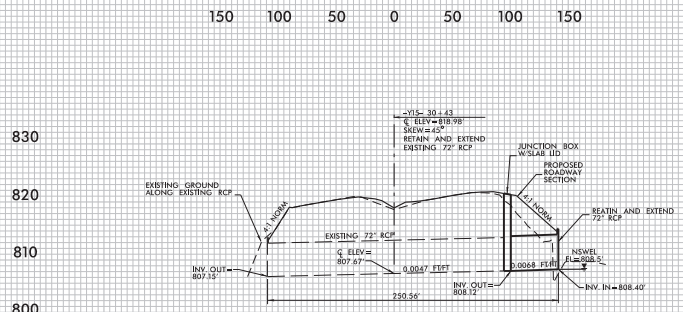
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U–2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U–2579AB – SITE 14



PROFILE ALONG ℄ OF PIPE

PERMIT DRAWINGS
SHEET 40 OF 78

P-60

5/14/99

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng.100.plt
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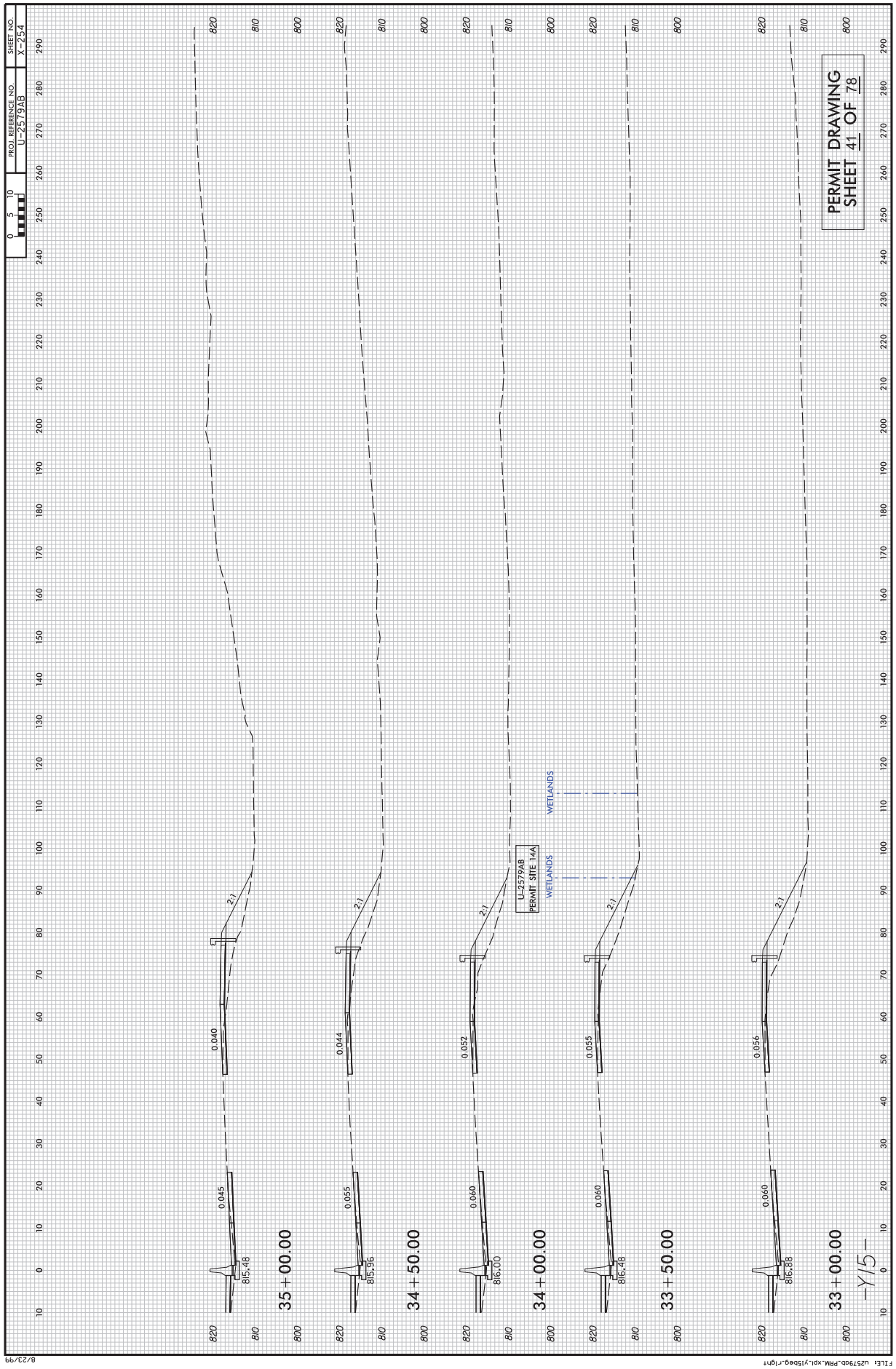

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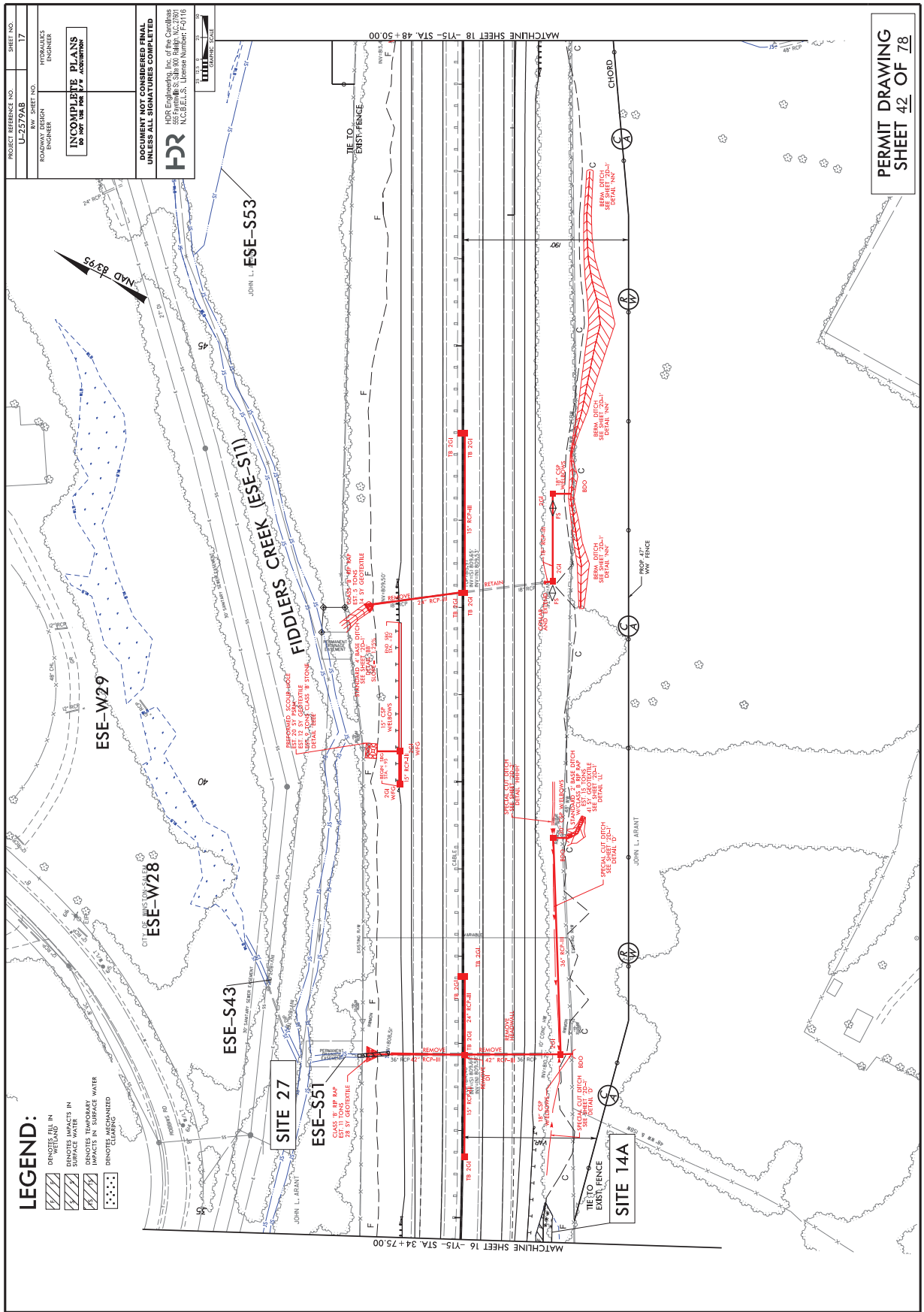
8/23/99


PERMIT DRAWING
SHEET 42 OF 78
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 17
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 1400, Charlotte, NC 28202
N.C.B.E.A.S. License Number: P-0116
GRAPHIC SCALE
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
ESE-S53
ESE-W29
ESE-W28
ESE-S43
ESE-S51
ESE-S11
FIDDLERS CREEK
SITE 27
SITE 14A
MATCHLINE SHEET 18 -Y15- STA. 48+50.00
MATCHLINE SHEET 16 -Y15- STA. 34+75.00
NAD 83/95
CHORD
REVISIONS
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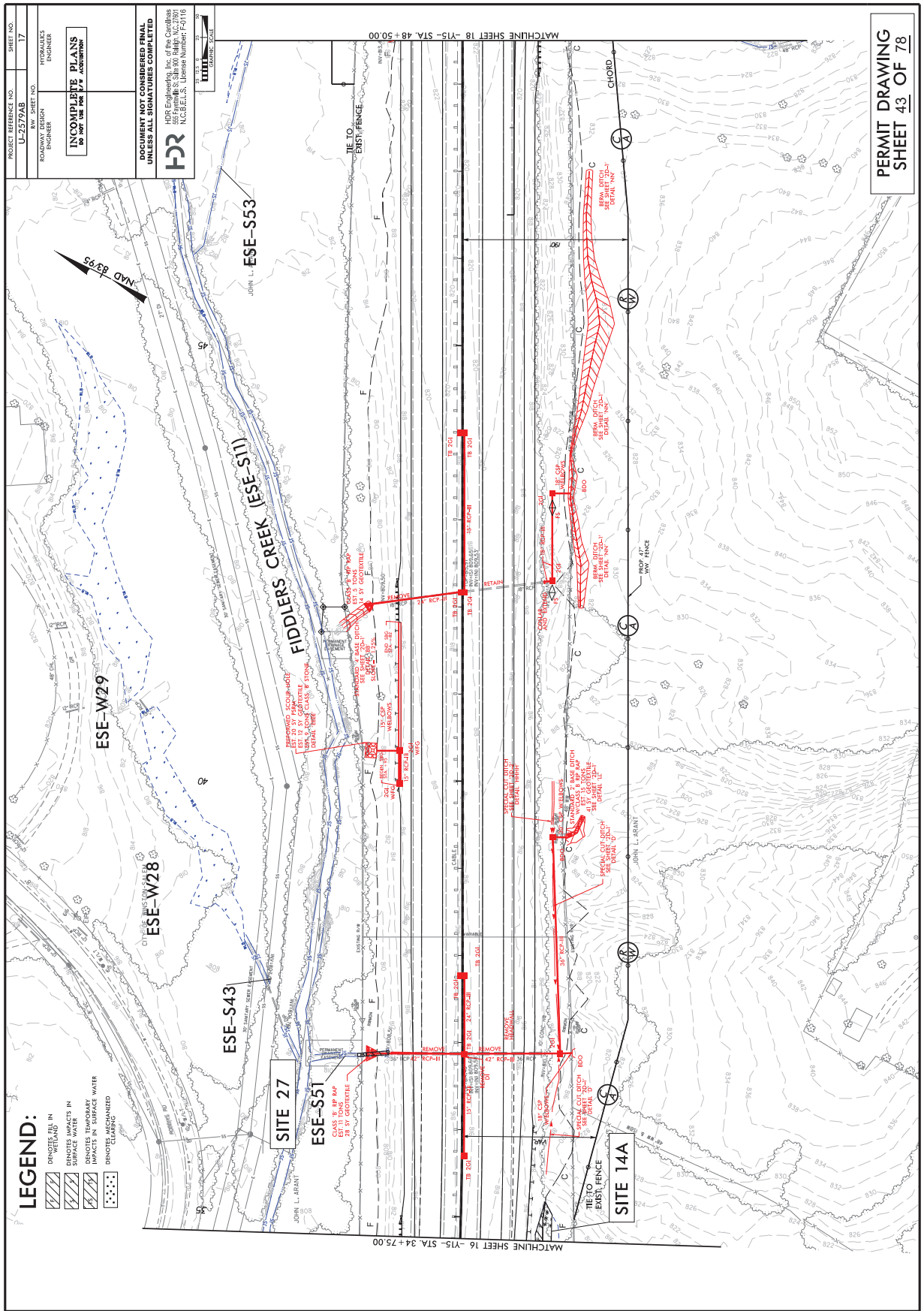
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
17
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 900, Charlotte, NC 28202
N.C.B.E.A.S. License Number: F-0116
GRAPHIC SCALE
PERMIT DRAWING
SHEET 43 OF 78
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
SITE 27
SITE 14A
ESE-S51
ESE-S43
ESE-W28
ESE-W29
ESE-S53
FIDDLERS CREEK (ESE-S11)
MATCHLINE SHEET 16 -Y15- STA. 34+75.00
MATCHLINE SHEET 18 -Y15- STA. 48+50.00
TIE TO EXIST. FENCE
CHORD
NAD 83/95
JOHN L. ARANT
REVISIONS
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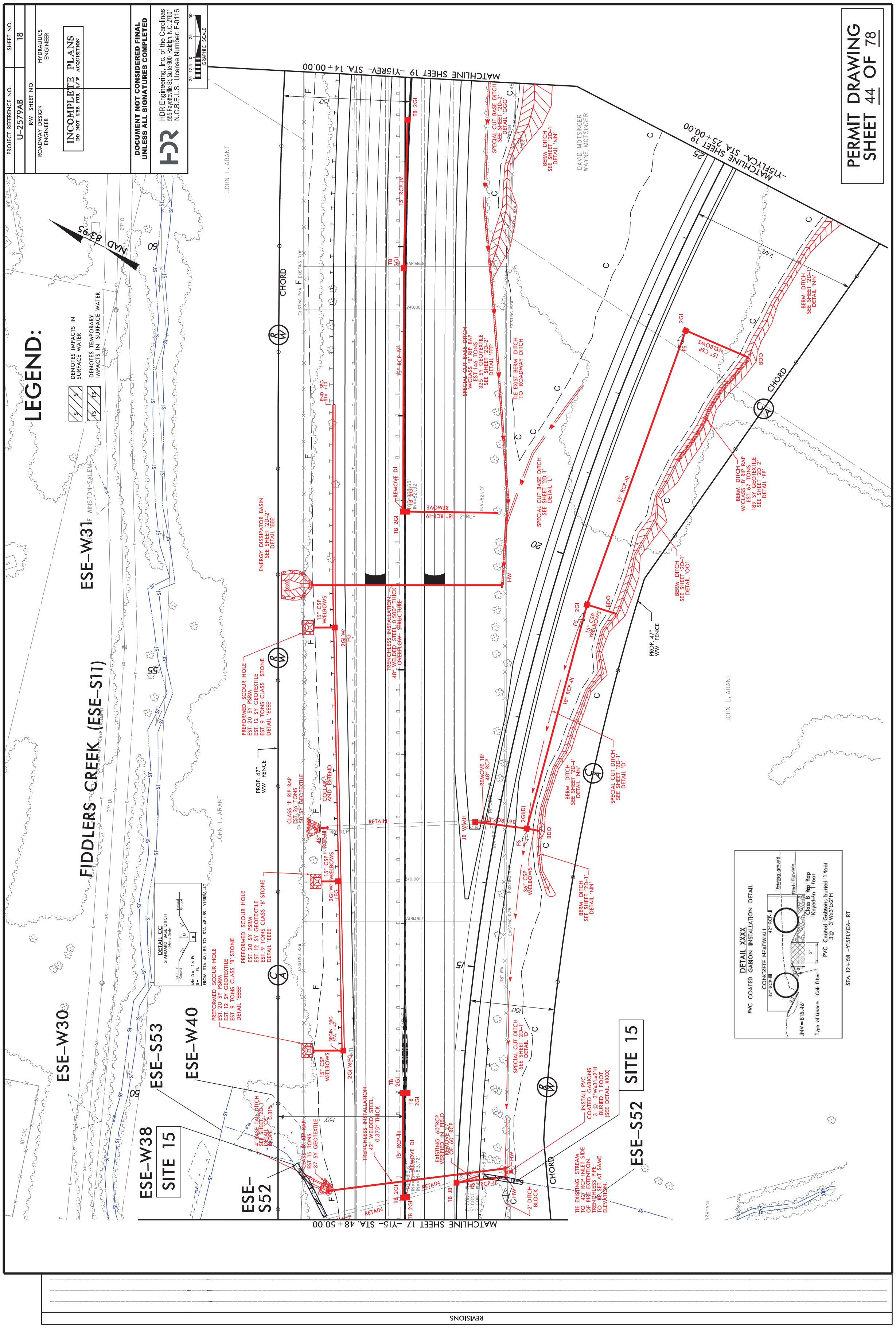
P-64



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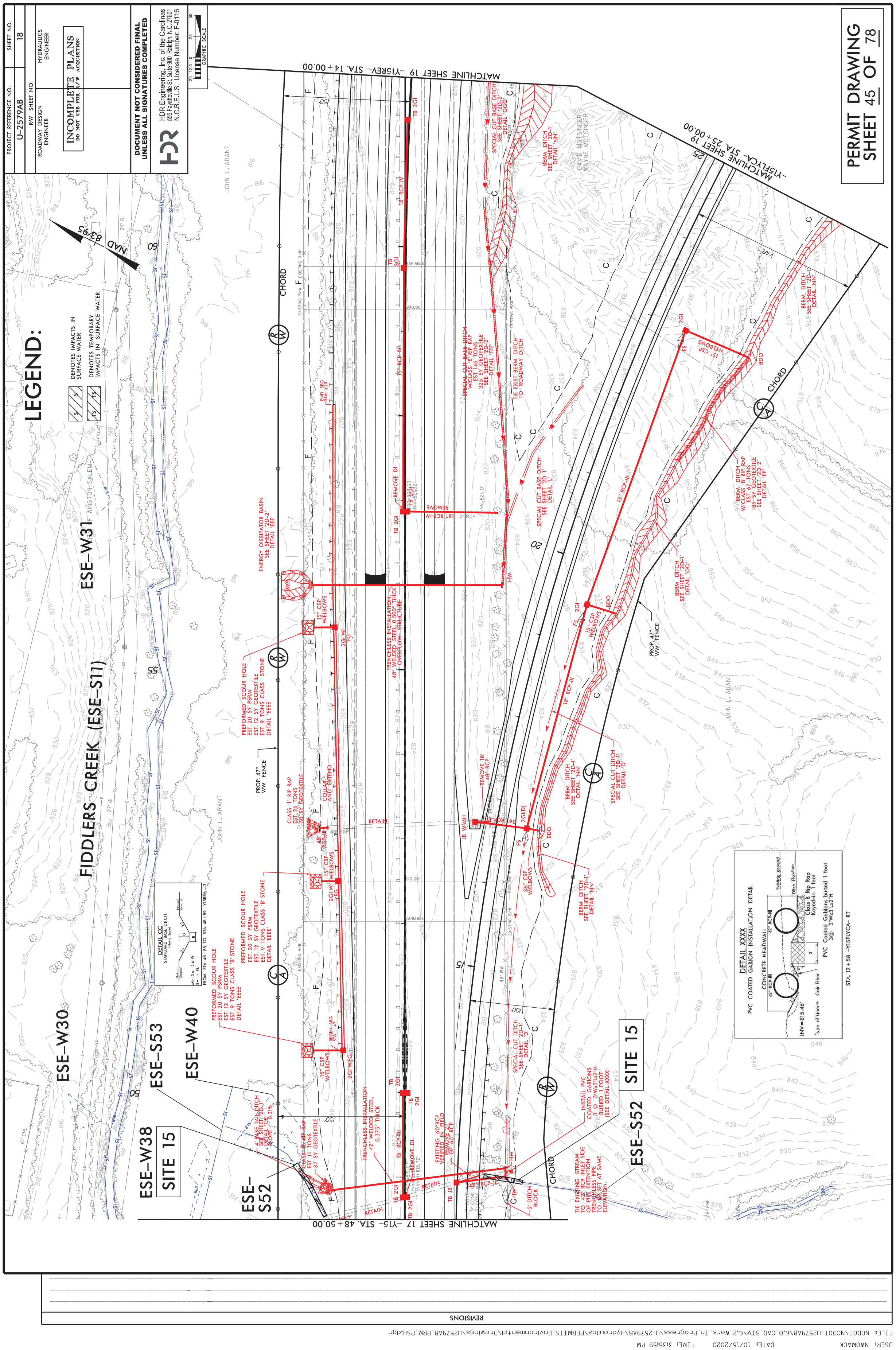
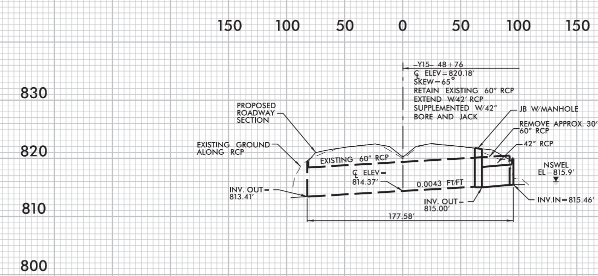

PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
18
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/95
MATCHLINE SHEET 19 -Y15REV- STA. 14+00.00
MATCHLINE SHEET 19 -Y15FLYCA- STA. 25+00.00
MATCHLINE SHEET 17 -Y15- STA. 48+50.00
FIDDLERS CREEK (ESE-S11)
ESE-W31
ESE-W30
ESE-S53
ESE-W40
ESE-W38
SITE 15
ESE-S52
CHORD
JOHN L. ARANT
DAVID MOTSINGER
WAYNE MOTSINGER
DETAIL XXXX
PVC COATED GABION INSTALLATION DETAIL
PERMIT DRAWING
SHEET 45 OF 78
REVISIONS

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U–2579AB – SITE 15



PROFILE ALONG ℄ OF PIPE

PERMIT DRAWINGS
SHEET 46 OF 78

REVISIONS

5/14/99

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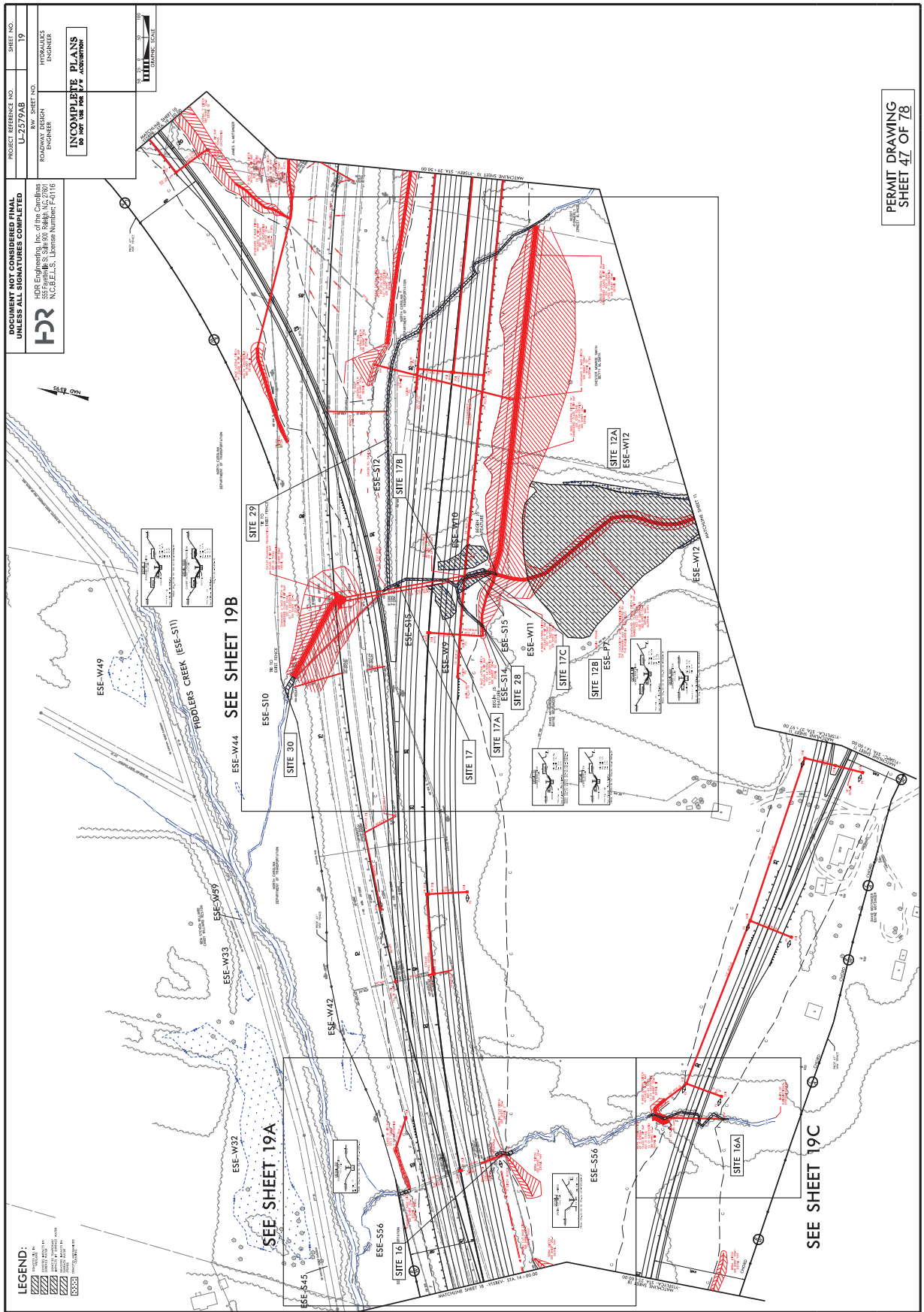
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900, Raleigh, NC 27601
N.C.B.E.L.S. License Number: P-0116
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 19
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
PERMIT DRAWING SHEET 47 OF 78
LEGEND:
SEE SHEET 19B
SEE SHEET 19A
SEE SHEET 19C
PIDDLERS CREEK (ESE-S11)
SITE 29
SITE 30
SITE 16
SITE 16A
SITE 17
SITE 17A
SITE 17B
SITE 17C
SITE 28
SITE 12A
SITE 12B
ESE-W49
ESE-W44
ESE-W59
ESE-W33
ESE-W32
ESE-W42
ESE-S10
ESE-S45
ESE-S56
ESE-S12
ESE-S13
ESE-S14
ESE-S15
ESE-W10
ESE-W9
ESE-W11
ESE-W12
ESE-P1
REVISIONS
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900, Raleigh, NC, 27601
N.C.B.E.L.S. License Number: P-0116
PROJECT REFERENCE NO.
U-2579AB
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
19
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
HORIZONTAL SCALE
PERMIT DRAWING
SHEET 48 OF 78
LEGEND:
SEE SHEET 19A
SEE SHEET 19B
SEE SHEET 19C
PIDDLERS CREEK
SITE 29
SITE 30
SITE 16
SITE 17
SITE 17A
SITE 17B
SITE 17C
SITE 28
SITE 12A
SITE 12B
SITE 16A
ESE-W49
ESE-S11
ESE-W44
ESE-S10
ESE-W59
ESE-W33
ESE-W32
ESE-W42
ESE-S45
ESE-S56
ESE-S12
ESE-S15
ESE-W10
ESE-W9
ESE-S14
ESE-S15
ESE-W11
ESE-W12
ESE-S64
REVISIONS
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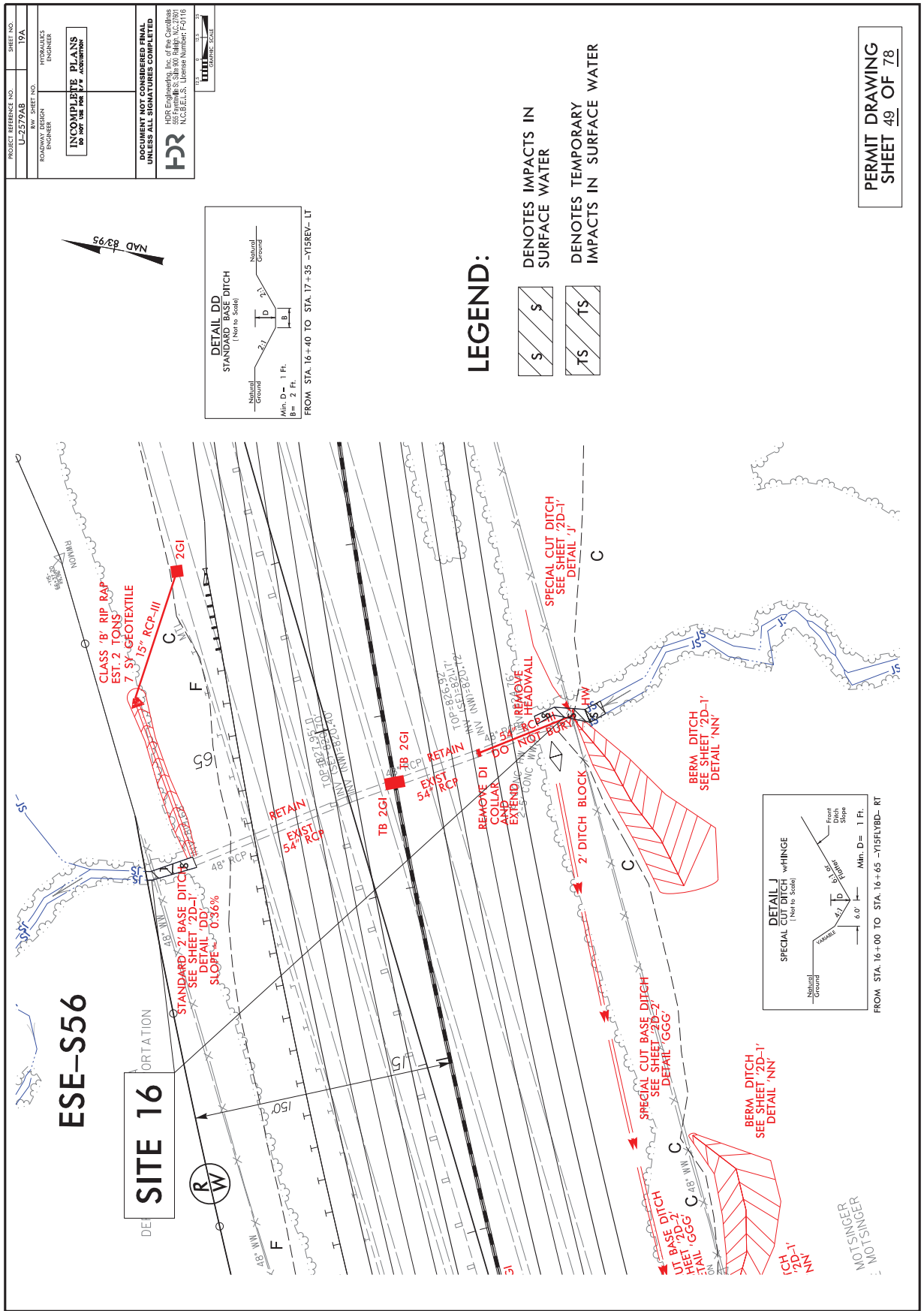

REVISIONS

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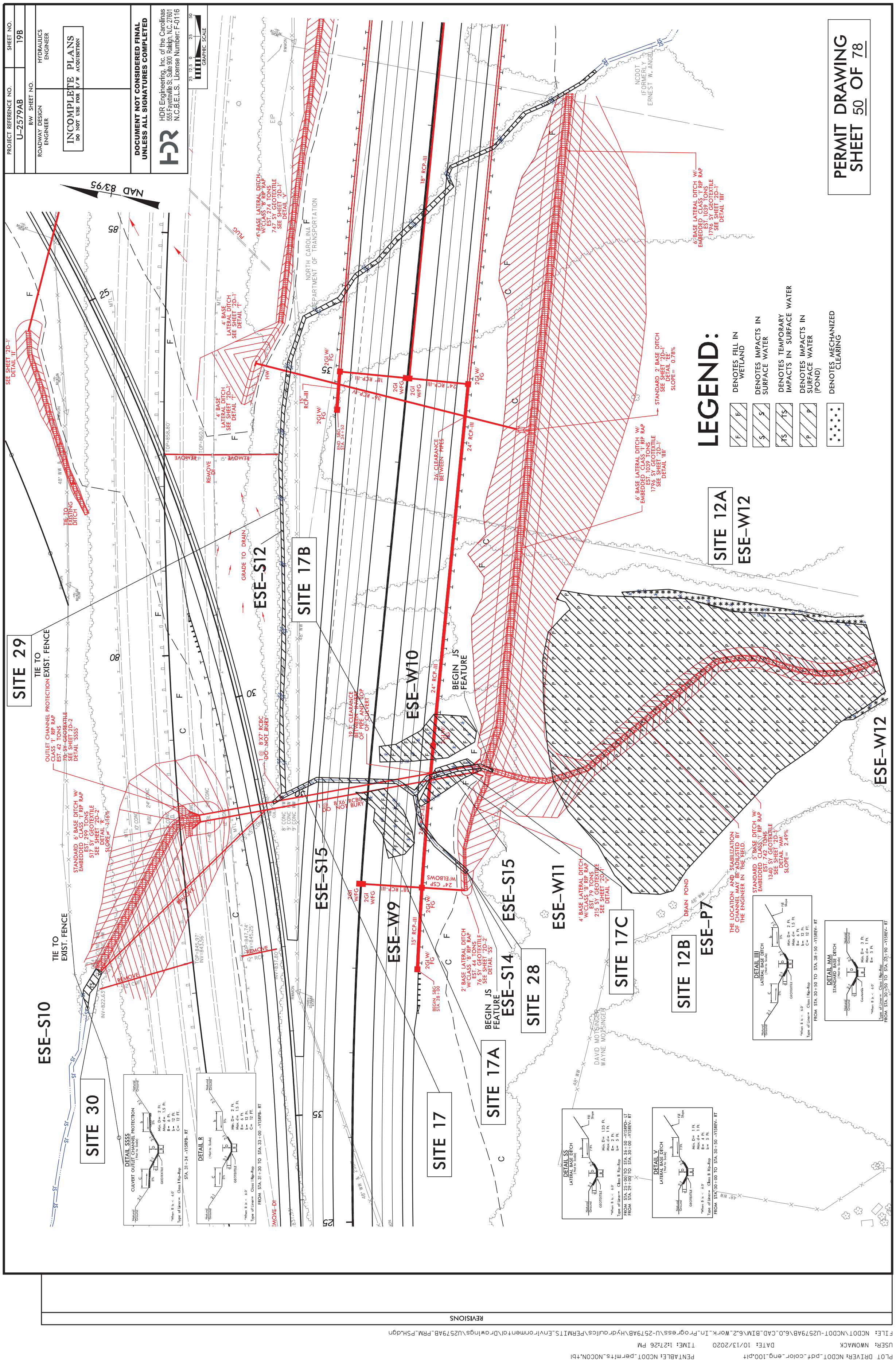
P-70

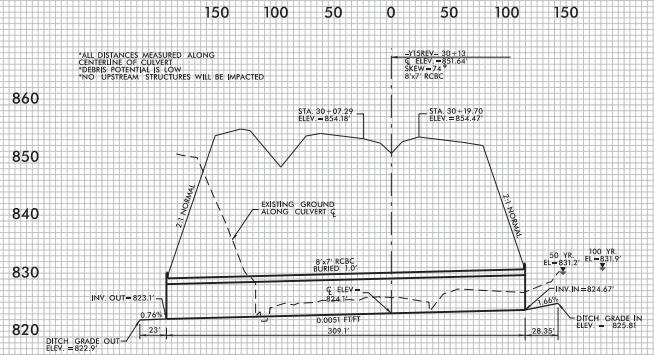

PROJECT REFERENCE NO. U-2579AB
SHEET NO. 19B
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
PERMIT DRAWING SHEET 50 OF 78
LEGEND:
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
SITE 29
TIE TO EXIST. FENCE
SITE 30
ESE-S10
SITE 17B
ESE-S12
SITE 17
SITE 17A
ESE-S15
ESE-W9
ESE-W10
BEGIN JS FEATURE
ESE-S14
SITE 28
ESE-S15
ESE-W11
SITE 17C
SITE 12B
ESE-P7
SITE 12A
ESE-W12
ESE-W12
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DAVID MOTSINGER WAYNE MOTSINGER
DETAIL SSSS
DETAIL R
DETAIL SS
DETAIL V
DETAIL IIIII
DETAIL MM
REVISIONS

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U-2579AB – SITE 17



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 51 OF 78

5/14/99

REVISIONS

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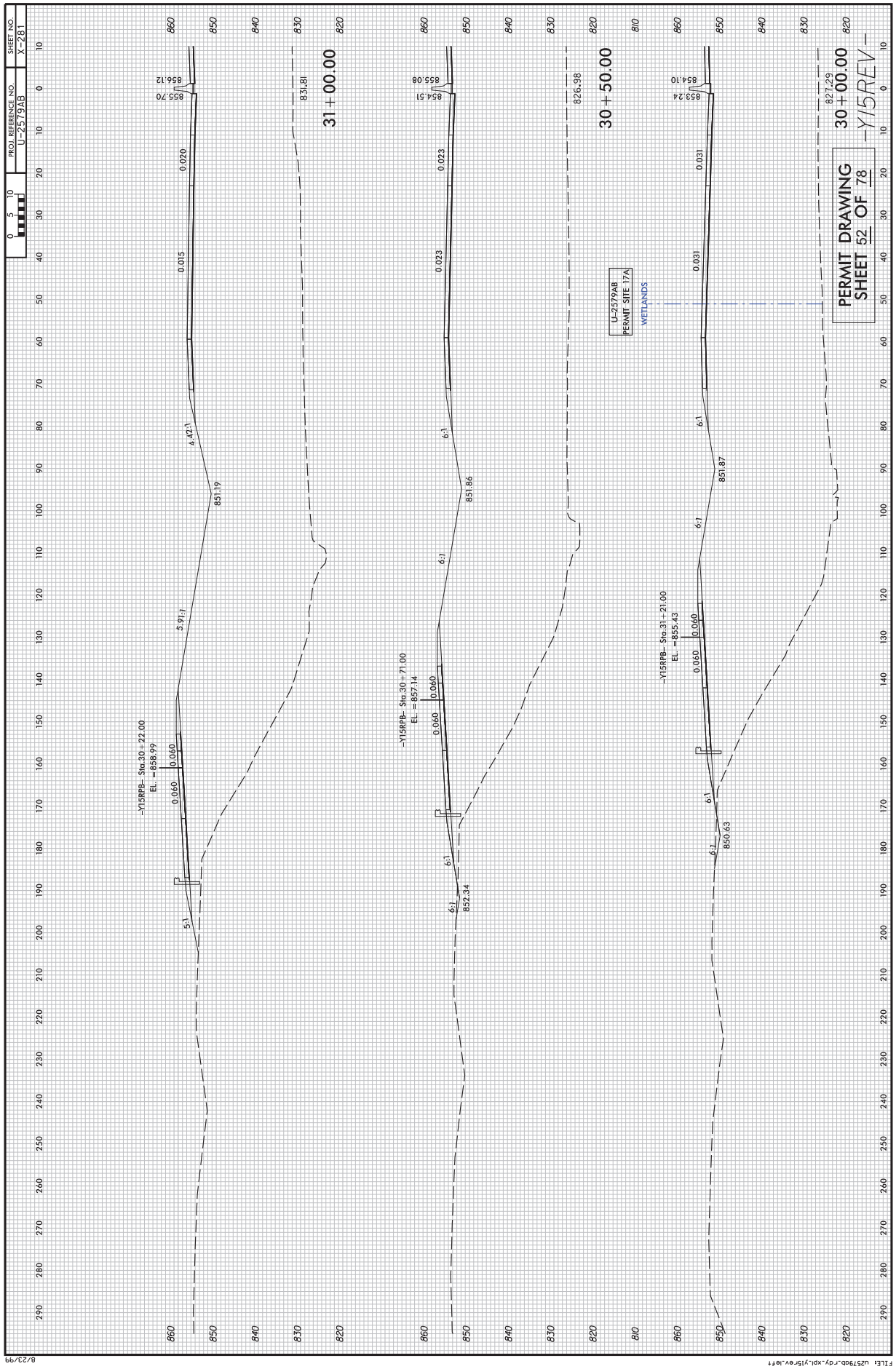

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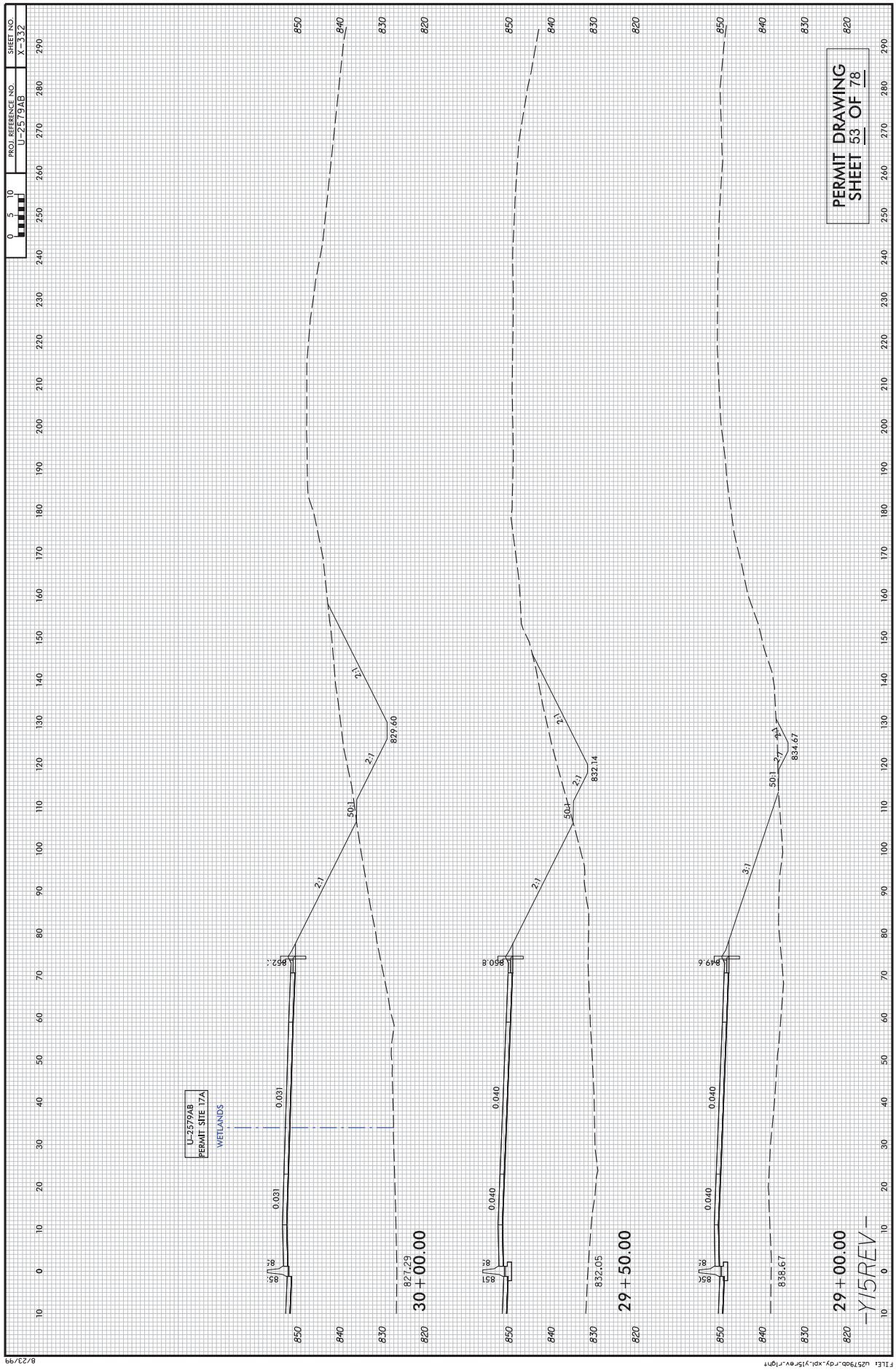
8/23/99



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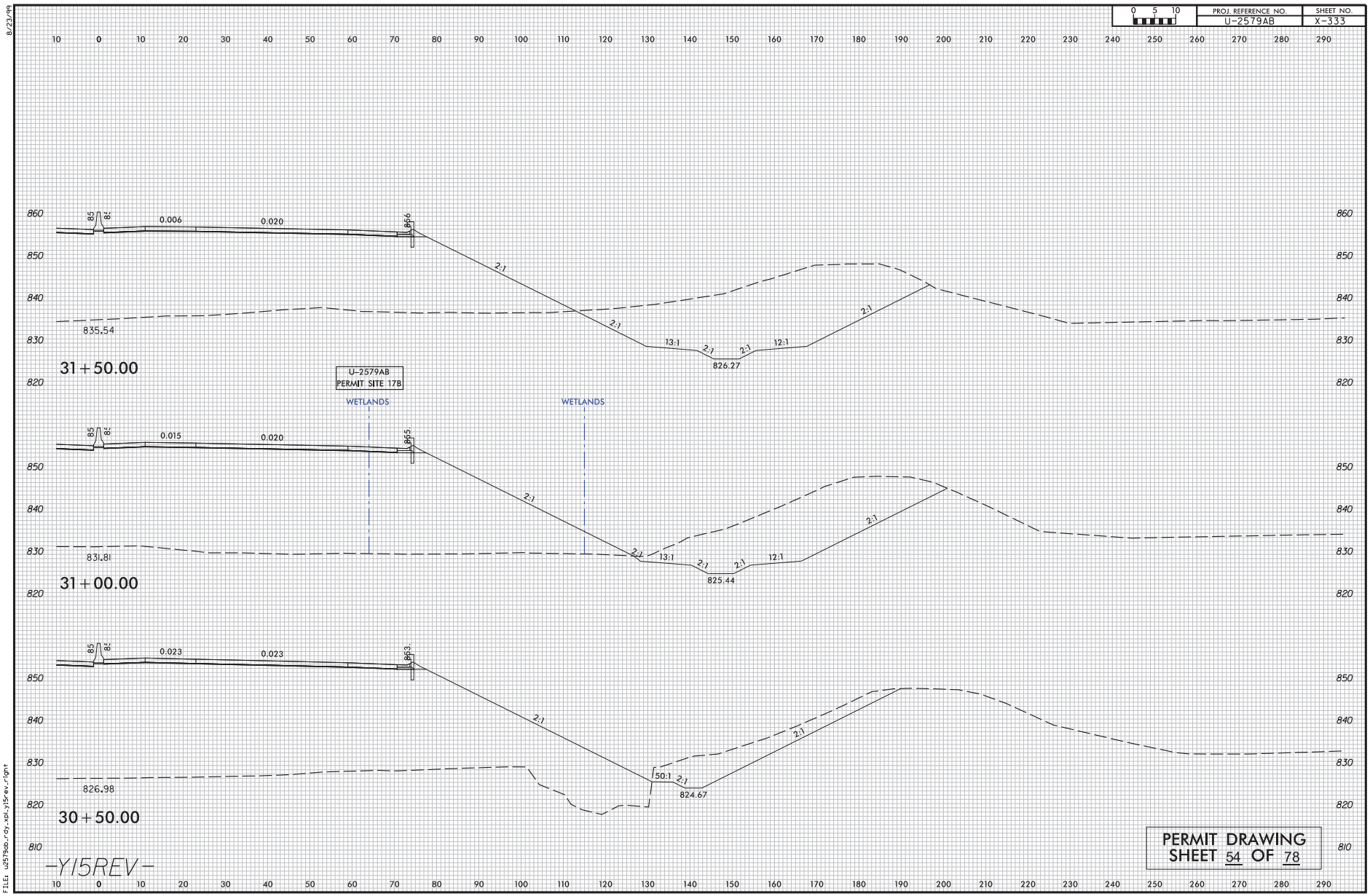
8/23/99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PROJ. REFERENCE NO.
U-2579AB
SHEET NO.
X-333
8/23/99
0.006
0.020
2:1
13:1
12:1
835.54
826.27
31+50.00
U-2579AB
PERMIT SITE 17B
WETLANDS
WETLANDS
0.015
0.020
831.81
825.44
31+00.00
0.023
0.023
826.98
824.67
50:1
30+50.00
-Y15REV-
PERMIT DRAWING
SHEET 54 OF 78
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FILE: u2579ab_rdy_xpl_y15r_ev_right
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DATE: 5/5/2020

P-74

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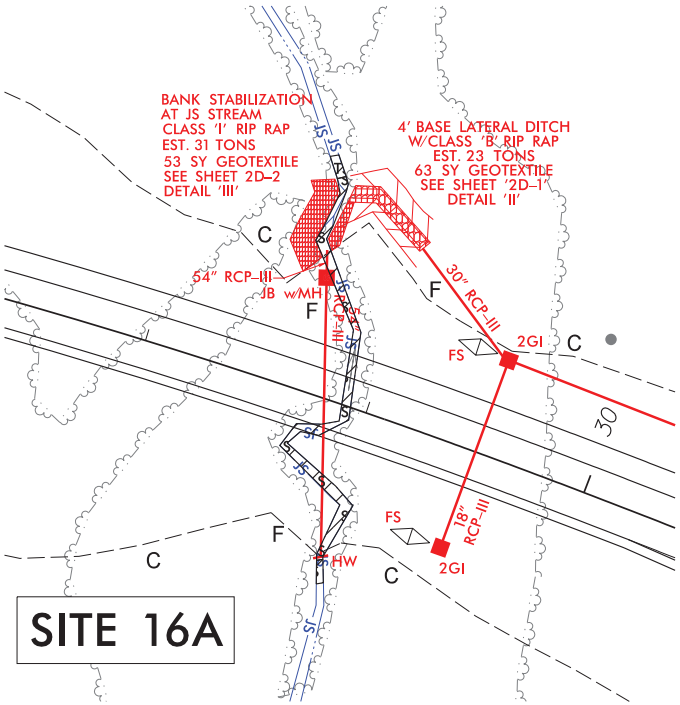
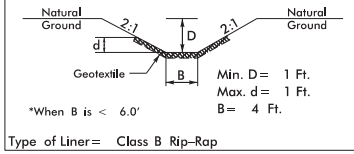
REVISIONS

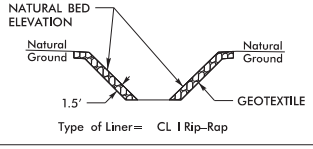


DETAIL II
STANDARD BASE DITCH
(Not to Scale)



FROM STA. 28+65 TO STA. 29+00 -Y15FLYCA- LT

DETAIL III
BANK STABILIZATION AT
JURISDICTIONAL STREAM
(Not to Scale)



STA. 28+70 -Y15FLYCA- LT

LEGEND:

S S — DENOTES IMPACTS IN SURFACE WATER

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	19C
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

GRAPHIC SCALE

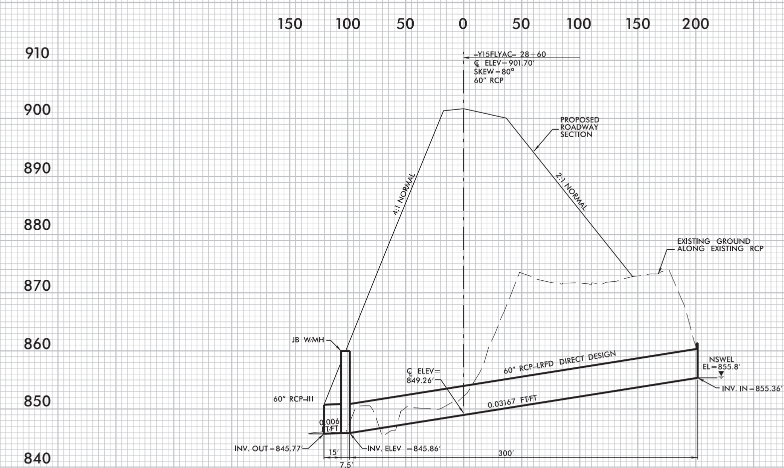
PERMIT DRAWING
SHEET 55 OF 78

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U–2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U–2579AB – SITE 19



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 56 OF 78

REVISIONS

5/14/99

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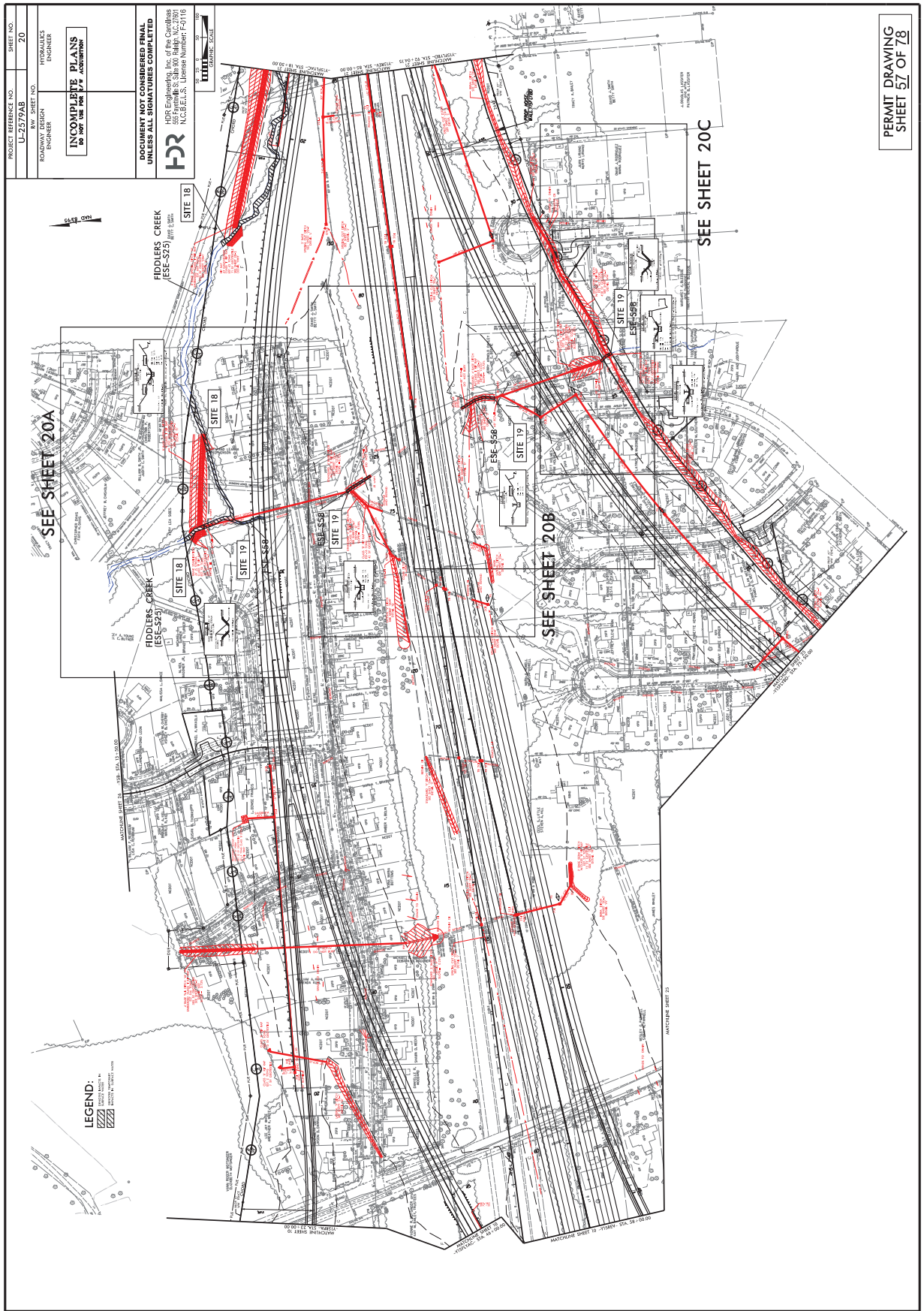

REVISIONS

ROW REV – MAY 7, 2019 – MOVED TUBN AROUND FROM PARCEL 268 TO PARCEL 668 AND SHIFTED TUBN AROUND DESIGN DOWN FIFTEEN FEET AND SHIFTED CONTROL ACCESS DOWN TO ACCOMODATE DESIGN. REMOVED RIGHT-OF-WAY FROM PARCEL 668 AND REDUCED PERMANENT UTILITY EASEMENT TO PROPERTY LINE ON PARCEL 241. ADDED RIGHT-OF-WAY TO PARCELS 241 AND 268. SMP
ROW REV – OCTOBER 14, 2019 – UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO –Y15FLYBD– FROM STATION 70+00 TO 92+19 JHG

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
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REVISIONS

ROW REV – MAY 7, 2019 – MOVED TUBN AROUND FROM PARCEL 248 TO PARCEL 248. SHIFTED TUBN AROUND DESIGN DOWN FIFTEEN FEET AND SHIFTED CONTROL ACCESS DOWN TO ACCOMODATE DESIGN. REMOVED RIGHT-OF-WAY FROM PARCEL 668 AND REDUCED PERMANENT UTILITY EASEMENT TO PROPERTY LINE ON PARCEL 241. ADDED RIGHT-OF-WAY TO PARCELS 241 AND 268. SMP ROW REV – OCTOBER 14, 2019 – UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO –Y15FLYBD– FROM STATION 70+00 TO 92+19 JHG

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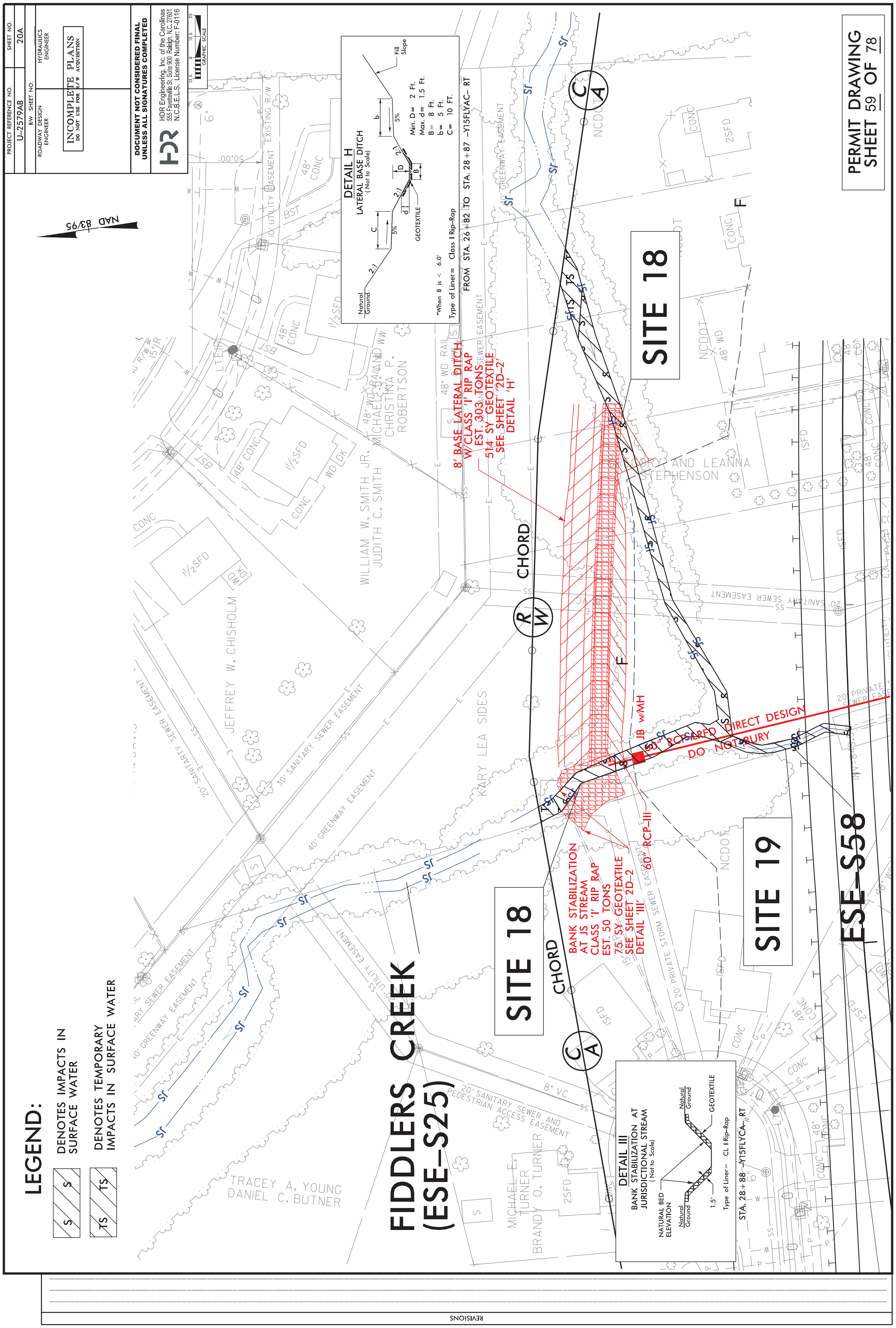
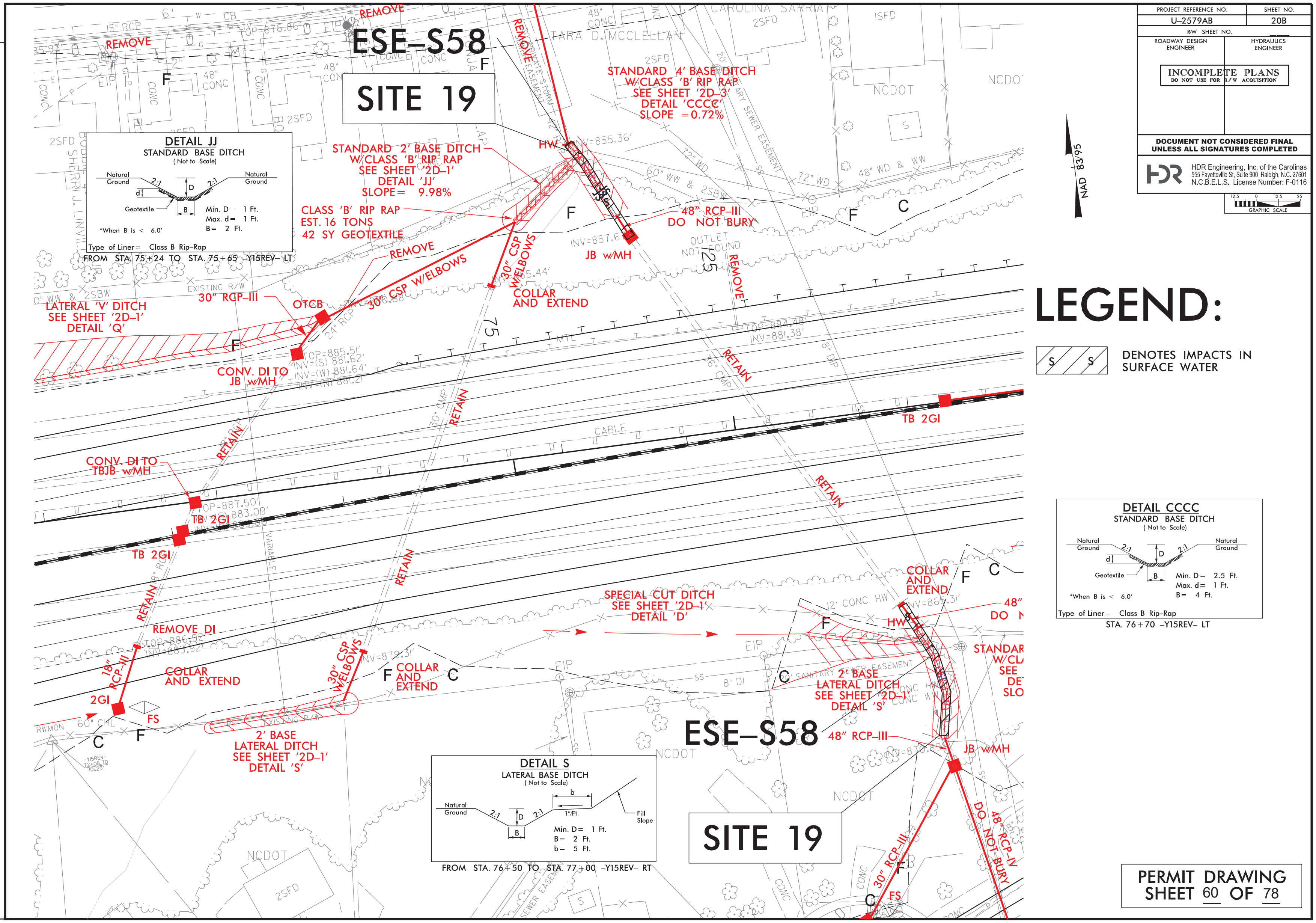

LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
FIDDLERS CREEK (ESE-S25)
SITE 18
SITE 18
SITE 19
ESE-S58
CHORD
8' BASE LATERAL DITCH W/CLASS 'I' RIP RAP EST. 303 TONS 514 SY GEOTEXTILE SEE SHEET '2D-2' DETAIL 'H'
BANK STABILIZATION AT JS STREAM CLASS 'I' RIP RAP EST. 50 TONS 75 SY GEOTEXTILE SEE SHEET '2D-2' DETAIL 'III'
60" RCP-III
JB W/MH
DIRECT DESIGN DO NOT BURY
DETAIL H LATERAL BASE DITCH (Not to Scale)
Min. D= 2 Ft. Max. d= 1.5 Ft. B= 8 Ft. b= 5 Ft. C= 10 FT.
Type of Liner= Class I Rip-Rap
FROM STA. 26+82 TO STA. 28+87 -Y15FLYAC- RT
DETAIL III BANK STABILIZATION AT JURISDICTIONAL STREAM (Not to Scale)
Type of Liner= CL I Rip-Rap
STA. 28+88 -Y15FLYCA- RT
PERMIT DRAWING SHEET 59 OF 78
PROJECT REFERENCE NO. U-2579AB SHEET NO. 20A
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
HDR Engineering, Inc. of the Carolinas 555 Fayetteville St. Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116
NAD 83/95
JEFFREY W. CHISHOLM
WILLIAM W. SMITH JR. JUDITH C. SMITH
MICHAEL A. AND CHRISTINA P. ROBERTSON
KARY LEA SIDES
TRACEY A. YOUNG DANIEL C. BUTNER
MICHAEL E. TURNER BRANDY O. TURNER
REVISIONS


PROJECT REFERENCE NO. U-2579AB
SHEET NO. 20B
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
ESE-S58
SITE 19
STANDARD 4' BASE DITCH W/CLASS 'B' RIP RAP SEE SHEET '2D-3' DETAIL 'CCCC' SLOPE =0.72%
STANDARD 2' BASE DITCH W/CLASS 'B' RIP RAP SEE SHEET '2D-1' DETAIL 'JJ' SLOPE= 9.98%
CLASS 'B' RIP RAP EST. 16 TONS 42 SY GEOTEXTILE
48" RCP-III DO NOT BURY
JB w/MH
REMOVE
30" CSP W/ELBOWS
COLLAR AND EXTEND
30" RCP-III
OTCB
LATERAL 'V' DITCH SEE SHEET '2D-1' DETAIL 'Q'
CONV. DI TO JB w/MH
CONV. DI TO TBJB w/MH
TB 2GI
RETAIN
REMOVE DI
18" RCP-III
2GI
2' BASE LATERAL DITCH SEE SHEET '2D-1' DETAIL 'S'
SPECIAL CUT DITCH SEE SHEET '2D-1' DETAIL 'D'
48" RCP-III
48" RCP-IV DO NOT BURY
HW
DETAIL JJ
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
Geotextile
Min. D= 1 Ft.
Max. d= 1 Ft.
B= 2 Ft.
*When B is < 6.0'
Type of Liner= Class B Rip-Rap
FROM STA. 75+24 TO STA. 75+65 -Y15REV- LT
DETAIL CCCC
STANDARD BASE DITCH
(Not to Scale)
Min. D= 2.5 Ft.
Max. d= 1 Ft.
B= 4 Ft.
Type of Liner= Class B Rip-Rap
STA. 76+70 -Y15REV- LT
DETAIL S
LATERAL BASE DITCH
(Not to Scale)
Fill Slope
Min. D= 1 Ft.
B= 2 Ft.
b= 5 Ft.
FROM STA. 76+50 TO STA. 77+00 -Y15REV- RT
PERMIT DRAWING SHEET 60 OF 78

REVISIONS

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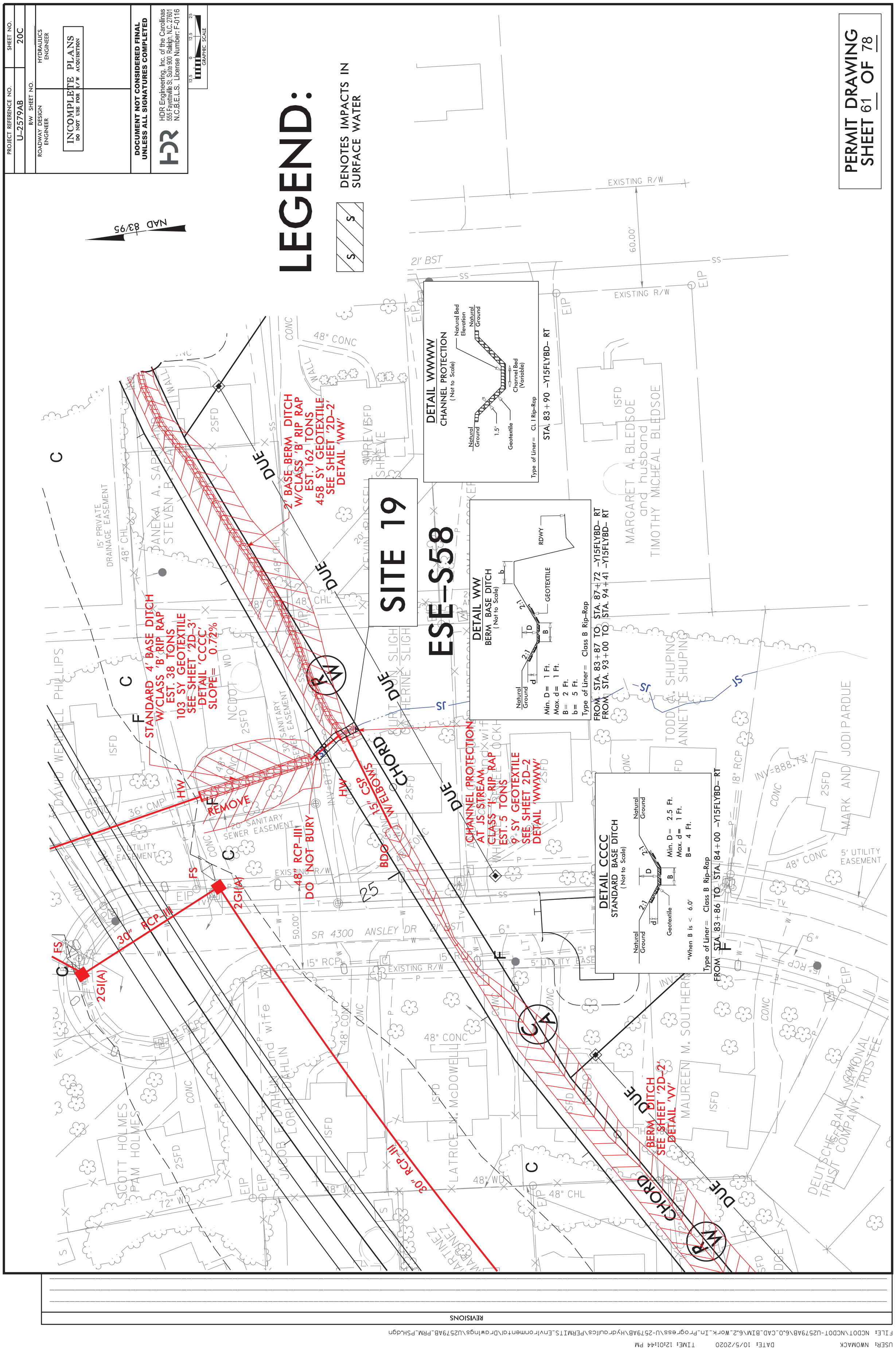
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
20C
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
PERMIT DRAWING
SHEET 61 OF 78
SITE 19
ESE-S58
DETAIL WWWW
CHANNEL PROTECTION
(Not to Scale)
Type of Liner= Cl. I Rip-Rap
STA. 83+90 -Y15FLYBD- RT
DETAIL WW
BERM BASE DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1 Ft.
B= 2 Ft.
b= 5 Ft.
Type of Liner= Class B Rip-Rap
FROM STA. 83+87 TO STA. 87+72 -Y15FLYBD- RT
FROM STA. 93+00 TO STA. 94+41 -Y15FLYBD- RT
DETAIL CCCC
STANDARD BASE DITCH
(Not to Scale)
Min. D= 2.5 Ft.
Max. d= 1 Ft.
B= 4 Ft.
*When B is < 6.0'
Type of Liner= Class B Rip-Rap
FROM STA. 83+86 TO STA. 84+00 -Y15FLYBD- RT
2' BASE BERM DITCH
W/CLASS 'B' RIP RAP
EST. 162 TONS
458 SY GEOTEXTILE
SEE SHEET '2D-2'
DETAIL 'WW'
STANDARD 4' BASE DITCH
W/CLASS 'B' RIP RAP
EST. 38 TONS
103 SY GEOTEXTILE
SEE SHEET '2D-3'
DETAIL 'CCCC'
SLOPE= 0.72%
CHANNEL PROTECTION
AT JS STREAM
CLASS 'I' RIP RAP
EST 5 TONS
9 SY GEOTEXTILE
SEE SHEET 2D-2
DETAIL 'WWWW'
BERM DITCH
SEE SHEET '2D-2'
DETAIL 'VV'
REMOVE
48" RCP-III
DO NOT BURY
15" CSP
W/ELBOWS
30" RCP-III
2GI(A)
SR 4300 ANSLEY DR
EXISTING R/W
MARGARET A. BLEDSOE
and husband
TIMOTHY MICHEAL BLEDSOE
MAUREEN M. SOUTHERN
MARK AND JODI PARDUE
DEUTSCHE BANK NATIONAL TRUST COMPANY, TRUSTEE
15' PRIVATE DRAINAGE EASEMENT
30' SANITARY SEWER EASEMENT
5' UTILITY EASEMENT
REVISIONS
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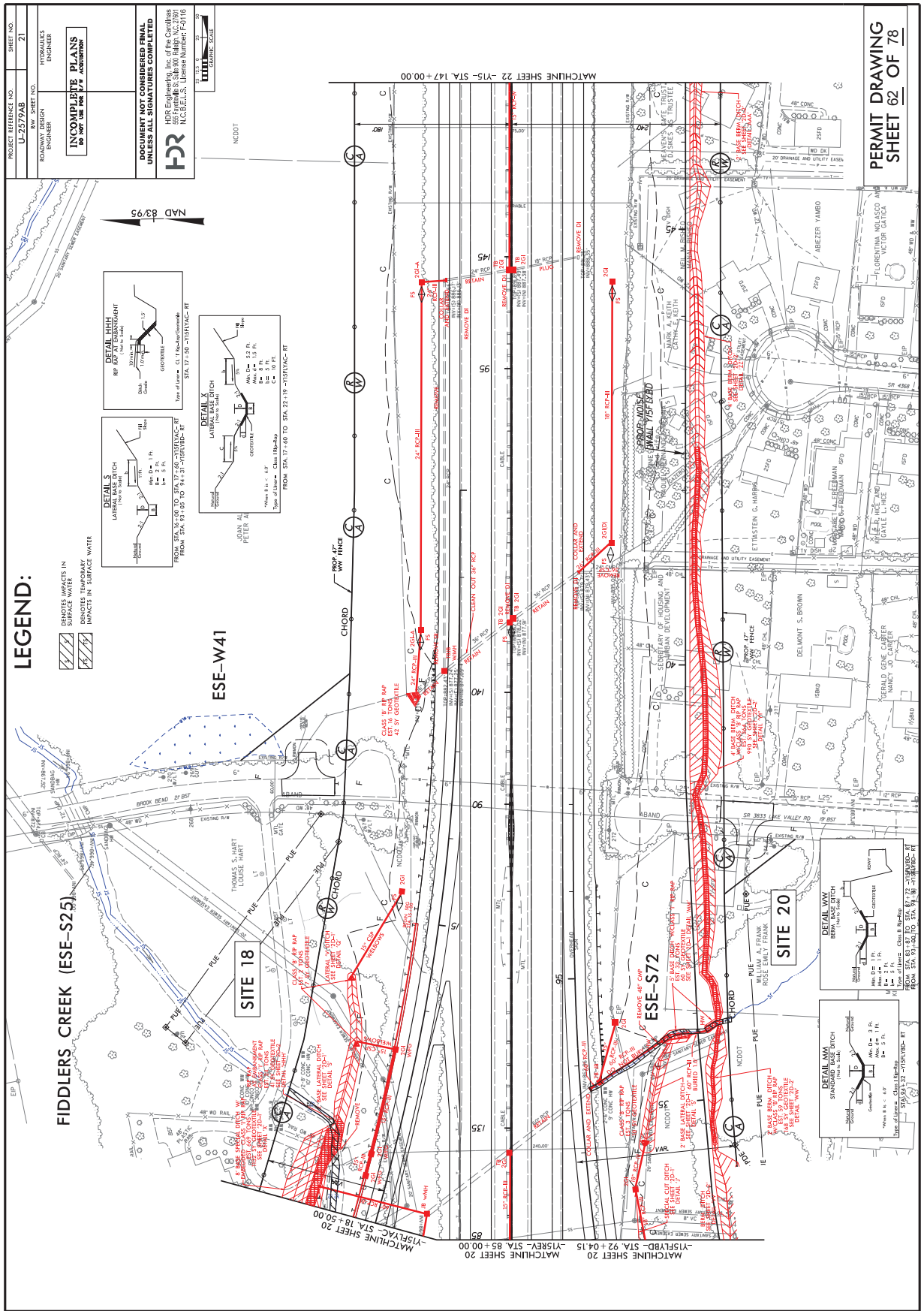

REVISIONS

ROW REV. – OCTOBER 14, 2019 – UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO -Y15FLYBD- FROM STATION 70+00 TO 92+19.JHG

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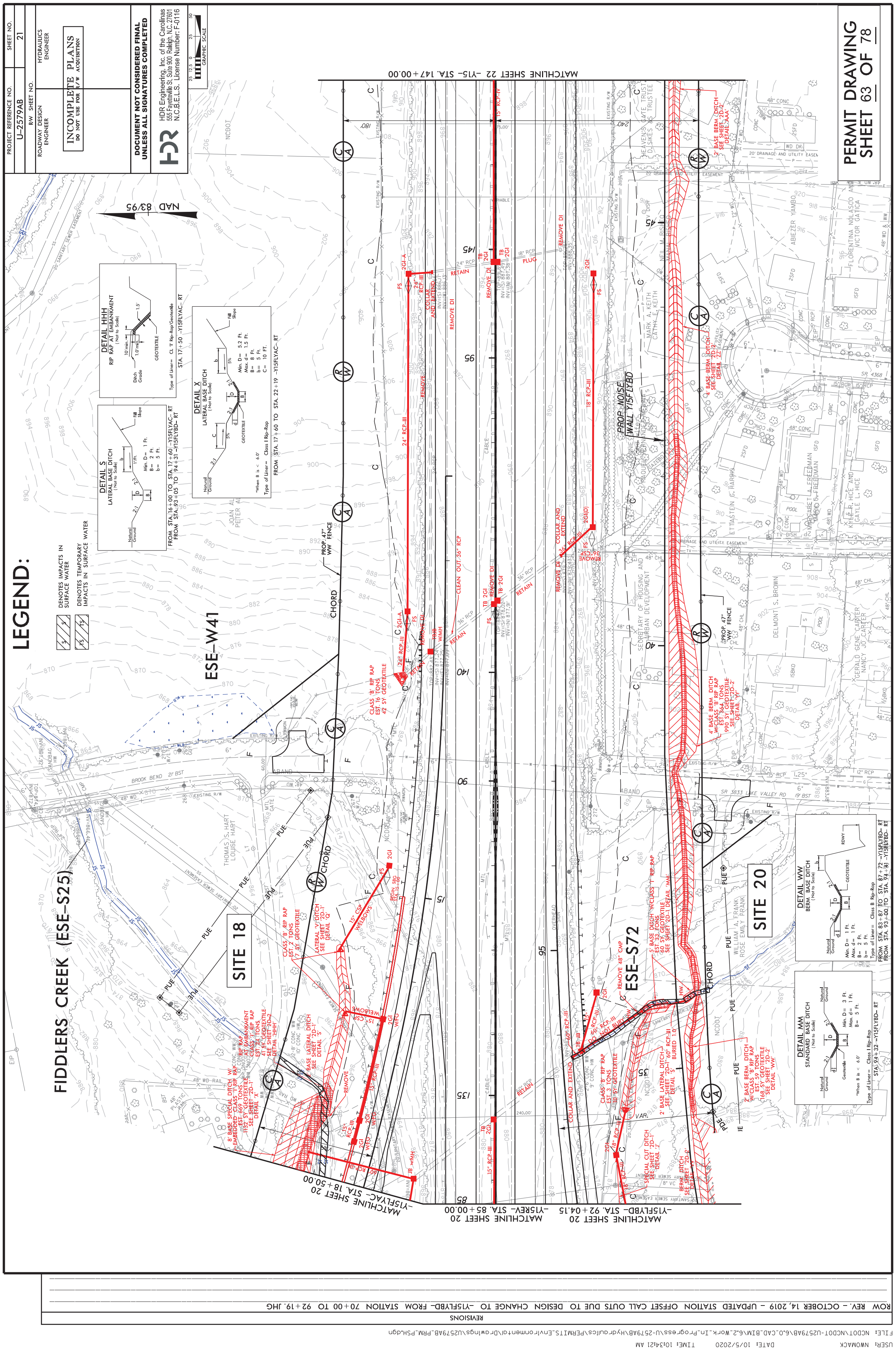
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 21
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DETAIL S
LATERAL BASE DITCH
DETAIL HHH
RIP RAP AT EMBANKMENT
DETAIL X
LATERAL BASE DITCH
DETAIL WW
BERM BASE DITCH
DETAIL MM
STANDARD BASE DITCH
FIDDLERS CREEK (ESE-S25)
ESE-W41
ESE-S72
SITE 18
SITE 20
PROP. NOISE WALL Y15FLYBD
MATCHLINE SHEET 22 -Y15- STA. 147+00.00
MATCHLINE SHEET 20 -Y15FLYAC- STA. 18+50.00
MATCHLINE SHEET 20 -Y15REV- STA. 85+00.00
MATCHLINE SHEET 20 -Y15FLYBD- STA. 92+04.15
PERMIT DRAWING SHEET 63 OF 78
REVISIONS
ROW REV. - OCTOBER 14, 2019 - UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO -Y15FLYBD- FROM STATION 70+00 TO 92+19. JHG

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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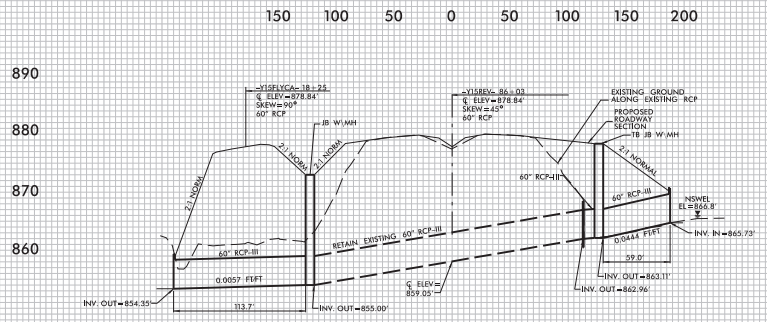
U-2579AB – SITE 18 AND 20



PROFILE ALONG ℄ OF PIPE

PERMIT DRAWINGS
SHEET 64 OF 78

P-84

5/14/99

REVISIONS

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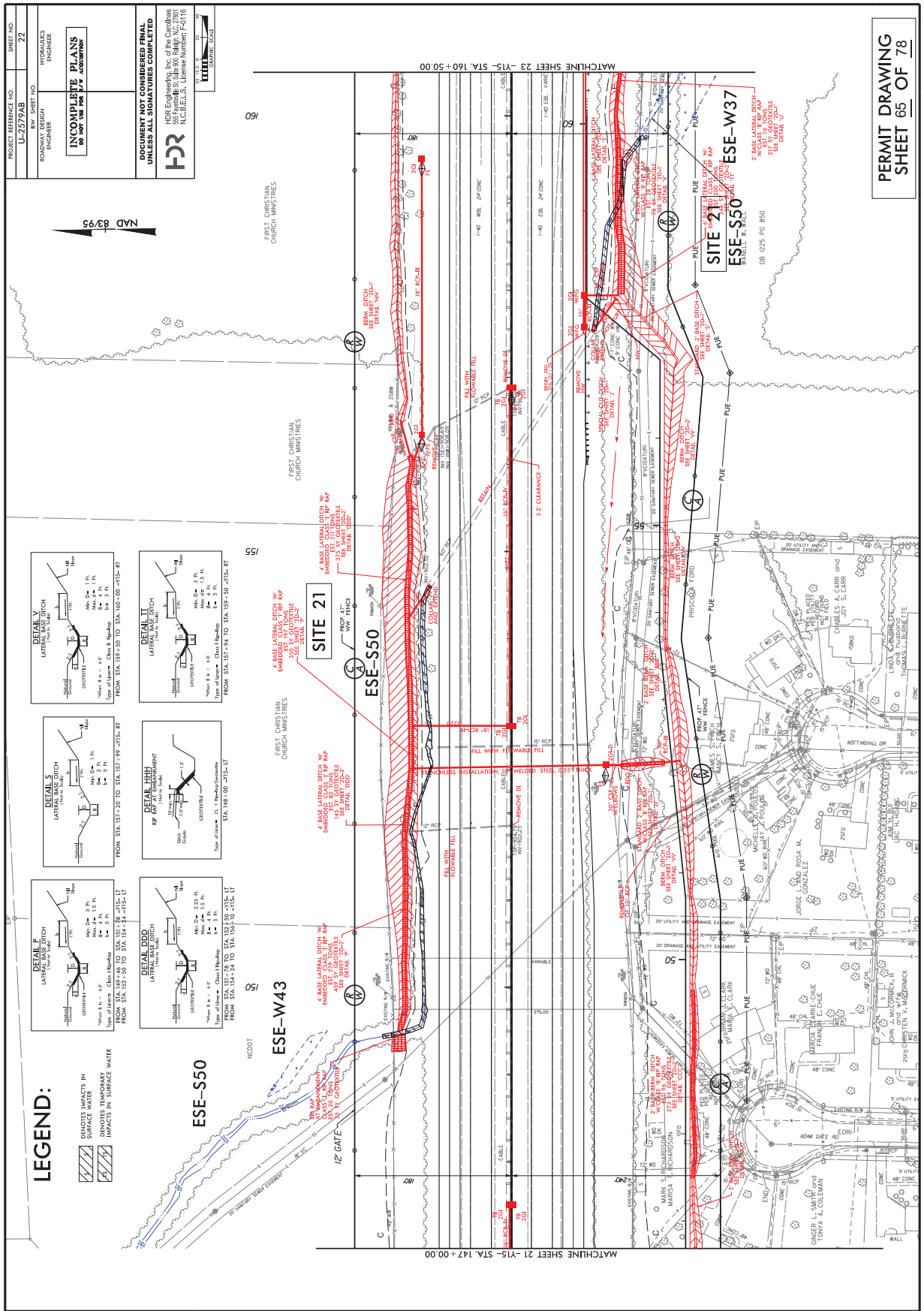
PERMIT DRAWING
SHEET 65 OF 78
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 22
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 1000, Charlotte, NC 28202
N.C.B.E.A.S. License Number: P-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 21
SITE 22
ESE-S50
ESE-W43
ESE-W37
MATCHLINE SHEET 23 -Y15- STA. 160+50.00
MATCHLINE SHEET 21 -Y15- STA. 147+00.00
FIRST CHRISTIAN CHURCH MINISTRIES
NCDOT
DETAIL V
DETAIL TT
DETAIL S
DETAIL HHH
DETAIL P
DETAIL DDD
REVISIONS
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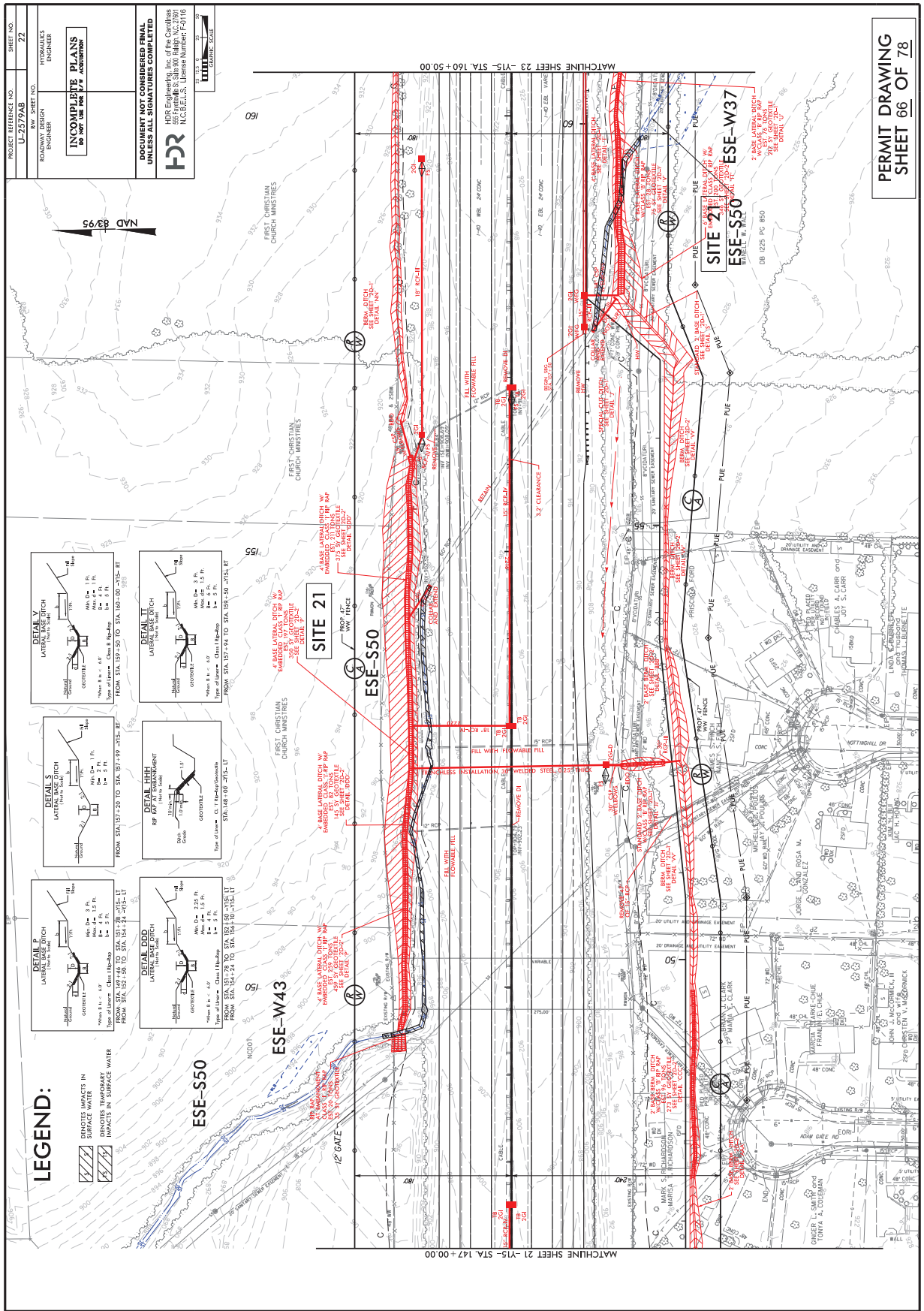
PROJECT REFERENCE NO. U-2579AB
SHEET NO. 22
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 South Church Street, Suite 1000, Charlotte, NC 28202
N.C.B.E.A.S. License Number: P-0116
GRAPHIC SCALE
PERMIT DRAWING
SHEET 66 OF 78
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DETAIL P
DETAIL S
DETAIL V
DETAIL TT
DETAIL DDD
DETAIL HHH
SITE 21
ESE-S50
ESE-W43
ESE-W37
MATCHLINE SHEET 21 -Y15- STA. 147+00.00
MATCHLINE SHEET 23 -Y15- STA. 160+50.00
NAD 83/95
FIRST CHRISTIAN CHURCH MINISTRIES
DB 1225 PG 850
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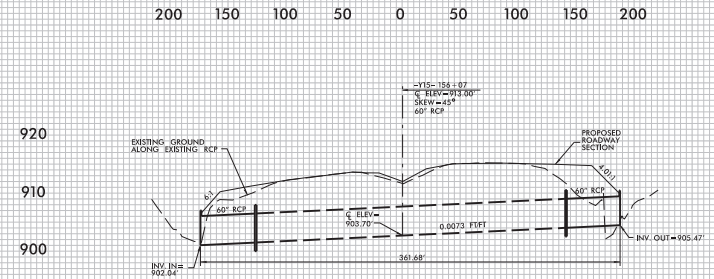
REVISIONS

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U-2579AB – SITE 21



PROFILE ALONG ℄ OF PIPE

PERMIT DRAWINGS
SHEET 67 OF 78

REVISIONS 5/14/99

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DATE: 5/5/2020

REVISIONS

ROW REV. - OCTOBER 14, 2019 - UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO -Y15FLYBD- FROM STATION 70+00 TO 92+19. JHG

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REVISIONS
ROW REV. – OCTOBER 14, 2019 – UPDATED STATION OFFSET CALL OUTS DUE TO DESIGN CHANGE TO –Y15FLYBD– FROM STATION 70+00 TO 92+19. JHG

PERMIT DRAWING
SHEET 69 OF 78

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	25

RW SHEET NO.

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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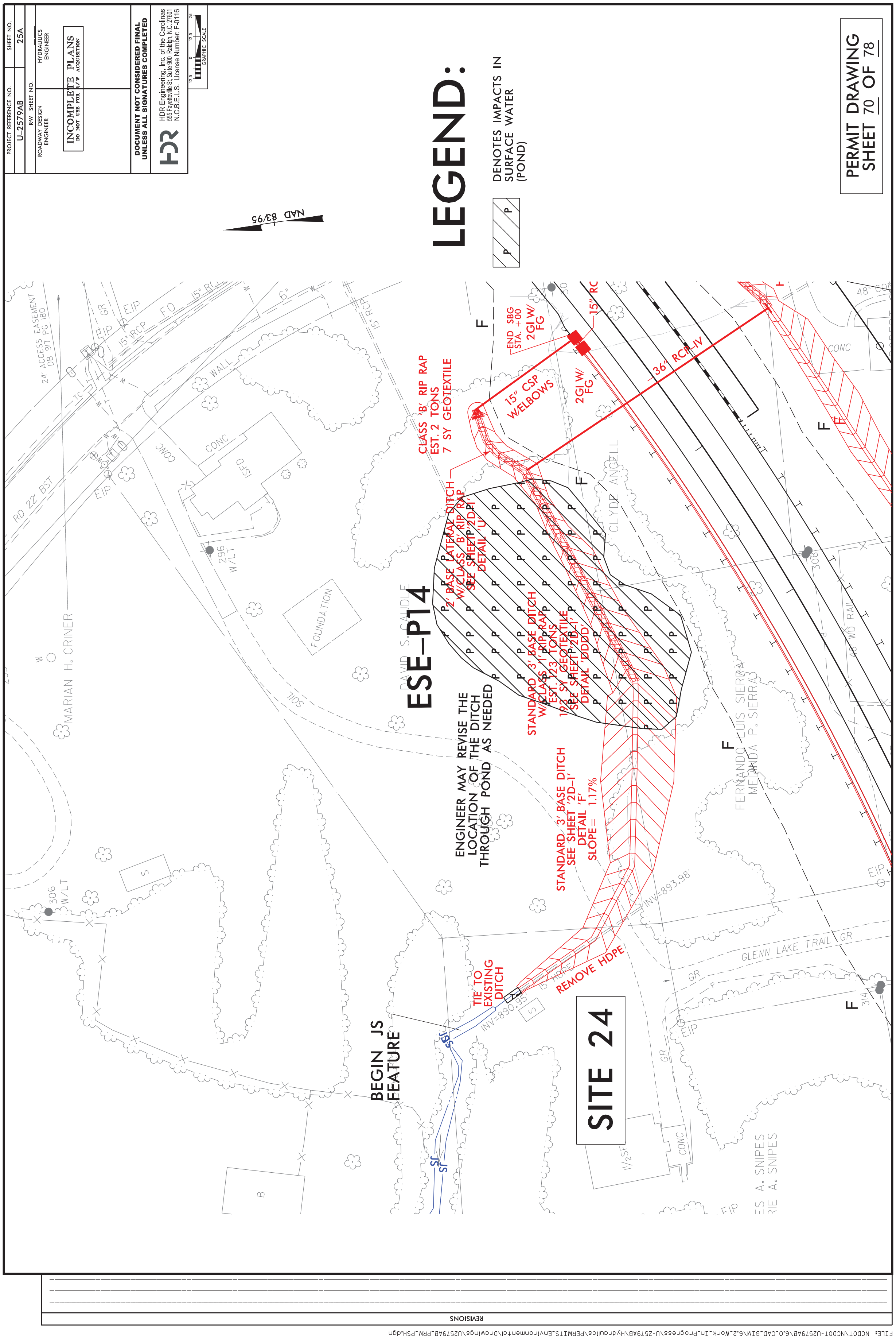
HDR

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, NC 27601
N.C.B.E.L.S. License Number: F-0116

0' 75' 150' 300'
GRAPHIC SCALE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SHEET NO. 25A
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
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HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116
GRAPHIC SCALE
NAD 83/95
LEGEND:
DENOTES IMPACTS IN SURFACE WATER (POND)
PERMIT DRAWING
SHEET 70 OF 78
ESE-P14
SITE 24
BEGIN JS FEATURE
TIE TO EXISTING DITCH
REMOVE HDPE
ENGINEER MAY REVISE THE LOCATION OF THE DITCH THROUGH POND AS NEEDED
STANDARD 3' BASE DITCH
SEE SHEET '2D-I' DETAIL 'F'
SLOPE = 1.17%
STANDARD 3' BASE DITCH
W/CLASS 'I' RIP-RAP
EST. 123 TONS
123 SY GEOTEXTILE
SEE SHEET '2D-I' DETAIL 'DDDD'
2' BASE LATERAL DITCH
W/CLASS 'B' RIP RAP
SEE SHEET '2D-I' DETAIL 'U'
CLASS 'B' RIP RAP
EST. 2 TONS
7 SY GEOTEXTILE
15" CSP W/ELBOWS
2GI W/ FG
END SBG STA. +00
2GI W/ FG
36" RCP-IV
15" RCP
MARIAN H. CRINER
DAVID S. CAUDLE
CLYDE ANGELL
FERNANDO LUIS SIERRA
MELINDA P. SIERRA
GLENN LAKE TRAIL
24' ACCESS EASEMENT DB 917 PG 180
RD 22' BST
FOUNDATION
CONC
1SFD
SOIL
WALL
296 W/LT
306 W/LT
308
314
INV=893.98'
INV=890.95'
48" WD RAIL
1/2SF
EIP
REVISIONS
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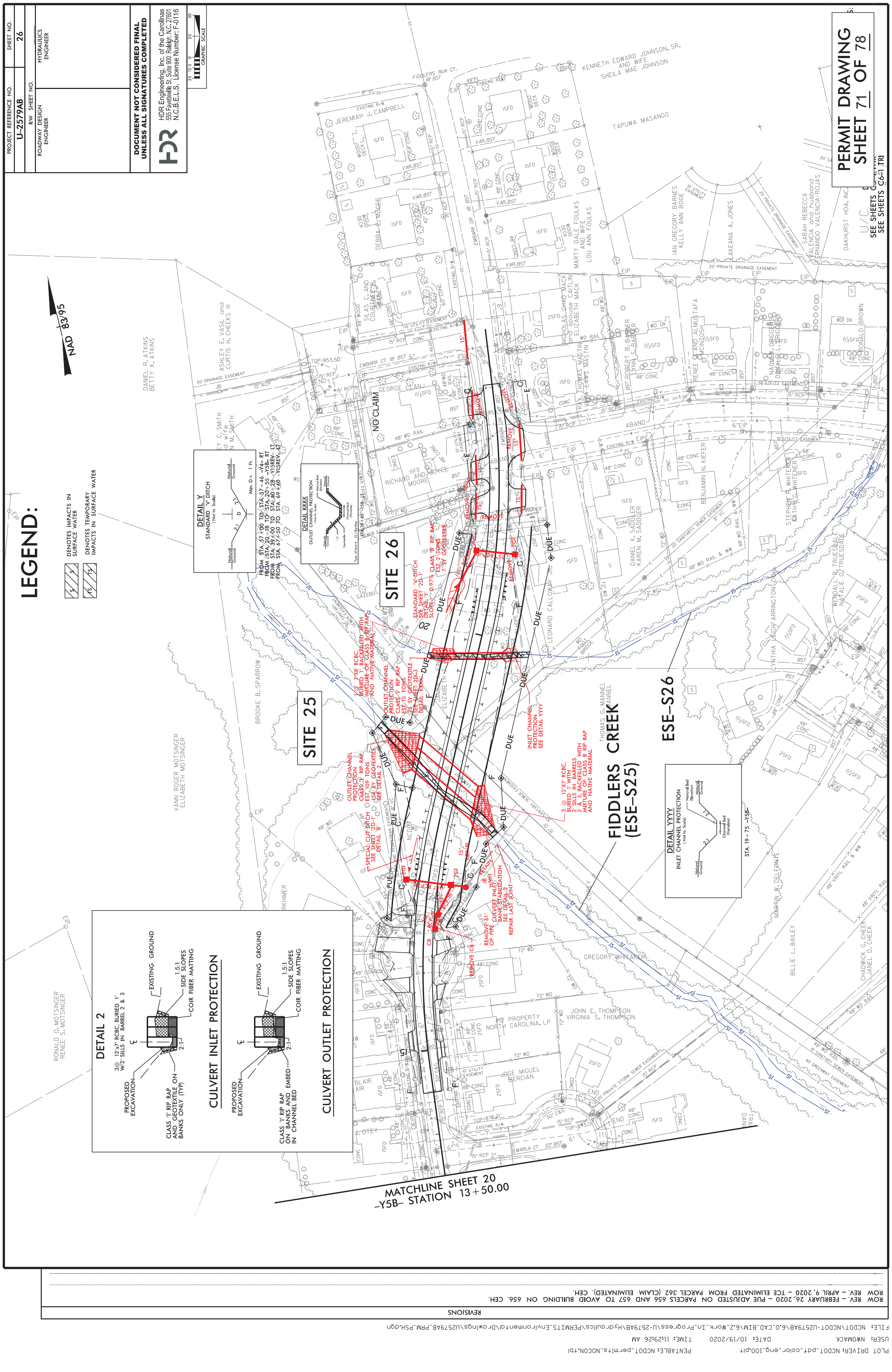
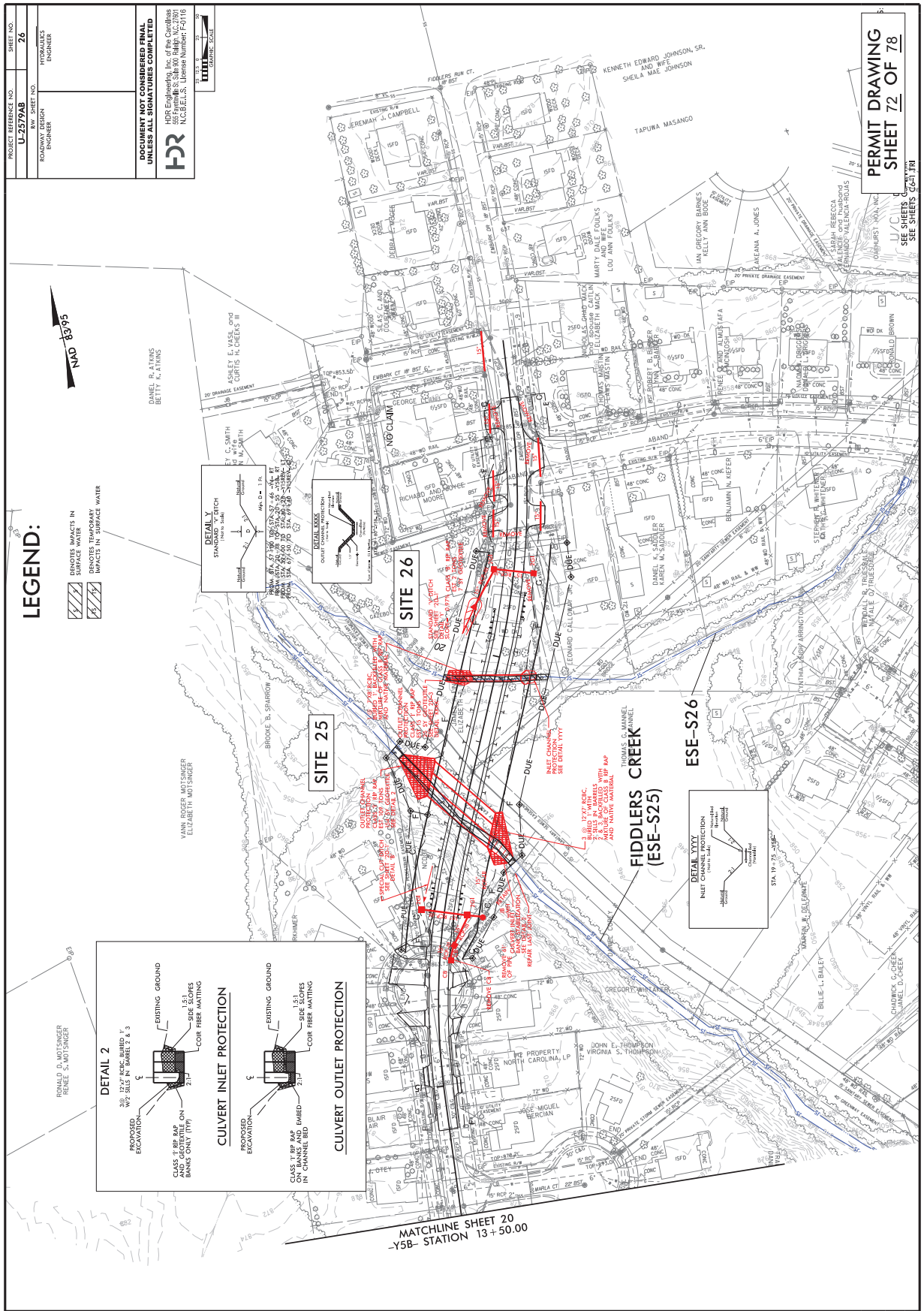

PERMIT DRAWING
SHEET 71 OF 78
PROJECT REFERENCE NO.
U-2579AB
SHEET NO.
26
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/95
SITE 25
SITE 26
FIDDLERS CREEK (ESE-S25)
ESE-S26
DETAIL Y
STANDARD 'V' DITCH
DETAIL KKKK
OUTLET CHANNEL PROTECTION
DETAIL YYYY
INLET CHANNEL PROTECTION
DETAIL 2
CULVERT INLET PROTECTION
CULVERT OUTLET PROTECTION
MATCHLINE SHEET 20
-Y5B- STATION 13+50.00
REVISIONS
ROW REV. - FEBRUARY 26, 2020 - PUE ADJUSTED ON PARCELS 656 AND 657 TO AVOID BUILDING ON 656. CEH.
ROW REV. - APRIL 9, 2020 - TCE ELIMINATED FROM PARCEL 362 (CLAIM ELIMINATED). CEH.


PROJECT REFERENCE NO. U-2579AB
SHEET NO. 26
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HDR Engineering, Inc. of the Carolinas
440 S. Church St., Suite 900, Charlotte, NC 28202
N.C.B.E.A.S. License Number: P-0116
GRAPHIC SCALE
PERMIT DRAWING SHEET 72 OF 78
SEE SHEETS 26-1 TO 26-3
SEE SHEETS 26-1 TO 26-3
LEGEND:
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/95
SITE 25
SITE 26
FIDDLERS CREEK (ESE-S25)
ESE-S26
MATCHLINE SHEET 20 -Y5B- STATION 13+50.00
DETAIL 2
CULVERT INLET PROTECTION
CULVERT OUTLET PROTECTION
DETAIL YYYY
INLET CHANNEL PROTECTION
DETAIL KKKK
OUTLET CHANNEL PROTECTION
DETAIL Y
STANDARD V-DITCH
KENNETH EDWARD JOHNSON, SR. AND WIFE SHEILA MAE JOHNSON
TAPUWA MASANGO
JEREMIAH J. CAMPBELL
DEBRA L. HOUSE
SLAS C. AND CHARLES
MARTY DALE FOULKS AND WIFE LOU ANN FOULKS
NICHOLAS JAMES MACK AND SPOUSE CAITLIN ELIZABETH MACK
IAN GREGORY BARNES KELLY ANN BODE
AKEANA A. JONES
SARAH REBECCA ALLEN AND HUSBAND ALLEN MACKENZIE ROLLINS
DANIEL R. ATKINS BETTY K. ATKINS
CHRISTY E. CASEL AND CHRISTS N. CHEERS III
GEORGE
NO CLAIM
RICHARD AND MOORE
THOMAS MASTIN AND LEWIS MASTIN
RENEE G. AND ALMUSTAFA MCDONOUGH
DONALD BROWN
BENJAMIN N. KIEFER
DANIEL K. SADDLER AND KAREN M. SADDLER
STEPHEN R. WHITENER AND WHITENER
LEONARD CALLOWAY JR.
CYNTHIA JASON ARRINGTON
WENDALL R. TRUESDALE AND NATALIE O. TRUESDALE
VANN ROGER MOTSINGER ELIZABETH MOTSINGER
BROOKE B. SPARROW
THOMAS G. MANNEL AND MANNEL
RONALD D. MOTSINGER RENEE S. MOTSINGER
GREGORY WHITAKER
JOHN E. THOMPSON VIRGINIA S. THOMPSON
PROPERTY NORTH CAROLINA, LP
JOSE MIGUEL BERCIAN
BILLIE L. BAILEY
CHADWICK G. CHEEK DANIEL D. CHEEK
DARIN W. DELEPINE
ROW REV. – FEBRUARY 26, 2020 – PUE ADJUSTED ON PARCELS 656 AND 657 TO AVOID BUILDING ON 656. CEH.
ROW REV. – APRIL 9, 2020 – TCE ELIMINATED FROM PARCEL 362 (CLAIM ELIMINATED). CEH.
REVISIONS
FILE: NCDOT\NCDOT-U2579AB\6.0_CAD_BIM\6.2_Work_In_Progress\U-2579AB_Hydraulics\PERMITS_Environmental\Drawings\U2579AB_PRM_PSH.dgn
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TIME: 12:04:40 PM
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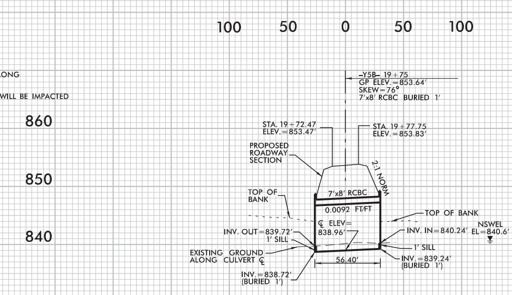
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

U-2579AB – SITE 26

*ALL DISTANCES MEASURED ALONG CENTERLINE OF CULVERT
*DEBRIS POTENTIAL IS LOW
*NO UPSTREAM STRUCTURES WILL BE IMPACTED



PROFILE ALONG ℄ OF CULVERT

PERMIT DRAWINGS
SHEET 74 OF 78

REVISIONS

5/14/99

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
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FILE: U2579AB_PRM_CSR_PSH

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER 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)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	Y4RPB 20+29 RT	30" RCP-III						0.09	< 0.01	48		
1	Y4RPB 20+29 RT	4' BASE DITCH						0.10	< 0.01	76	18	
2	Y4 40+43 RT	36" CSP						< 0.01		51		
2	Y4 40+43 RT	ENERGY DISSIPATOR BASIN						< 0.01		20		
2	Y4 40+43 RT	BANK STABILIZATION						< 0.01		14		
2	Y4 40+43 RT	DETOUR							0.01		76	
3	L 746+02 RT	54" RCP-IV						0.10	< 0.01	137	12	
4	L 748+64 - 750+76 LT	ROADWAY FILL						0.01		74		
4A	L 750+02 - 753+80 LT	ROADWAY FILL	0.13									
4B	L 748+64 - 750+76 LT	FILL IN POND						0.89				
5	L 755+00 - 758+02 LT	PIPE REM./ PROP. DITCH						< 0.01	< 0.01	28	32	
5A	L 758+02 LT	PIPE REM./ PROP. DITCH				< 0.01						
6	L 768+62	2 @ 12' x 10' RCBC						0.13		589		
6	L 768+62	INLET CHANNEL FLOODPLAIN BENCH						< 0.01	0.01	26	41	
6	L 768+62	OUTLET CHANNEL PROTECTION						0.02	0.03	81	88	
6A	L 764+50 LT	ROADWAY FILL	0.03									
6B	L 760+00 LT	36" RCP SEGMENT REPLACEMENT /CLEAN							< 0.01		19	
7	Y15FLYBD	54" RCP						0.02		92		
7	Y15FLYBD	4' BASE DITCH						< 0.01	< 0.01	84	10	
7	Y15FLYBD	RIPRAP PAD						< 0.01	< 0.01	16	25	
7A	Y15FLYBD	54" RCP-IV	0.36									
8	L 781+44	42" RCP-III						0.05	< 0.01	444		
8	L 781+44	BANK STABILIZATION						< 0.01	< 0.01	17	10	
TOTALS*:			0.51			< 0.01		1.44	0.07	1797	331	

*Rounded totals are sum of actual impacts

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Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER 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)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
9	Y15RPDREV 36+18 RT	CULVERT INLET CHANNEL PROTECTION						< 0.01	< 0.01	66	10	
9	Y15RPDREV 35+55 CL	6' x 7' RCBC BURIED 1'						0.03		226		
9	Y15RPDREV 34+76 LT	CULVERT OUTLET CHANNEL PROTECTION						< 0.01		22		
9	Y15RPDREV 34+50 LT	6' BASE DITCH						0.02		149		
9	L 793+98 LT	CULVERT INLET CHANNEL PROTECTION						< 0.01		18		
9	L 793+98 CL	6' x 7' RCBC BURIED 1'						0.04		354		
9	Y15FLYBD 45+10 CL	6' BASE DITCH						0.02	< 0.01	195	10	
10	L 798+10	60" RCP-V						0.07		616		
10	L 798+10	5' BASE DITCH						< 0.01		52		
12	Y15REV 31+45 RT	5' x7' RCBC						0.07		372		
12	Y15REV 31+45 RT	CHANNEL STABILIZATION/ DITCH						0.07		277		
12A	Y15REV 31+45 RT	5' x7' RCBC	0.08			0.17						
12B	Y15REV 31+45 RT	FILL IN POND						2.37				
13	L 833+21 LT	36" RCP						0.06	< 0.01	504		
13	L 833+21 LT	BANK STABILIZATION						< 0.01		28	10	
13A	L 833+21	ROADWAY FILL	0.08									
14	Y15 31+20 RT	72" RCP-III						< 0.01	< 0.01	44	43	
14	Y15 31+20 RT	BANK STABILIZATION						< 0.01	< 0.01	22	14	
14A	Y15 31+99 RT	ROADWAY FILL	0.03			0.07						
15	Y15 48+97	42" RCP-III						< 0.01	< 0.01	36	10	
15	Y15 48+97	RIPRAP PAD/DITCH						< 0.01	< 0.01	23	48	
16	Y15 64+60 RT	54" RCP-III						< 0.01	< 0.01	44	26	
16A	Y15FLYCA 28+70 LT	BANK STABILIZATION						< 0.01	< 0.01	33	10	
16A	Y15FLYCA 28+80 CL	54" RCP-III						0.02	< 0.01	170	10	
TOTALS*:			0.19			0.24		2.80	0.02	3251	191	

*Rounded totals are sum of actual impacts

NOTES:
There is no site 11 for the project

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WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER 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)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
17	Y15REV 30+00	8' x7' RCBC						0.03		427		
17	Y15REV 30+00	CHANNEL PROTECTION						< 0.01		35		
17A	Y15REV 30+00 RT	8' x7' RCBC	0.06									
17B	Y15REV 30+50 RT	8'x7' RCBC	0.09									
17C	Y15REV 30+50 RT	8' x7' RCBC	0.03									
18	Y15FLYAC 25+93 - 29+16 RT	ROADWAY FILL						0.16	0.02	900	102	
18	Y15FLYAC 25+93 - 29+16 RT	BANK STABILIZATION						< 0.01	< 0.01	44	11	
19	Y15FLYAC 28+72 RT	ROADWAY FILL						< 0.01		80		
19	Y15 124+35 LT	4' BASE DITCH						< 0.01		50		
19	Y15 124+40 LT	48" RCP-III						< 0.01		14		
19	Y15 125+82 RT	48" RCP-III						< 0.01		16		
19	Y15 126+00 RT	4' BASE DITCH						< 0.01		65		
19	Y15FLYBD 83+80 RT	48" RCP-III						< 0.01		18		
19	Y15FLYBD 83+85 RT	CHANNEL PROTECTION						< 0.01	< 0.01	6	6	
20	Y15FLYBD 93+75	60" RCP-III						0.01		100		
20	Y15FLYBD 94+22, 94+45	5' BASE DITCH						< 0.01	< 0.01	55	10	
20	Y15FLYBD 94+25	60" RCP-III						< 0.01		20		
21	Y15 149+41 - 154+60 LT	ROADWAY FILL						0.48	< 0.01	548	10	
21	Y15 157+53 - 159+59 RT	ROADWAY FILL						0.02	< 0.01	180	50	
22	Y4RPB 20+55 RT	2' BASE DITCH						< 0.01		67		
23	L 830+95 - 833+21 LT	ROADWAY FILL						< 0.01	< 0.01	62	10	
23A	L 832+00 LT	ROADWAY FILL	0.22		0.02	0.06						
24	Y15FLYFLBD 67+67 LT	FILL IN POND						0.35				
24	Y15FLYFLBD 66+00 LT	DITCH TIE IN							< 0.01		10	
TOTALS*:			0.41		0.02	0.06		1.10	0.03	2687	209	

*Rounded totals are sum of actual impacts

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25	Y5B 18+06	3 @ 12' x 7' RCBC						0.02		92		
25	Y5B 18+06	BANK STABILIZATION						< 0.01	< 0.01	35	5	
25	Y5B 18+06	OUTLET CHANNEL PROTECTION						0.01	< 0.01	48	13	
26	Y5B 19+75 RT	7' x8' RCBC						< 0.01		56		
26	Y5B 19+75 LT	INLET CHANNEL PROTECTION						< 0.01	< 0.01	18	14	
26	Y15 36+87 RT	OUTLET CHANNEL PROTECTION						< 0.01		33		
27	Y15 36+87 RT	42" RCP-III						< 0.01		14		
27	Y15REV 30+10 RT	RIPRAP PAD						< 0.01	< 0.01	12	10	
28	Y15REV 30+10 RT	8' x6' RCBC						0.13		114		
29	Y15REV 29+24-38+84	ROADWAY FILL						0.10	< 0.01	1023	10	
30	Y15RPB 31+30 RT	6' BASE DITCH							< 0.01		41	
		TOTALS SHEET 1	0.52			< 0.01		1.44	0.07	1797	331	
		TOTALS SHEET 2	0.19			0.24		2.80	0.02	3251	191	
		TOTALS SHEET 3	0.40		0.02	0.06		1.10	0.03	2687	209	
		TOTALS SHEET 4						0.28	0.02	1445	93	
TOTALS*:		Project Totals	1.11		0.02	0.29		5.63	0.14	9180	824	

*Rounded totals are sum of actual impacts

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum	L.S.	
0003	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUB-BING	5 ACR		
0005	0022000000-E	225	UNCLASSIFIED EXCAVATION	3,192,000 CY		
0006	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (22+26.35 -Y1B-)	Lump Sum	L.S.	
0007	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (23+43.03 -Y16-)	Lump Sum	L.S.	
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (47+28.33 -Y15REV-)	Lump Sum	L.S.	
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (30+67.66 -Y4-)	Lump Sum	L.S.	
0013	0036000000-E	225	UNDERCUT EXCAVATION	10,000 CY		
0014	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	4 EA		
0015	0134000000-E	240	DRAINAGE DITCH EXCAVATION	162,460 CY		
0016	0141000000-E	240	BERM DITCH CONSTRUCTION	6,820 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0017	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	64,350 SY		
0018	0163000000-E	250	REMOVAL OF EXISTING CONCRETE PAVEMENT	75,130 SY		
0019	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	16,650 SY		
0020	0185000000-E	250	BREAKING OF EXISTING CONCRETE PAVEMENT	9,630 SY		
0021	0192000000-N	260	PROOF ROLLING	120 HR		
0022	0194000000-E	265	SELECT GRANULAR MATERIAL, CLASS III	28,900 CY		
0023	0195000000-E	265	SELECT GRANULAR MATERIAL	10,000 CY		
0024	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA-TION	74,600 SY		
0025	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO-LEUM CONTAMINATED SOIL	500 TON		
0026	0318000000-E	300	FOUNDATION CONDITIONING MATE-RIAL, MINOR STRUCTURES	7,124 TON		
0027	0320000000-E	300	FOUNDATION CONDITIONING GEO-TEXTILE	25,560 SY		
0028	0343000000-E	310	15" SIDE DRAIN PIPE	1,416 LF		
0029	0344000000-E	310	18" SIDE DRAIN PIPE	344 LF		
0030	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (42", V)	362 LF		
0031	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (54", V)	292 LF		
0032	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (60", V)	620 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0033	0360000000-E	310	12" RC PIPE CULVERTS, CLASS III	124 LF		
0034	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	9,040 LF		
0035	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	12,832 LF		
0036	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	6,288 LF		
0037	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	3,838 LF		
0038	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	2,832 LF		
0039	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	1,756 LF		
0040	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	704 LF		
0041	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	212 LF		
0042	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	744 LF		
0043	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	56 LF		
0044	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	168 LF		
0045	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	292 LF		
0046	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	360 LF		
0047	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	4,348 LF		
0048	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	2,932 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0049	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	1,232 LF		
0050	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	92 LF		
0051	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	784 LF		
0052	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	348 LF		
0053	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (36", 0.079")	164 LF		
0054	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (42", 0.109")	80 LF		
0055	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	2,390 LF		
0056	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	688 LF		
0057	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	752 LF		
0058	0600000000-E	310	30" CS PIPE CULVERTS, 0.079" THICK	580 LF		
0059	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	86 EA		
0060	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	26 EA		
0061	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (24", 0.064")	20 EA		
0062	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (30", 0.079")	18 EA		
0063	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (36", 0.079")	2 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0064	0636000000-E	310	**" CS PIPE ELBOWS, ******" THICK (42", 0.109")	2 EA		
0065	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (24", 0.375")	54 LF		
0066	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (30", 0.375")	102 LF		
0067	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (42", 0.500")	192 LF		
0068	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (48", 0.500")	114 LF		
0069	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (24", 0.375")	54 LF		
0070	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (30", 0.375")	102 LF		
0071	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (42", 0.500")	192 LF		
0072	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (48", 0.500")	114 LF		
0073	0995000000-E	340	PIPE REMOVAL	14,480 LF		
0074	0996000000-N	350	PIPE CLEAN OUT	10 EA		
0075	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0076	1077000000-E	SP	#57 STONE	20 TON		
0077	1099500000-E	505	SHALLOW UNDERCUT	8,000 CY		
0078	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	98,565 TON		
0079	1110000000-E	510	STABILIZER AGGREGATE	500 TON		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0080	1111000000-E	SP	CLASS IV AGGREGATE STABILIZATION	9,500 TON		
0081	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	187,400 SY		
0082	1121000000-E	520	AGGREGATE BASE COURSE	15,800 TON		
0083	1220000000-E	545	INCIDENTAL STONE BASE	1,000 TON		
0084	1231000000-E	560	SHOULDER BORROW	21,700 CY		
0085	1275000000-E	600	PRIME COAT	6,216 GAL		
0086	1330000000-E	607	INCIDENTAL MILLING	3,520 SY		
0087	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	139,930 TON		
0088	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	94,040 TON		
0089	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	50,950 TON		
0090	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	38,290 TON		
0091	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	16,525 TON		
0092	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	1,355 TON		
0093	1735000000-E	723	REPAIR OF JOINTED CONCRETE PAVEMENT SLABS	1,250 SY		
0094	1736000000-E	723	SELECT MATERIAL, CLASS IV	50 TON		
0095	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	57,550 LF		
0096	1847000000-E	710	******" PORT CEM CONC PAVEMENT, THROUGH LANES (WITH DOWELS) (12")	132,215 SY		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0097	1858000000-E	710	******" PORT CEM CONC PAVEMENT, RAMPS (WITH DOWELS) (12")	9,980 SY		
0098	1869000000-E	710	******" PORT CEM CONC PAVEMENT, MISCELLANEOUS (WITHOUT DOWELS) (12")	3,470 SY		
0099	1891000000-E	SP	GENERIC PAVING ITEM 7" JOINTED CONCRETE TRUCK APRON	380 SY		
0100	1891000000-E	SP	GENERIC PAVING ITEM DIAMOND GRINDING PCC PAVEMENT	45,730 SY		
0101	1913000000-E	720	CONCRETE SHOULDERS ADJACENT TO ******" PAVEMENT (12")	75,440 SY		
0102	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum	L.S.	
0103	1925000000-E	730	MILLED RUMBLE STRIPS (CONCRETE SHOULDERS)	60,240 LF		
0104	2000000000-N	806	RIGHT-OF-WAY MARKERS	278 EA		
0105	2020000000-N	806	CONTROL-OF-ACCESS MARKERS	8 EA		
0106	2022000000-E	815	SUBDRAIN EXCAVATION	5,174.4 CY		
0107	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	15,400 SY		
0108	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	2,587.2 CY		
0109	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	15,400 LF		
0110	2070000000-N	815	SUBDRAIN PIPE OUTLET	31 EA		
0111	2077000000-E	815	6" OUTLET PIPE	186 LF		
0112	2099000000-E	816	SHOULDER DRAIN	22,060 LF		
0113	2110000000-E	816	4" SHOULDER DRAIN PIPE	22,060 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0114	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	1,780 LF		
0115	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	40 EA		
0116	2143000000-E	818	BLOTTING SAND	20 TON		
0117	2209000000-E	838	ENDWALLS	56.374 CY		
0118	2220000000-E	838	REINFORCED ENDWALLS	50 CY		
0119	2253000000-E	840	PIPE COLLARS	21.554 CY		
0120	2275000000-E	SP	FLOWABLE FILL	31 CY		
0121	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	502 EA		
0122	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	96.64 CY		
0123	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	518.6 LF		
0124	2354000000-N	840	FRAME WITH GRATE, STD 840.22	4 EA		
0125	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	19 EA		
0126	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	106 EA		
0127	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	176 EA		
0128	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	4 EA		
0129	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	7 EA		
0130	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	45 EA		
0131	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	46 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0132	2396000000-N	840	FRAME WITH COVER, STD 840.54	44 EA		
0133	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	69 EA		
0134	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	6 EA		
0135	2473000000-N	SP	GENERIC DRAINAGE ITEM OUTLET CONTROL STUCTURE	2 EA		
0136	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	3,290 LF		
0137	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	13,160 LF		
0138	2556000000-E	846	SHOULDER BERM GUTTER	10,080 LF		
0139	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	550 LF		
0140	2591000000-E	848	4" CONCRETE SIDEWALK	2,550 SY		
0141	2605000000-N	848	CONCRETE CURB RAMPS	33 EA		
0142	2612000000-E	848	6" CONCRETE DRIVEWAY	1,200 SY		
0143	2619000000-E	850	4" CONCRETE PAVED DITCH	390 SY		
0144	2627000000-E	852	4" CONCRETE ISLAND COVER	6,020 SY		
0145	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	1,350 SY		
0146	2657000000-E	852	**" MONOLITHIC CONCRETE MEDIAN (*****) (8", NON-MOUNTABLE)	20 SY		
0147	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T)	9,670 LF		
0148	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	1,850 LF		
0149	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	2,750 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0150	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	9 EA		
0151	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	17,520 LF		
0152	2738000000-E	SP	GENERIC PAVING ITEM FILL AND CAP BEHIND BARRIER	270 SY		
0153	2752000000-E	SP	GENERIC PAVING ITEM 2'-0" MODIFIED VALLEY GUTTER	230 LF		
0154	2752000000-E	SP	GENERIC PAVING ITEM DDI BARRIER	710 LF		
0155	2759000000-N	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	4 EA		
0156	2815000000-N	858	ADJUSTMENT OF DROP INLETS	2 EA		
0157	2860000000-N	859	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX	1 EA		
0158	2905000000-N	859	CONVERT EXISTING DROP INLET TO JUNCTION BOX	6 EA		
0159	3030000000-E	862	STEEL BEAM GUARDRAIL	53,000 LF		
0160	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	150 LF		
0161	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA		
0162	3180000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)	1 EA		
0163	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	51 EA		
0164	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	8 EA		
0165	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	52 EA		
0166	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	13 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0167	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	30 EA		
0168	3360000000-E	863	REMOVE EXISTING GUARDRAIL	8,650 LF		
0169	3365000000-E	863	REMOVE EXISTING GUIDERAIL	15,390 LF		
0170	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	2,950 LF		
0171	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-2)	10 EA		
0172	3389400000-E	865	DOUBLE FACED CABLE GUIDERAIL	1,300 LF		
0173	3389500000-N	865	ADDITIONAL GUIDERAIL POSTS	5 EA		
0174	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	1 EA		
0175	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	51,900 LF		
0176	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	3,256 EA		
0177	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	825 EA		
0178	3559000000-E	866	** STRAND BARBED WIRE FENCE WITH POSTS (5)	3,230 LF		
0179	3564000000-E	866	SINGLE GATES, **" HIGH, **' WIDE, **' OPENING (47", 12', 12')	6 EA		
0180	3628000000-E	876	RIP RAP, CLASS I	8,220 TON		
0181	3635000000-E	876	RIP RAP, CLASS II	210 TON		
0182	3642000000-E	876	RIP RAP, CLASS A	10 TON		
0183	3649000000-E	876	RIP RAP, CLASS B	4,780 TON		
0184	3651000000-E	SP	BOULDERS	40 TON		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0185	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	35,825 SY		
0186	3659000000-N	873	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	11 EA		
0187	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	15 CY		
0188	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	3 CY		
0189	4057000000-E	SP	OVERHEAD FOOTING	727 CY		
0190	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	15,077 LB		
0191	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	4,418 LB		
0192	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	4,723 LF		
0193	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	14 EA		
0194	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (155+88 -Y15-)	Lump Sum	L.S.	
0195	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (160+00 -Y15-)	Lump Sum	L.S.	
0196	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (160+85 -Y15-)	Lump Sum	L.S.	
0197	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (17+50 -Y15REV-)	Lump Sum	L.S.	
0198	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (20+87 -Y4-)	Lump Sum	L.S.	
0199	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (24+50 -Y15-)	Lump Sum	L.S.	
0200	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (26+00 -Y4-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0201	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (26+37 -Y15FLYBD-)	Lump Sum	L.S.	
0202	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (29+41 -Y4-)	Lump Sum	L.S.	
0203	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (31+94 -Y4-)	Lump Sum	L.S.	
0204	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (32+00 -Y15-)	Lump Sum	L.S.	
0205	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (32+00 -Y15FLYAC-)	Lump Sum	L.S.	
0206	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (34+68 -Y15FLYCA-)	Lump Sum	L.S.	
0207	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (47+00 -Y15FLYAC-)	Lump Sum	L.S.	
0208	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (50+46 -Y15-)	Lump Sum	L.S.	
0209	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (52+00 -Y15FLYCA-)	Lump Sum	L.S.	
0210	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (56+00 -Y15REV-)	Lump Sum	L.S.	
0211	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (666+00 -L-)	Lump Sum	L.S.	
0212	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (686+00 -L-)	Lump Sum	L.S.	
0213	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (702+30 -L-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0214	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (706+00 -L-)	Lump Sum	L.S.	
0215	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (737+50 -L- EB)	Lump Sum	L.S.	
0216	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (737+50 -L- WB)	Lump Sum	L.S.	
0217	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (757+00 -L-)	Lump Sum	L.S.	
0218	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (76+25 -Y15FLYBD-)	Lump Sum	L.S.	
0219	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (763+84 -L-)	Lump Sum	L.S.	
0220	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (794+00 -L-)	Lump Sum	L.S.	
0221	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (819+00 -L-)	Lump Sum	L.S.	
0222	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (826+00 -L-)	Lump Sum	L.S.	
0223	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (835+50 -L-)	Lump Sum	L.S.	
0224	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (89+70 -Y15REV-)	Lump Sum	L.S.	
0225	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (91+50 -Y15REV-)	Lump Sum	L.S.	
0226	4096000000-N	904	SIGN ERECTION, TYPE D	7 EA		
0227	4102000000-N	904	SIGN ERECTION, TYPE E	255 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0228	4108000000-N	904	SIGN ERECTION, TYPE F	7 EA		
0229	4109000000-N	904	SIGN ERECTION, TYPE *** (OVER-HEAD) (A)	56 EA		
0230	4109000000-N	904	SIGN ERECTION, TYPE *** (OVER-HEAD) (B)	29 EA		
0231	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	18 EA		
0232	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	2 EA		
0233	4114000000-N	904	SIGN ERECTION, MILEMARKERS	12 EA		
0234	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	3 EA		
0235	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	6 EA		
0236	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	5 EA		
0237	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	33 EA		
0238	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	562 SF		
0239	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	2,452 SF		
0240	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	565 SF		
0241	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	16 SF		
0242	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	380 SF		
0243	4415000000-N	1115	FLASHING ARROW BOARD	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0244	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	10 EA		
0245	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	10 EA		
0246	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	56 EA		
0247	4430000000-N	1130	DRUMS	410 EA		
0248	4432000000-N	SP	HIGH VISIBILITY DRUMS	510 EA		
0249	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	60 EA		
0250	4435000000-N	1135	CONES	74 EA		
0251	4445000000-E	1145	BARRICADES (TYPE III)	936 LF		
0252	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	45 LF		
0253	4455000000-N	1150	FLAGGER	106 DAY		
0254	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	9 EA		
0255	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	14 EA		
0256	4480000000-N	1165	TMA	6 EA		
0257	4485000000-E	1170	PORTABLE CONCRETE BARRIER	31,326 LF		
0258	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	250 LF		
0259	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	45,830 LF		
0260	4510000000-N	1190	LAW ENFORCEMENT	64 HR		
0261	4570000000-E	SP	TEMPORARY GLARE SCREEN	4,977 LF		
0262	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	9 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0263	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8 EA		
0264	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM FLASHING BEACON AND DETECTION SYSTEM	2 EA		
0265	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	3,165 EA		
0266	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	44,152 LF		
0267	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	156,846 LF		
0268	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	2,728 LF		
0269	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	18,414 LF		
0270	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	108 EA		
0271	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	288 EA		
0272	4775000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (IV)	1,646 LF		
0273	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (IV)	1,632 LF		
0274	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	200,932 LF		
0275	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	7,767 LF		
0276	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	134 LF		
0277	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	4,594 LF		
0278	4840000000-N	1205	PAINT PAVEMENT MARKING CHARAC-TER	60 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0279	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	465 EA		
0280	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	268,270 LF		
0281	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	9,332 LF		
0282	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	22,125 LF		
0283	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	164,490 LF		
0284	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	490 LF		
0285	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	3,829 LF		
0286	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	319 LF		
0287	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	27 EA		
0288	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12" 30 MILS (STANDARD GLASS BEADS)	13,967 LF		
0289	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 30 MILS (STANDARD GLASS BEADS)	4,479 LF		
0290	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 30 MILS (STANDARD GLASS BEADS)	138,443 LF		
0291	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 8", 30 MILS (STANDARD GLASS BEADS)	124 LF		
0292	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	1,989 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0293	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	4,352 EA		
0294	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	145 EA		
0295	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA		
0296	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA		
0297	5025000000-E	SP	HIGH MOUNT FOUNDATIONS	21 CY		
0298	5030000000-N	SP	HIGH MOUNT LUMINAIRES ******** (560W LED)	18 EA		
0299	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' SA, 15' ARM)	13 EA		
0300	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)	8 EA		
0301	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R1)	19 EA		
0302	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R2)	2 EA		
0303	5080000000-N	SP	LIGHT STANDARD LUMINAIRES, TYPE ********** (RDW, 285W LED)	29 EA		
0304	5120000000-N	1407	ELECTRIC SERVICE POLE **** ******** (30' CLASS 4)	1 EA		
0305	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 1/0 USE)	25 LF		
0306	5145000000-N	1408	LIGHT CONTROL EQUIPMENT, TYPE RW ********** (240/480 V)	1 EA		
0307	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	470 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0308	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")	655 LF		
0309	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")	315 LF		
0310	5170000000-E	1410	** #8 W/G FEEDER CIRCUIT (2)	460 LF		
0311	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2)	600 LF		
0312	5180000000-E	1410	** #4 W/G FEEDER CIRCUIT (2)	190 LF		
0313	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	5,230 LF		
0314	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	3,040 LF		
0315	5215000000-E	1410	** #4 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	2,635 LF		
0316	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (CS36)	1 EA		
0317	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM18)	3 EA		
0318	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG18)	13 EA		
0319	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG30)	5 EA		
0320	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS18)	19 EA		
0321	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS30)	2 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0322	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0323	5325000000-E	1510	**" WATER LINE (36")	1,303 LF		
0324	5325200000-E	1510	2" WATER LINE	271 LF		
0325	5325600000-E	1510	6" WATER LINE	5,887 LF		
0326	5326200000-E	1510	12" WATER LINE	35 LF		
0327	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	41,890 LB		
0328	5540000000-E	1515	6" VALVE	41 EA		
0329	5558000000-E	1515	12" VALVE	1 EA		
0330	5571600000-E	1515	6" TAPPING SLEEVE & VALVE	1 EA		
0331	5600000000-E	1515	**" BLOW OFF (3/4")	1 EA		
0332	5648000000-N	1515	RELOCATE WATER METER	48 EA		
0333	5649000000-N	1515	RECONNECT WATER METER	4 EA		
0334	5666000000-N	1515	FIRE HYDRANT	24 EA		
0335	5672000000-N	1515	RELOCATE FIRE HYDRANT	1 EA		
0336	5673000000-E	1515	FIRE HYDRANT LEG	503 LF		
0337	5678400000-E	1515	6" LINE STOP	1 EA		
0338	5679000000-E	1515	12" LINE STOP	1 EA		
0339	5686500000-E	1515	WATER SERVICE LINE	2,465 LF		
0340	5691300000-E	1520	8" SANITARY GRAVITY SEWER	8,921 LF		
0341	5691600000-E	1520	16" SANITARY GRAVITY SEWER	1,586 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0342	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	21 EA		
0343	5768500000-E	1520	SEWER SERVICE LINE	1,240 LF		
0344	5775000000-E	1525	4' DIA UTILITY MANHOLE	40 EA		
0345	5776000000-E	1525	5' DIA UTILITY MANHOLE	18 EA		
0346	5777000000-E	1525	6' DIA UTILITY MANHOLE	4 EA		
0347	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	222 LF		
0348	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	190 LF		
0349	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	12 LF		
0350	5798000000-E	1530	ABANDON **" UTILITY PIPE (15")	1,565 LF		
0351	5798000000-E	1530	ABANDON **" UTILITY PIPE (36")	410 LF		
0352	5801000000-E	1530	ABANDON 8" UTILITY PIPE	5,100 LF		
0353	5811000000-E	1530	ABANDON 18" UTILITY PIPE	391 LF		
0354	5815000000-N	1530	REMOVE WATER METER	373 EA		
0355	5815500000-N	1530	REMOVE FIRE HYDRANT	49 EA		
0356	5816000000-N	1530	ABANDON UTILITY MANHOLE	102 EA		
0357	5828000000-N	1530	REMOVE UTILITY MANHOLE	5 EA		
0358	5835000000-E	1540	**" ENCASEMENT PIPE (54")	330 LF		
0359	5835800000-E	1540	18" ENCASEMENT PIPE	1,340 LF		
0360	5836200000-E	1540	30" ENCASEMENT PIPE	360 LF		
0361	5872500000-E	1550	BORE AND JACK OF **" (18")	885 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0362	5882000000-N	SP	GENERIC UTILITY ITEM 36" X 6" TAPPING SLEEVE AND VALVE	1 EA		
0363	5882000000-N	SP	GENERIC UTILITY ITEM 4" COMBINATION AIR VALVE IN MH	1 EA		
0364	5882000000-N	SP	GENERIC UTILITY ITEM STEEL PILE PIER	3 EA		
0365	6000000000-E	1605	TEMPORARY SILT FENCE	242,460 LF		
0366	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	9,325 TON		
0367	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	44,570 TON		
0368	6012000000-E	1610	SEDIMENT CONTROL STONE	25,840 TON		
0369	6015000000-E	1615	TEMPORARY MULCHING	1,404.5 ACR		
0370	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	54,100 LB		
0371	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEED-ING	270.5 TON		
0372	6024000000-E	1622	TEMPORARY SLOPE DRAINS	24,585 LF		
0373	6029000000-E	SP	SAFETY FENCE	5,640 LF		
0374	6030000000-E	1630	SILT EXCAVATION	206,860 CY		
0375	6036000000-E	1631	MATTING FOR EROSION CONTROL	771,880 SY		
0376	6037000000-E	SP	COIR FIBER MAT	1,515 SY		
0377	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	18,500 SY		
0378	6042000000-E	1632	1/4" HARDWARE CLOTH	40,410 LF		
0379	6045000000-E	SP	**" TEMPORARY PIPE (15")	150 LF		

County : Forsyth

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0380	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	100 LF		
0381	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	165 SY		
0382	6069000000-E	1638	STILLING BASINS	1,016 CY		
0383	6070000000-N	1639	SPECIAL STILLING BASINS	13 EA		
0384	6071010000-E	SP	WATTLE	1,530 LF		
0385	6071012000-E	SP	COIR FIBER WATTLE	9,400 LF		
0386	6071013000-E	SP	WATTLE BARRIER	28,290 LF		
0387	6071020000-E	SP	POLYACRYLAMIDE (PAM)	14,635 LB		
0388	6071030000-E	1640	COIR FIBER BAFFLE	29,710 LF		
0389	6071050000-E	SP	**" SKIMMER (1-1/2")	58 EA		
0390	6071050000-E	SP	**" SKIMMER (2")	29 EA		
0391	6071050000-E	SP	**" SKIMMER (2-1/2")	8 EA		
0392	6071050000-E	SP	**" SKIMMER (3")	5 EA		
0393	6071050000-E	SP	**" SKIMMER (4")	1 EA		
0394	6084000000-E	1660	SEEDING & MULCHING	747 ACR		
0395	6087000000-E	1660	MOWING	858 ACR		
0396	6090000000-E	1661	SEED FOR REPAIR SEEDING	14,250 LB		
0397	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	36.75 TON		
0398	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	18,275 LB		

County : Forsyth

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0399	6108000000-E	1665	FERTILIZER TOPDRESSING	548 TON		
0400	6111000000-E	SP	IMPERVIOUS DIKE	1,090 LF		
0401	6114500000-N	1667	SPECIALIZED HAND MOWING	290 MHR		
0402	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	150 EA		
0403	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	34 EA		
0404	6120000000-E	SP	CULVERT DIVERSION CHANNEL	2,650 CY		
0405	6123000000-E	1670	REFORESTATION	11 ACR		
0406	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	185 EA		
0407	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	553 EA		
0408	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	16 EA		
0409	7060000000-E	1705	SIGNAL CABLE	15,050 LF		
0410	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	72 EA		
0411	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	7 EA		
0412	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	10 EA		
0413	7252000000-E	1710	MESSENGER CABLE (1/4")	4,600 LF		
0414	7264000000-E	1710	MESSENGER CABLE (3/8")	2,925 LF		
0415	7279000000-E	1715	TRACER WIRE	35,406 LF		
0416	7288000000-E	1715	PAVED TRENCHING (**********) (1, 2")	25 LF		

County : Forsyth

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0417	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	4,271 LF		
0418	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	28,788 LF		
0419	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 2")	2,530 LF		
0420	7300000000-E	1715	UNPAVED TRENCHING (**********) (4, 2")	440 LF		
0421	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,375 LF		
0422	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	2,354 LF		
0423	7301000000-E	1715	DIRECTIONAL DRILL (**********) (3, 2")	594 LF		
0424	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	98 EA		
0425	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)	75 EA		
0426	7360000000-N	1720	WOOD POLE	23 EA		
0427	7372000000-N	1721	GUY ASSEMBLY	23 EA		
0428	7384000000-E	1722	***" RISER WITH ********** (1-1/2", WEATHERHEAD)	11 EA		
0429	7408000000-E	1722	1" RISER WITH WEATHERHEAD	2 EA		
0430	7420000000-E	1722	2" RISER WITH WEATHERHEAD	2 EA		
0431	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	5,625 LF		
0432	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	13,700 LF		
0433	7481000000-N	SP	SITE SURVEY	2 EA		
0434	7481200000-N	SP	LUMINAIRE ARM FOR VIDEO SYSTEM	4 EA		

County : Forsyth

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0435	7481240000-N	SP	CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT	8 EA		
0436	7481260000-N	SP	EXTERNAL LOOP EMULATOR PROCESSING UNIT	2 EA		
0437	7481280000-N	SP	RELOCATE CAMERA SENSOR UNIT	8 EA		
0438	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (144)	21,534 LF		
0439	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (24)	830 LF		
0440	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (36)	5,425 LF		
0441	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (72)	21,055 LF		
0442	7528000000-E	1730	DROP CABLE	5,271 LF		
0443	7540000000-N	1731	SPLICE ENCLOSURE	19 EA		
0444	7552000000-N	1731	INTERCONNECT CENTER	21 EA		
0445	7566000000-N	1733	DELINEATOR MARKER	87 EA		
0446	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	4,900 LF		
0447	7576000000-N	SP	METAL STRAIN SIGNAL POLE	8 EA		
0448	7588000000-N	SP	METAL POLE WITH SINGLE MAST ARM	6 EA		
0449	7613000000-N	SP	SOIL TEST	21 EA		
0450	7614100000-E	SP	DRILLED PIER FOUNDATION	95 CY		
0451	7631000000-N	SP	MAST ARM WITH METAL POLE DESIGN	6 EA		
0452	7636000000-N	1745	SIGN FOR SIGNALS	25 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0453	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	18 EA		
0454	7684000000-N	1750	SIGNAL CABINET FOUNDATION	4 EA		
0455	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE MOUNTED)	4 EA		
0456	7744000000-N	1751	DETECTOR CARD (TYPE 170)	32 EA		
0457	7901000000-N	1753	CABINET BASE EXTENDER	4 EA		
0458	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	1 EA		
0459	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	66 EA		
0460	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE (60')	7 EA		
0461	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	8 EA		
0462	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	5 EA		
0463	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	5 EA		
0464	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE-2C)	5 EA		
0465	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	11 EA		
0466	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	17 EA		
0467	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	8 EA		
0468	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET	1 EA		
0469	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0470	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION	1 EA		
0471	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER-SIZED)	12 EA		
0472	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA-TION PANEL	11 EA		
0473	7980000000-N	SP	GENERIC SIGNAL ITEM SOLAR POWER ASSEMBLY	1 EA		
0474	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	11 EA		
0475	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR	660 LF		
0476	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC-TORS	1,675 LF		
0477	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC-TORS	3,570 LF		

CULVERT ITEMS

0478	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (30+13.47 -Y115REV-)	Lump Sum	L.S.	
0479	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0480	8126000000-N	414	CULVERT EXCAVATION, STA ****** (18+22.67 -Y5B-)	Lump Sum	L.S.	
0481	8126000000-N	414	CULVERT EXCAVATION, STA ****** (19+75.11 -Y5B-)	Lump Sum	L.S.	
0482	8126000000-N	414	CULVERT EXCAVATION, STA ****** (30+13.47 -Y115REV-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0483	8126000000-N	414	CULVERT EXCAVATION, STA ****** (35+53.70 -Y15RPDREV-)	Lump Sum	L.S.	
0484	8126000000-N	414	CULVERT EXCAVATION, STA ****** (43+66.60 -Y15FLYCA-)	Lump Sum	L.S.	
0485	8126000000-N	414	CULVERT EXCAVATION, STA ****** (768+62.23 -L-)	Lump Sum	L.S.	
0486	8126000000-N	414	CULVERT EXCAVATION, STA ****** (792+88.12 -L-)	Lump Sum	L.S.	
0487	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	6,207 TON		
0488	8196000000-E	420	CLASS A CONCRETE (CULVERT)	4,604.7 CY		
0489	8245000000-E	425	REINFORCING STEEL (CULVERT)	799,380 LB		
0490	8590000000-E	876	RIP RAP, CLASS ** (A)	85 TON		
0491	8594000000-E	876	RIP RAP, CLASS B	85 TON		
0492	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,990 SY		

WALL ITEMS

0493	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	4,090 SF		
0494	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	3,250 SF		
0495	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT	555,368 SF		
0496	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 1	56,818 SF		
0497	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 2	85,427 SF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0498	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 3	87,297 SF		
0499	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 4	108,020 SF		
			STRUCTURE ITEMS			
0500	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 22+26.35 -Y1B-)	Lump Sum	L.S.	
0501	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0502	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0503	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (2, 47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0504	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (2, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0505	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0506	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0507	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0508	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0509	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	

County : Forsyth

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0510	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0511	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0512	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0513	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0514	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0515	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0516	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0517	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (7, 58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0518	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (8, 60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0519	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (9, 60+66.06-Y15FLYAC-)	Lump Sum	L.S.	
0520	8096000000-E	450	PILE EXCAVATION IN SOIL	115 LF		
0521	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	185 LF		
0522	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (4'-6")	56 LF		
0523	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (6'-0")	47 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0524	8105560000-E	411	4'-0" DIA DRILLED PIERS IN SOIL	98.5 LF		
0525	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (4'-6")	56 LF		
0526	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (5'-6")	140 LF		
0527	8105660000-E	411	4'-0" DIA DRILLED PIERS NOT IN SOIL	212 LF		
0528	8112730000-N	450	PDA TESTING	2 EA		
0529	8113000000-N	411	SID INSPECTIONS	5 EA		
0530	8114000000-N	411	SPT TESTING	8 EA		
0531	8115000000-N	411	CSL TESTING	4 EA		
0532	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	294,675 SF		
0533	8161000000-E	420	GROOVING BRIDGE FLOORS	268,594 SF		
0534	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	9,485.3 CY		
0535	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	2,195.6 CY		
0536	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (22+26.35 -Y1B-)	Lump Sum	L.S.	
0537	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (23+43.03 -Y16-)	Lump Sum	L.S.	
0538	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (30+67.66 -Y4-)	Lump Sum	L.S.	
0539	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (47+28.33 -Y15REV-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0540	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (47+63.62 -Y15FLYBD-)	Lump Sum	L.S.	
0541	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (58+33.94 -Y15FLYCA-)	Lump Sum	L.S.	
0542	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (60+66.06 -Y15FLYAC-)	Lump Sum	L.S.	
0543	8217000000-E	425	REINFORCING STEEL (BRIDGE)	2,090,775 LB		
0544	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	29,987 LB		
0545	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	1,763.7 LF		
0546	8280000000-E	440	APPROX ..... LBS STRUCTURAL STEEL	11,906,699 LS		
0547	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	114 EA		
0548	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)	805 EA		
0549	8364000000-E	450	HP12X53 STEEL PILES	4,420 LF		
0550	8384000000-E	450	HP14X73 STEEL PILES	40,416 LF		
0551	8391000000-N	450	STEEL PILE POINTS	39 EA		
0552	8392500000-E	450	PREDRILLING FOR PILES	96 LF		
0553	8475000000-E	460	TWO BAR METAL RAIL	1,617.2 LF		
0554	8503000000-E	460	CONCRETE BARRIER RAIL	10,618.7 LF		
0555	8505000000-E	460	VERTICAL CONCRETE BARRIER RAIL	423.5 LF		
0556	8510000000-E	460	CONCRETE MEDIAN BARRIER	309.7 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0557	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 2'-3 1/2")	354.1 LF		
0558	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 2'-6")	832.98 LF		
0559	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 3'-3 3/4")	481.4 LF		
0560	8531000000-E	462	4" SLOPE PROTECTION	4,824.2 SY		
0561	8654000000-N	SP	DISC BEARINGS	Lump Sum	L.S.	
0562	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0563	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum	L.S.	
0564	8713000000-N	SP	MODULAR EXPANSION JOINT SEALS	Lump Sum	L.S.	
0565	8860000000-N	SP	GENERIC STRUCTURE ITEM POST TENSIONING ENCASEMENT	Lump Sum	L.S.	
0566	8860000000-N	SP	GENERIC STRUCTURE ITEM POST TENSIONING TENDONS	Lump Sum	L.S.	
0567	8867000000-E	SP	GENERIC STRUCTURE ITEM 63" PRESTRESSED CONCRETE FLORIDA I-BEAM GIRDERS	4,566.33 LF		
0568	8881000000-E	SP	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE	95.2 CY		
0569	8897000000-N	SP	GENERIC STRUCTURE ITEM 9-5/8" DIA MICROPILES	196 EA		
0570	8897000000-N	SP	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES	1 EA		
0571	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0572	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS	1 EA		

1515/Dec14/Q24607642.628/D2743137475000/E572 **Total Amount Of Bid For Entire Project :**

Advertised DBE Goal: 8.0%
DBE Participation Submitted: 8.0%

Vendor 1 of 3: WEBBER, LLC (12078)
Call Order 001 (Proposal: C204633)

Bid Bond Information

Projects:		**Bond Maximum:**	
Counties:		**State of Incorporation:**	IN
Bond ID:	F35F-C530-940F-6F72	**Agency Execution Date:**	2021-12-13T00
Paid by Check:	No	**Surety Name:**	SuretyWave
Bond Percent:	5%	**Bond Agency Name:**	Federal Insurance Company

Vendor 1 of 3: WEBBER, LLC (12078)
Call Order 001 (Proposal: C204633)

Bid Information

Proposal County: FORSYTH

Vendor Address: 9303 NEW TRAILS DR SUITE 200
SUITE 200
THE WOODLANDS , TX , 77381

Signature Check: Troy Wayne Childers

Time Bid Received: December 21, 2021 01:53 PM

Amendment Count: 2

Bid Checksum: BC3A1F081B

Bid Total: $261,764,022.37

Items Total: $261,764,022.37

Time Total: $0.00

Bidding Errors:
None.

DBE Load Information

Letting ID: L211221
Letting Date: 12/21/2021
Call Order: 001
Contract ID: C204633
Project: NHPIM-0040(68)NHPIM-0040(68)NHPIM-0040(68)NHPIM-0040(68)
Bid Total: $261,764,022.37
DBE Goal: 8.00% ($20,941,121.79)

Vendor ID: 12078
Vendor Name: Webber, LLC
DBE Entered: 8.00% ($20,945,186.47)

Vendor ID	DBE Name	Is Supplier?	City/State	Goods/Service	Amount
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607	SubContractor	6,012,967.97
3230	HIATT & MASON ENTERPRISES INC	False	POST OFFICE BOX 1378 , MOUNT AIRY, NC 27030	SubContractor	7,793,429.50
3376	REYNOLDS FENCE & GUARDRAIL INC	False	9320 MACHADO DRIVE , INDIAN TRAIL, NC 28079	SubContractor	1,949,410.00
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114	SubContractor	4,307,751.50
12836	SKYROCK CONCRETE FINISHING INC	False	P. O. BOX 2278 , SHELBY, NC 28151	SubContractor	881,627.50

BondID: F35F-C530-940F-6F72
Surety Registry Agency: SuretyWave
Verified?: 1
Surety Agency: Federal Insurance Company
Bond Execution Date: 2021-12-13T00:00:00

Line Number	Item Number	Quantity	Unit	Unit Price	Extension Price
Section 0001 ROADWAY ITEMS - NPAR (CITY OF WINSTON SALEM)					
0001	0000100000-N MOBILIZATION	1.000	LS	$13,500,000.0000	$13,500,000.00
0002	0000400000-N CONSTRUCTION SURVEYING	1.000	LS	$5,000,000.0000	$5,000,000.00
0003	0001000000-E CLEARING & GRUBBING .. ACRE(S)	1.000	LS	$13,500,000.0000	$13,500,000.00
0004	0008000000-E SUPPLEMENTARY CLEARING & GRUB-BING	5.000	ACR	$8,854.7300	$44,273.65
0005	0022000000-E UNCLASSIFIED EXCAVATION	3192000.000	CY	$4.9400	$15,768,480.00
0006	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (22+26.35 -Y1B-)	1.000	LS	$30,500.4100	$30,500.41
0007	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (23+43.03 -Y16-)	1.000	LS	$30,689.6900	$30,689.69
0008	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (47+28.33 -Y15REV-)	1.000	LS	$91,890.6600	$91,890.66
0009	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (47+63.62 -Y15FLYBD-)	1.000	LS	$42,821.4200	$42,821.42
0010	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (58+33.94 -Y15FLYCA-)	1.000	LS	$52,200.6600	$52,200.66
0011	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (60+66.06 -Y15FLYAC-)	1.000	LS	$46,435.4000	$46,435.40
0012	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (30+67.66 -Y4-)	1.000	LS	$123,127.9600	$123,127.96
0013	0036000000-E UNDERCUT EXCAVATION	10000.000	CY	$8.0900	$80,900.00
0014	0127000000-N EMBANKMENT SETTLEMENT GAUGES	4.000	EA	$1,000.0000	$4,000.00
0015	0134000000-E DRAINAGE DITCH EXCAVATION	162460.000	CY	$12.1300	$1,970,639.80
0016	0141000000-E BERM DITCH CONSTRUCTION	6820.000	LF	$10.1100	$68,950.20
0017	0156000000-E REMOVAL OF EXISTING ASPHALT PAVEMENT	64350.000	SY	$7.4900	$481,981.50
0018	0163000000-E REMOVAL OF EXISTING CONCRETE PAVEMENT	75130.000	SY	$18.2000	$1,367,366.00
0019	0177000000-E BREAKING OF EXISTING ASPHALT PAVEMENT	16650.000	SY	$5.0600	$84,249.00
0020	0185000000-E BREAKING OF EXISTING CONCRETE PAVEMENT	9630.000	SY	$6.0700	$58,454.10
0021	0192000000-N PROOF ROLLING	120.000	HR	$500.0000	$60,000.00
0022	0194000000-E SELECT GRANULAR MATERIAL, CLASS III	28900.000	CY	$60.6700	$1,753,363.00
0023	0195000000-E	10000.000	CY	$45.5000	$455,000.00

		SELECT GRANULAR MATERIAL			
0024	0196000000-E	74600.000	SY	$3.0300	$226,038.00
		GEOTEXTILE FOR SOIL STABILIZA-TION			
0025	0255000000-E	500.000	TON	$151.6700	$75,835.00
		GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO- LEUM CONTAMINATED SOIL			
0026	0318000000-E	7124.000	TON	$62.4700	$445,036.28
		FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES			
0027	0320000000-E	25560.000	SY	$3.1200	$79,747.20
		FOUNDATION CONDITIONING GEO- TEXTILE			
0028	0343000000-E	1416.000	LF	$57.2700	$81,094.32
		15" SIDE DRAIN PIPE			
0029	0344000000-E	344.000	LF	$67.6800	$23,281.92
		18" SIDE DRAIN PIPE			
0030	0354000000-E	362.000	LF	$390.4500	$141,342.90
		*** RC PIPE CULVERTS, CLASS ***** (42", V)			
0031	0354000000-E	292.000	LF	$572.6700	$167,219.64
		*** RC PIPE CULVERTS, CLASS ***** (54", V)			
0032	0354000000-E	620.000	LF	$645.5500	$400,241.00
		*** RC PIPE CULVERTS, CLASS ***** (60", V)			
0033	0360000000-E	124.000	LF	$52.0600	$6,455.44
		12" RC PIPE CULVERTS, CLASS III			
0034	0366000000-E	9040.000	LF	$52.0600	$470,622.40
		15" RC PIPE CULVERTS, CLASS III			
0035	0372000000-E	12832.000	LF	$67.6800	$868,469.76
		18" RC PIPE CULVERTS, CLASS III			
0036	0378000000-E	6288.000	LF	$93.7100	$589,248.48
		24" RC PIPE CULVERTS, CLASS III			
0037	0384000000-E	3838.000	LF	$124.9500	$479,558.10
		30" RC PIPE CULVERTS, CLASS III			
0038	0390000000-E	2832.000	LF	$187.4200	$530,773.44
		36" RC PIPE CULVERTS, CLASS III			
0039	0396000000-E	1756.000	LF	$255.1000	$447,955.60
		42" RC PIPE CULVERTS, CLASS III			
0040	0402000000-E	704.000	LF	$312.3600	$219,901.44
		48" RC PIPE CULVERTS, CLASS III			
0041	0408000000-E	212.000	LF	$520.6000	$110,367.20
		54" RC PIPE CULVERTS, CLASS III			
0042	0414000000-E	744.000	LF	$598.7000	$445,432.80
		60" RC PIPE CULVERTS, CLASS III			
0043	0426000000-E	56.000	LF	$1,041.2100	$58,307.76
		72" RC PIPE CULVERTS, CLASS III			
0044	0448000000-E	168.000	LF	$390.4500	$65,595.60
		**** RC PIPE CULVERTS, CLASS IV (48")			
0045	0448000000-E	292.000	LF	$572.6700	$167,219.64
		**** RC PIPE CULVERTS, CLASS IV (54")			
0046	0448000000-E	360.000	LF	$624.7300	$224,902.80
		**** RC PIPE CULVERTS, CLASS IV (60")			
0047	0448200000-E	4348.000	LF	$62.4700	$271,619.56
		15" RC PIPE CULVERTS, CLASS IV			

0048	0448300000-E	2932.000	LF	$67.6800	$198,437.76
	18" RC PIPE CULVERTS, CLASS IV				
0049	0448400000-E	1232.000	LF	$104.1200	$128,275.84
	24" RC PIPE CULVERTS, CLASS IV				
0050	0448500000-E	92.000	LF	$135.3600	$12,453.12
	30" RC PIPE CULVERTS, CLASS IV				
0051	0448600000-E	784.000	LF	$197.8300	$155,098.72
	36" RC PIPE CULVERTS, CLASS IV				
0052	0448700000-E	348.000	LF	$260.3000	$90,584.40
	42" RC PIPE CULVERTS, CLASS IV				
0053	0576000000-E	164.000	LF	$260.3000	$42,689.20
	" CS PIPE CULVERTS, ***" THICK (36", 0.079")				
0054	0576000000-E	80.000	LF	$343.6000	$27,488.00
	" CS PIPE CULVERTS, ***" THICK (42", 0.109")				
0055	0582000000-E	2390.000	LF	$93.7100	$223,966.90
	15" CS PIPE CULVERTS, 0.064" THICK				
0056	0588000000-E	688.000	LF	$104.1200	$71,634.56
	18" CS PIPE CULVERTS, 0.064" THICK				
0057	0594000000-E	752.000	LF	$114.5300	$86,126.56
	24" CS PIPE CULVERTS, 0.064" THICK				
0058	0600000000-E	580.000	LF	$229.0700	$132,860.60
	30" CS PIPE CULVERTS, 0.079" THICK				
0059	0636000000-E	86.000	EA	$520.6000	$44,771.60
	" CS PIPE ELBOWS, ***" THICK (15", 0.064")				
0060	0636000000-E	26.000	EA	$572.6700	$14,889.42
	" CS PIPE ELBOWS, ***" THICK (18", 0.064")				
0061	0636000000-E	20.000	EA	$624.7300	$12,494.60
	" CS PIPE ELBOWS, ***" THICK (24", 0.064")				
0062	0636000000-E	18.000	EA	$1,041.2100	$18,741.78
	" CS PIPE ELBOWS, ***" THICK (30", 0.079")				
0063	0636000000-E	2.000	EA	$1,041.2100	$2,082.42
	" CS PIPE ELBOWS, ***" THICK (36", 0.079")				
0064	0636000000-E	2.000	EA	$1,561.8200	$3,123.64
	" CS PIPE ELBOWS, ***" THICK (42", 0.109")				
0065	0973100000-E	54.000	LF	$104.1200	$5,622.48
	" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (24", 0.375")				
0066	0973100000-E	102.000	LF	$130.1500	$13,275.30
	" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (30", 0.375")				
0067	0973100000-E	192.000	LF	$156.1800	$29,986.56
	" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (42", 0.500")				
0068	0973100000-E	114.000	LF	$182.2100	$20,771.94
	" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (48", 0.500")				
0069	0973300000-E	54.000	LF	$156.1800	$8,433.72
	" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (24", 0.375")				
0070	0973300000-E	102.000	LF	$182.2100	$18,585.42
	" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (30", 0.375")				
0071	0973300000-E	192.000	LF	$208.2400	$39,982.08
	" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (42", 0.500")				
0072	0973300000-E	114.000	LF	$260.3000	$29,674.20

	" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (48", 0.500")				
0073	0995000000-E PIPE REMOVAL	14480.000	LF	$15.6200	$226,177.60
0074	0996000000-N PIPE CLEAN OUT	10.000	EA	$5,206.0500	$52,060.50
0075	1011000000-N FINE GRADING	1.000	LS	$3,225,000.0000	$3,225,000.00
0076	1077000000-E #57 STONE	20.000	TON	$46.8500	$937.00
0077	1099500000-E SHALLOW UNDERCUT	8000.000	CY	$10.1500	$81,200.00
0078	1099700000-E CLASS IV SUBGRADE STABILIZA- TION	98565.000	TON	$43.0300	$4,241,251.95
0079	1110000000-E STABILIZER AGGREGATE	500.000	TON	$43.0300	$21,515.00
0080	1111000000-E CLASS IV AGGREGATE STABILIZA- TION	9500.000	TON	$44.2600	$420,470.00
0081	1115000000-E GEOTEXTILE FOR PAVEMENT STA- BILIZATION	187400.000	SY	$4.3000	$805,820.00
0082	1121000000-E AGGREGATE BASE COURSE	15800.000	TON	$46.7200	$738,176.00
0083	1220000000-E INCIDENTAL STONE BASE	1000.000	TON	$40.4400	$40,440.00
0084	1231000000-E SHOULDER BORROW	21700.000	CY	$15.1700	$329,189.00
0085	1275000000-E PRIME COAT	6216.000	GAL	$5.2500	$32,634.00
0086	1330000000-E INCIDENTAL MILLING	3520.000	SY	$2.0000	$7,040.00
0087	1491000000-E ASPHALT CONC BASE COURSE, TYPE B25.0C	139930.000	TON	$55.0000	$7,696,150.00
0088	1503000000-E ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	94040.000	TON	$53.0000	$4,984,120.00
0089	1519000000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5B	50950.000	TON	$59.2500	$3,018,787.50
0090	1523000000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5C	38290.000	TON	$60.0000	$2,297,400.00
0091	1575000000-E ASPHALT BINDER FOR PLANT MIX	16525.000	TON	$518.0000	$8,559,950.00
0092	1693000000-E ASPHALT PLANT MIX, PAVEMENT REPAIR	1355.000	TON	$162.8900	$220,715.95
0093	1735000000-E REPAIR OF JOINTED CONCRETE PAVEMENT SLABS	1250.000	SY	$451.6600	$564,575.00
0094	1736000000-E SELECT MATERIAL, CLASS IV	50.000	TON	$1,165.2700	$58,263.50
0095	1840000000-E MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	57550.000	LF	$0.1800	$10,359.00
0096	1847000000-E *****" PORT CEM CONC PAVEMENT,THROUGH LANES (WITH DOWELS) (12")	132215.000	SY	$73.4200	$9,707,225.30

0097	1858000000-E	9980.000	SY	$75.8700	$757,182.60
	***** PORT CEM CONC PAVEMENT,RAMPS (WITH DOWELS) (12")				
0098	1869000000-E	3470.000	SY	$91.0400	$315,908.80
	***** PORT CEM CONC PAVEMENT,MISCELLANEOUS (WITHOUT DOWELS) (12")				
0099	1891000000-E	380.000	SY	$90.7700	$34,492.60
	GENERIC PAVING ITEM 7" JOINTED CONCRETE TRUCK APRON				
0100	1891000000-E	45730.000	SY	$5.0300	$230,021.90
	GENERIC PAVING ITEM DIAMOND GRINDING PCC PAVEMENT				
0101	1913000000-E	75440.000	SY	$64.5600	$4,870,406.40
	CONCRETE SHOULDERS ADJACENT TO****** PAVEMENT (12")				
0102	1924000000-N	1.000	LS	$925,000.0000	$925,000.00
	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT				
0103	1925000000-E	60240.000	LF	$2.5000	$150,600.00
	MILLED RUMBLE STRIPS (CONCRETE SHOULDERS)				
0104	2000000000-N	278.000	EA	$108.3300	$30,115.74
	RIGHT-OF-WAY MARKERS				
0105	2020000000-N	8.000	EA	$214.0000	$1,712.00
	CONTROL-OF-ACCESS MARKERS				
0106	2022000000-E	5174.400	CY	$15.6800	$81,134.59
	SUBDRAIN EXCAVATION				
0107	2026000000-E	15400.000	SY	$3.9200	$60,368.00
	GEOTEXTILE FOR SUBSURFACE DRAINS				
0108	2036000000-E	2587.200	CY	$102.4900	$265,162.13
	SUBDRAIN COARSE AGGREGATE				
0109	2044000000-E	15400.000	LF	$24.3700	$375,298.00
	6" PERFORATED SUBDRAIN PIPE				
0110	2070000000-N	31.000	EA	$609.2300	$18,886.13
	SUBDRAIN PIPE OUTLET				
0111	2077000000-E	186.000	LF	$39.7300	$7,389.78
	6" OUTLET PIPE				
0112	2099000000-E	22060.000	LF	$7.2700	$160,376.20
	SHOULDER DRAIN				
0113	2110000000-E	22060.000	LF	$2.1200	$46,767.20
	4" SHOULDER DRAIN PIPE				
0114	2121000000-E	1780.000	LF	$16.9800	$30,224.40
	4" OUTLET PIPE FOR SHOULDER DRAINS				
0115	2132000000-N	40.000	EA	$626.2600	$25,050.40
	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET				
0116	2143000000-E	20.000	TON	$30.0000	$600.00
	BLOTTING SAND				
0117	2209000000-E	56.374	CY	$1,561.7000	$88,039.28
	ENDWALLS				
0118	2220000000-E	50.000	CY	$2,082.4200	$104,121.00
	REINFORCED ENDWALLS				
0119	2253000000-E	21.554	CY	$1,561.5200	$33,657.00
	PIPE COLLARS				
0120	2275000000-E	31.000	CY	$468.5400	$14,524.74
	FLOWABLE FILL				
0121	2286000000-N	502.000	EA	$4,164.8400	$2,090,749.68

		MASONRY DRAINAGE STRUCTURES			
0122	2297000000-E	96.640	CY	$3,644.2300	$352,178.39
	MASONRY DRAINAGE STRUCTURES				
0123	2308000000-E	518.600	LF	$1,041.2100	$539,971.51
	MASONRY DRAINAGE STRUCTURES				
0124	2354000000-N	4.000	EA	$780.9100	$3,123.64
	FRAME WITH GRATE, STD 840.22				
0125	2364000000-N	19.000	EA	$885.0300	$16,815.57
	FRAME WITH TWO GRATES, STD 840.16				
0126	2364200000-N	106.000	EA	$780.9100	$82,776.46
	FRAME WITH TWO GRATES, STD 840.20				
0127	2365000000-N	176.000	EA	$780.9100	$137,440.16
	FRAME WITH TWO GRATES, STD 840.22				
0128	2366000000-N	4.000	EA	$780.9100	$3,123.64
	FRAME WITH TWO GRATES, STD 840.24				
0129	2374000000-N	7.000	EA	$937.0900	$6,559.63
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)				
0130	2374000000-N	45.000	EA	$1,041.2100	$46,854.45
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)				
0131	2374000000-N	46.000	EA	$937.0900	$43,106.14
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)				
0132	2396000000-N	44.000	EA	$780.9100	$34,360.04
	FRAME WITH COVER, STD 840.54				
0133	2407000000-N	69.000	EA	$3,123.6300	$215,530.47
	STEEL FRAME WITH TWO GRATES, STD 840.37				
0134	2451000000-N	6.000	EA	$4,750.0000	$28,500.00
	CONCRETE TRANSITIONAL SECTION FOR DROP INLET				
0135	2473000000-N	2.000	EA	$52,060.4700	$104,120.94
	GENERIC DRAINAGE ITEM OUTLET CONTROL STUCTURE				
0136	2542000000-E	3290.000	LF	$29.7500	$97,877.50
	1'-6" CONCRETE CURB & GUTTER				
0137	2549000000-E	13160.000	LF	$35.4500	$466,522.00
	2'-6" CONCRETE CURB & GUTTER				
0138	2556000000-E	10080.000	LF	$59.4100	$598,852.80
	SHOULDER BERM GUTTER				
0139	2577000000-E	550.000	LF	$108.0100	$59,405.50
	CONCRETE EXPRESSWAY GUTTER				
0140	2591000000-E	2550.000	SY	$87.2500	$222,487.50
	4" CONCRETE SIDEWALK				
0141	2605000000-N	33.000	EA	$6,000.0000	$198,000.00
	CONCRETE CURB RAMPS				
0142	2612000000-E	1200.000	SY	$260.8300	$312,996.00
	6" CONCRETE DRIVEWAY				
0143	2619000000-E	390.000	SY	$92.5600	$36,098.40
	4" CONCRETE PAVED DITCH				
0144	2627000000-E	6020.000	SY	$80.0000	$481,600.00
	4" CONCRETE ISLAND COVER				
0145	2655000000-E	1350.000	SY	$150.0000	$202,500.00
	5" MONOLITHIC CONCRETE ISLANDS(KEYED IN)				

0146	2657000000-E	20.000	SY	$407.0900	$8,141.80
	**" MONOLITHIC CONCRETE MEDIAN(*****) (8", NON-MOUNTABLE)				
0147	2703000000-E	9670.000	LF	$143.1500	$1,384,260.50
	CONCRETE BARRIER, TYPE ******* (T)				
0148	2703000000-E	1850.000	LF	$176.6500	$326,802.50
	CONCRETE BARRIER, TYPE ******* (T1)				
0149	2703000000-E	2750.000	LF	$372.5900	$1,024,622.50
	CONCRETE BARRIER, TYPE ******* (T2)				
0150	2710000000-N	9.000	EA	$23,878.1700	$214,903.53
	CONCRETE BARRIER TRANSITION SECTION				
0151	2724000000-E	17520.000	LF	$93.9100	$1,645,303.20
	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED				
0152	2738000000-E	270.000	SY	$192.0000	$51,840.00
	GENERIC PAVING ITEM FILL AND CAP BEHIND BARRIER				
0153	2752000000-E	230.000	LF	$92.6500	$21,309.50
	GENERIC PAVING ITEM 2'-0" MODIFIED VALLEY GUTTER				
0154	2752000000-E	710.000	LF	$365.4800	$259,490.80
	GENERIC PAVING ITEM DDI BARRIER				
0155	2759000000-N	4.000	EA	$51,624.3700	$206,497.48
	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION				
0156	2815000000-N	2.000	EA	$1,561.8200	$3,123.64
	ADJUSTMENT OF DROP INLETS				
0157	2860000000-N	1.000	EA	$5,206.0500	$5,206.05
	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX				
0158	2905000000-N	6.000	EA	$5,206.0500	$31,236.30
	CONVERT EXISTING DROP INLET TOJUNCTION BOX				
0159	3030000000-E	53000.000	LF	$27.5000	$1,457,500.00
	STEEL BEAM GUARDRAIL				
0160	3045000000-E	150.000	LF	$29.0000	$4,350.00
	STEEL BEAM GUARDRAIL, SHOP CURVED				
0161	3150000000-N	10.000	EA	$56.0000	$560.00
	ADDITIONAL GUARDRAIL POSTS				
0162	3180000000-N	1.000	EA	$2,900.0000	$2,900.00
	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)				
0163	3210000000-N	51.000	EA	$1,050.0000	$53,550.00
	GUARDRAIL END UNITS, TYPE CAT-1				
0164	3215000000-N	8.000	EA	$2,000.0000	$16,000.00
	GUARDRAIL ANCHOR UNITS, TYPE III				
0165	3287000000-N	52.000	EA	$3,100.0000	$161,200.00
	GUARDRAIL END UNITS, TYPE TL-3				
0166	3288000000-N	13.000	EA	$3,000.0000	$39,000.00
	GUARDRAIL END UNITS, TYPE TL-2				
0167	3317000000-N	30.000	EA	$2,900.0000	$87,000.00
	GUARDRAIL ANCHOR UNITS, TYPE B-77				
0168	3360000000-E	8650.000	LF	$1.5000	$12,975.00
	REMOVE EXISTING GUARDRAIL				
0169	3365000000-E	15390.000	LF	$2.5000	$38,475.00
	REMOVE EXISTING GUIDERAIL				
0170	3380000000-E	2950.000	LF	$10.0000	$29,500.00

		TEMPORARY STEEL BEAM GUARDRAIL			
0171	3389150000-N	10.000	EA	$2,500.0000	$25,000.00
	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-2)				
0172	3389400000-E	1300.000	LF	$13.0000	$16,900.00
	DOUBLE FACED CABLE GUIDERAIL				
0173	3389500000-N	5.000	EA	$100.0000	$500.00
	ADDITIONAL GUIDERAIL POSTS				
0174	3389600000-N	1.000	EA	$4,000.0000	$4,000.00
	CABLE GUIDERAIL ANCHOR UNITS				
0175	3503000000-E	51900.000	LF	$6.5000	$337,350.00
	WOVEN WIRE FENCE, 47" FABRIC				
0176	3509000000-E	3256.000	EA	$32.0000	$104,192.00
	4" TIMBER FENCE POSTS, 7'-6" LONG				
0177	3515000000-E	825.000	EA	$45.0000	$37,125.00
	5" TIMBER FENCE POSTS, 8'-0" LONG				
0178	3559000000-E	3230.000	LF	$15.0000	$48,450.00
	** STRAND BARBED WIRE FENCE WITH POSTS (5)				
0179	3564000000-E	6.000	EA	$3,000.0000	$18,000.00
	SINGLE GATES, **" HIGH, **' WIDE, **' OPENING (47", 12', 12')				
0180	3628000000-E	8220.000	TON	$50.0000	$411,000.00
	RIP RAP, CLASS I				
0181	3635000000-E	210.000	TON	$55.0000	$11,550.00
	RIP RAP, CLASS II				
0182	3642000000-E	10.000	TON	$40.0000	$400.00
	RIP RAP, CLASS A				
0183	3649000000-E	4780.000	TON	$50.0000	$239,000.00
	RIP RAP, CLASS B				
0184	3651000000-E	40.000	TON	$200.0000	$8,000.00
	BOULDERS				
0185	3656000000-E	35825.000	SY	$3.1200	$111,774.00
	GEOTEXTILE FOR DRAINAGE				
0186	3659000000-N	11.000	EA	$6,247.2600	$68,719.86
	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON				
0187	4048000000-E	15.000	CY	$1,018.5600	$15,278.40
	REINFORCED CONCRETE SIGN FOUN-DATIONS				
0188	4054000000-E	3.000	CY	$1,018.5600	$3,055.68
	PLAIN CONCRETE SIGN FOUNDA- TIONS				
0189	4057000000-E	727.000	CY	$321.6500	$233,839.55
	OVERHEAD FOOTING				
0190	4060000000-E	15077.000	LB	$6.4300	$96,945.11
	SUPPORTS, BREAKAWAY STEEL BEAM				
0191	4066000000-E	4418.000	LB	$6.4300	$28,407.74
	SUPPORTS, SIMPLE STEEL BEAM				
0192	4072000000-E	4723.000	LF	$8.5800	$40,523.34
	SUPPORTS, 3-LB STEEL U-CHANNEL				
0193	4078000000-E	14.000	EA	$107.2200	$1,501.08
	SUPPORTS, 2-LB STEEL U-CHANNEL				
0194	4082100000-N	1.000	LS	$117,938.1400	$117,938.14
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (155+88 -Y15-)				

0195	4082100000-N	1.000 LS	$102,391.7500	$102,391.75
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (160+00 -Y15-)			
0196	4082100000-N	1.000 LS	$102,391.7500	$102,391.75
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (160+85 -Y15-)			
0197	4082100000-N	1.000 LS	$101,855.6700	$101,855.67
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (17+50 -Y15REV-)			
0198	4082100000-N	1.000 LS	$192,989.6900	$192,989.69
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (20+87 -Y4-)			
0199	4082100000-N	1.000 LS	$101,855.6700	$101,855.67
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (24+50 -Y15-)			
0200	4082100000-N	1.000 LS	$160,824.7400	$160,824.74
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (26+00 -Y4-)			
0201	4082100000-N	1.000 LS	$144,742.2700	$144,742.27
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (26+37 -Y15FLYBD-)			
0202	4082100000-N	1.000 LS	$84,164.9500	$84,164.95
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (29+41 -Y4-)			
0203	4082100000-N	1.000 LS	$84,164.9500	$84,164.95
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (31+94 -Y4-)			
0204	4082100000-N	1.000 LS	$92,742.2700	$92,742.27
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (32+00 -Y15-)			
0205	4082100000-N	1.000 LS	$144,742.2700	$144,742.27
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (32+00 -Y15FLYAC-)			
0206	4082100000-N	1.000 LS	$171,546.3900	$171,546.39
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (34+68 -Y15FLYCA-)			
0207	4082100000-N	1.000 LS	$83,628.8700	$83,628.87
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (47+00 -Y15FLYAC-)			
0208	4082100000-N	1.000 LS	$160,824.7400	$160,824.74
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (50+46 -Y15-)			
0209	4082100000-N	1.000 LS	$84,701.0300	$84,701.03
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (52+00 -Y15FLYCA-)			
0210	4082100000-N	1.000 LS	$92,206.1900	$92,206.19
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (56+00 -Y15REV-)			
0211	4082100000-N	1.000 LS	$144,742.2700	$144,742.27
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (666+00 -L-)			
0212	4082100000-N	1.000 LS	$109,896.9100	$109,896.91
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (686+00 -L-)			
0213	4082100000-N	1.000 LS	$167,793.8100	$167,793.81
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (702+30 -L-)			
0214	4082100000-N	1.000 LS	$102,927.8400	$102,927.84
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (706+00 -L-)			
0215	4082100000-N	1.000 LS	$102,927.8400	$102,927.84
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (737+50 -L- EB)			
0216	4082100000-N	1.000 LS	$134,020.6200	$134,020.62
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (737+50 -L- WB)			
0217	4082100000-N	1.000 LS	$92,206.1900	$92,206.19
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (757+00 -L-)			
0218	4082100000-N	1.000 LS	$85,237.1100	$85,237.11
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (76+25 -Y15FLYBD-)			
0219	4082100000-N	1.000 LS	$134,020.6200	$134,020.62

	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (763+84 -L-)				
0220	4082100000-N	1.000	LS	$144,742.2700	$144,742.27
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (794+00 -L-)				
0221	4082100000-N	1.000	LS	$134,020.6200	$134,020.62
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (819+00 -L-)				
0222	4082100000-N	1.000	LS	$122,226.8000	$122,226.80
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (826+00 -L-)				
0223	4082100000-N	1.000	LS	$134,020.6200	$134,020.62
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (835+50 -L-)				
0224	4082100000-N	1.000	LS	$112,577.3200	$112,577.32
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (89+70 -Y15REV-)				
0225	4082100000-N	1.000	LS	$134,020.6200	$134,020.62
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (91+50 -Y15REV-)				
0226	4096000000-N	7.000	EA	$160.8200	$1,125.74
	SIGN ERECTION, TYPE D				
0227	4102000000-N	255.000	EA	$73.4400	$18,727.20
	SIGN ERECTION, TYPE E				
0228	4108000000-N	7.000	EA	$160.8200	$1,125.74
	SIGN ERECTION, TYPE F				
0229	4109000000-N	56.000	EA	$10.7200	$600.32
	SIGN ERECTION, TYPE *** (OVER-HEAD) (A)				
0230	4109000000-N	29.000	EA	$10.7200	$310.88
	SIGN ERECTION, TYPE *** (OVER-HEAD) (B)				
0231	4110000000-N	18.000	EA	$696.9100	$12,544.38
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)				
0232	4110000000-N	2.000	EA	$482.4800	$964.96
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)				
0233	4114000000-N	12.000	EA	$160.8300	$1,929.96
	SIGN ERECTION, MILEMARKERS				
0234	4116100000-N	3.000	EA	$804.1200	$2,412.36
	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)				
0235	4138000000-N	6.000	EA	$536.0800	$3,216.48
	DISPOSAL OF SUPPORT, STEEL BEAM				
0236	4152000000-N	5.000	EA	$536.0800	$2,680.40
	DISPOSAL OF SIGN SYSTEM, STEELBEAM				
0237	4155000000-N	33.000	EA	$10.7200	$353.76
	DISPOSAL OF SIGN SYSTEM, U- CHANNEL				
0238	4400000000-E	562.000	SF	$6.2400	$3,506.88
	WORK ZONE SIGNS (STATIONARY)				
0239	4402000000-E	2452.000	SF	$13.5200	$33,151.04
	HIGH VISIBILITY STATIONARY SIGNS				
0240	4405000000-E	565.000	SF	$9.3600	$5,288.40
	WORK ZONE SIGNS (PORTABLE)				
0241	4407000000-E	16.000	SF	$12.4800	$199.68
	HIGH VISIBILITY PORTABLE SIGNS				
0242	4410000000-E	380.000	SF	$6.7600	$2,568.80
	WORK ZONE SIGNS (BARRICADE MOUNTED)				
0243	4415000000-N	8.000	EA	$2,600.0000	$20,800.00
	FLASHING ARROW BOARD				

0244	4420000000-N PORTABLE CHANGEABLE MESSAGE SIGN	10.000	EA	$11,232.0000	$112,320.00
0245	4423000000-N WORK ZONE DIGITAL SPEED LIMIT SIGNS	10.000	EA	$4,160.0000	$41,600.00
0246	4424000000-N WORK ZONE PRESENCE LIGHTING	56.000	EA	$2,600.0000	$145,600.00
0247	4430000000-N DRUMS	410.000	EA	$40.8200	$16,736.20
0248	4432000000-N HIGH VISIBILITY DRUMS	510.000	EA	$75.4000	$38,454.00
0249	4434000000-N SEQUENTIAL FLASHING WARNING LIGHTS	60.000	EA	$104.0000	$6,240.00
0250	4435000000-N CONES	74.000	EA	$20.8000	$1,539.20
0251	4445000000-E BARRICADES (TYPE III)	936.000	LF	$23.4000	$21,902.40
0252	4447000000-E PEDESTRIAN CHANNELIZING DE- VICES	45.000	LF	$57.2000	$2,574.00
0253	4455000000-N FLAGGER	106.000	DAY	$385.0800	$40,818.48
0254	4465000000-N TEMPORARY CRASH CUSHIONS	9.000	EA	$10,632.9100	$95,696.19
0255	4470000000-N REMOVE & RESET TEMPORARY CRASH CUSHION	14.000	EA	$2,987.3400	$41,822.76
0256	4480000000-N TMA	6.000	EA	$57,200.0000	$343,200.00
0257	4485000000-E PORTABLE CONCRETE BARRIER	31326.000	LF	$36.8100	$1,153,110.06
0258	4490000000-E PORTABLE CONCRETE BARRIER (ANCHORED)	250.000	LF	$63.6100	$15,902.50
0259	4500000000-E REMOVE AND RESET PORTABLE CON-CRETE BARRIER	45830.000	LF	$6.2300	$285,520.90
0260	4510000000-N LAW ENFORCEMENT	64.000	HR	$53.2200	$3,406.08
0261	4570000000-E TEMPORARY GLARE SCREEN	4977.000	LF	$16.1500	$80,378.55
0262	4600000000-N GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	9.000	EA	$172.0000	$1,548.00
0263	4600000000-N GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8.000	EA	$2,300.0000	$18,400.00
0264	4600000000-N GENERIC TRAFFIC CONTROL ITEM FLASHING BEACON AND DETECTION SYSTEM	2.000	EA	$38,496.0000	$76,992.00
0265	4650000000-N TEMPORARY RAISED PAVEMENT MARKERS	3165.000	EA	$5.7800	$18,293.70
0266	4685000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (4", 90 MILS)	44152.000	LF	$0.7200	$31,789.44
0267	4688000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (6", 90 MILS)	156846.000	LF	$0.7500	$117,634.50
0268	4695000000-E	2728.000	LF	$1.6400	$4,473.92

		THERMOPLASTIC PAVEMENT MARKINGLINES (8", 90 MILS)			
0269	4700000000-E	18414.000	LF	$1.5400	$28,357.56
		THERMOPLASTIC PAVEMENT MARKINGLINES (12", 90 MILS)			
0270	4720000000-E	108.000	EA	$143.0000	$15,444.00
		THERMOPLASTIC PAVEMENT MARKINGCHARACTER (90 MILS)			
0271	4725000000-E	288.000	EA	$171.6000	$49,420.80
		THERMOPLASTIC PAVEMENT MARKINGSYMBOL (90 MILS)			
0272	4775000000-E	1646.000	LF	$7.7000	$12,674.20
		COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (IV)			
0273	4785000000-E	1632.000	LF	$13.2000	$21,542.40
		COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (IV)			
0274	4810000000-E	200932.000	LF	$0.4600	$92,428.72
		PAINT PAVEMENT MARKING LINES (4")			
0275	4820000000-E	7767.000	LF	$1.4000	$10,873.80
		PAINT PAVEMENT MARKING LINES (8")			
0276	4825000000-E	134.000	LF	$6.9900	$936.66
		PAINT PAVEMENT MARKING LINES (12")			
0277	4835000000-E	4594.000	LF	$2.1700	$9,968.98
		PAINT PAVEMENT MARKING LINES (24")			
0278	4840000000-N	60.000	EA	$73.4600	$4,407.60
		PAINT PAVEMENT MARKING CHARAC-TER			
0279	4845000000-N	465.000	EA	$76.2200	$35,442.30
		PAINT PAVEMENT MARKING SYMBOL			
0280	4847500000-E	268270.000	LF	$1.0900	$292,414.30
		WORK ZONE PERFORMANCE PAVEMENTMARKING LINES, 6"			
0281	4847600000-E	9332.000	LF	$2.9400	$27,436.08
		WORK ZONE PERFORMANCE PAVEMENTMARKING LINES, 12"			
0282	4850000000-E	22125.000	LF	$3.0300	$67,038.75
		REMOVAL OF PAVEMENT MARKING LINES (4")			
0283	4855000000-E	164490.000	LF	$0.4300	$70,730.70
		REMOVAL OF PAVEMENT MARKING LINES (6")			
0284	4860000000-E	490.000	LF	$1.8300	$896.70
		REMOVAL OF PAVEMENT MARKING LINES (8")			
0285	4865000000-E	3829.000	LF	$3.5500	$13,592.95
		REMOVAL OF PAVEMENT MARKING LINES (12")			
0286	4870000000-E	319.000	LF	$9.6300	$3,071.97
		REMOVAL OF PAVEMENT MARKING LINES (24")			
0287	4875000000-N	27.000	EA	$110.0000	$2,970.00
		REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS			
0288	4890000000-E	13967.000	LF	$2.0400	$28,492.68
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12" 30 MILS (STANDARD GLASS BEADS)			
0289	4890000000-E	4479.000	LF	$2.1500	$9,629.85
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 30 MILS (STANDARD GLASS BEADS)			
0290	4890000000-E	138443.000	LF	$1.5400	$213,202.22
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 30 MILS (STANDARD GLASS BEADS)			
0291	4890000000-E	124.000	LF	$14.1500	$1,754.60
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 8", 30 MILS			

	(STANDARD GLASS BEADS)				
0292	4891000000-E	1989.000	LF	$7.2100	$14,340.69
	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)				
0293	4895000000-N	4352.000	EA	$45.1000	$196,275.20
	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER				
0294	4900000000-N	145.000	EA	$8.8000	$1,276.00
	PERMANENT RAISED PAVEMENT MARKERS				
0295	5010000000-E	3.000	EA	$30,303.0300	$90,909.09
	100' HIGH MOUNT STANDARD				
0296	5020000000-N	1.000	EA	$3,636.3600	$3,636.36
	PORTABLE DRIVE UNIT				
0297	5025000000-E	21.000	CY	$1,111.1100	$23,333.31
	HIGH MOUNT FOUNDATIONS				
0298	5030000000-N	18.000	EA	$1,818.1800	$32,727.24
	HIGH MOUNT LUMINAIRES ******** (560W LED)				
0299	5050000000-N	13.000	EA	$5,050.5100	$65,656.63
	LIGHT STANDARDS, TYPE MTLT ********** (45' SA, 15' ARM)				
0300	5050000000-N	8.000	EA	$5,454.5500	$43,636.40
	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)				
0301	5070000000-N	19.000	EA	$878.7900	$16,697.01
	STANDARD FOUNDATION ********* (TYPE R1)				
0302	5070000000-N	2.000	EA	$888.8900	$1,777.78
	STANDARD FOUNDATION ********* (TYPE R2)				
0303	5080000000-N	29.000	EA	$752.5300	$21,823.37
	LIGHT STANDARD LUMINAIRES, TYPE ********** (RDW, 285W LED)				
0304	5120000000-N	1.000	EA	$3,686.8700	$3,686.87
	ELECTRIC SERVICE POLE ********** (30' CLASS 4)				
0305	5125000000-E	25.000	LF	$50.5100	$1,262.75
	ELECTRIC SERVICE LATERAL ********** (3 1/0 USE)				
0306	5145000000-N	1.000	EA	$17,676.7700	$17,676.77
	LIGHT CONTROL EQUIPMENT, TYPE RW ********** (240/480 V)				
0307	5155000000-E	470.000	LF	$6.5700	$3,087.90
	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")				
0308	5160000000-E	655.000	LF	$15.9100	$10,421.05
	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")				
0309	5160000000-E	315.000	LF	$22.7300	$7,159.95
	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")				
0310	5170000000-E	460.000	LF	$2.8300	$1,301.80
	** #8 W/G FEEDER CIRCUIT (2)				
0311	5175000000-E	600.000	LF	$3.5900	$2,154.00
	** #6 W/G FEEDER CIRCUIT (2)				
0312	5180000000-E	190.000	LF	$4.2900	$815.10
	** #4 W/G FEEDER CIRCUIT (2)				
0313	5205000000-E	5230.000	LF	$8.8400	$46,233.20
	** #8 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5")				
0314	5210000000-E	3040.000	LF	$9.0900	$27,633.60
	** #6 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5")				
0315	5215000000-E	2635.000	LF	$10.8600	$28,616.10

	** #4 W/G FEEDER CIRCUIT IN ***** CONDUIT (2, 1.5")				
0316	5240000000-N ELECTRICAL JUNCTION BOXES ********** (CS36)	1.000	EA	$1,060.6100	$1,060.61
0317	5240000000-N ELECTRICAL JUNCTION BOXES ********** (HM18)	3.000	EA	$378.7900	$1,136.37
0318	5240000000-N ELECTRICAL JUNCTION BOXES ********** (IG18)	13.000	EA	$404.0400	$5,252.52
0319	5240000000-N ELECTRICAL JUNCTION BOXES ********** (IG30)	5.000	EA	$707.0700	$3,535.35
0320	5240000000-N ELECTRICAL JUNCTION BOXES ********** (LS18)	19.000	EA	$373.7400	$7,101.06
0321	5240000000-N ELECTRICAL JUNCTION BOXES ********** (LS30)	2.000	EA	$707.0700	$1,414.14
0322	5255000000-N PORTABLE LIGHTING	1.000	LS	$124,875.6000	$124,875.60
0323	5325000000-E **" WATER LINE (36")	1303.000	LF	$917.5900	$1,195,619.77
0324	5325200000-E 2" WATER LINE	271.000	LF	$36.9800	$10,021.58
0325	5325600000-E 6" WATER LINE	5887.000	LF	$122.6100	$721,805.07
0326	5326200000-E 12" WATER LINE	35.000	LF	$550.7500	$19,276.25
0327	5329000000-E DUCTILE IRON WATER PIPE FITTINGS	41890.000	LB	$17.2400	$722,183.60
0328	5540000000-E 6" VALVE	41.000	EA	$2,160.8000	$88,592.80
0329	5558000000-E 12" VALVE	1.000	EA	$4,788.9400	$4,788.94
0330	5571600000-E 6" TAPPING SLEEVE & VALVE	1.000	EA	$4,992.9600	$4,992.96
0331	5600000000-E **" BLOW OFF (3/4")	1.000	EA	$1,715.5800	$1,715.58
0332	5648000000-N RELOCATE WATER METER	48.000	EA	$1,801.0100	$86,448.48
0333	5649000000-N RECONNECT WATER METER	4.000	EA	$1,527.6400	$6,110.56
0334	5666000000-N FIRE HYDRANT	24.000	EA	$4,645.2300	$111,485.52
0335	5672000000-N RELOCATE FIRE HYDRANT	1.000	EA	$4,498.4900	$4,498.49
0336	5673000000-E FIRE HYDRANT LEG	503.000	LF	$74.7700	$37,609.31
0337	5678400000-E 6" LINE STOP	1.000	EA	$18,090.4500	$18,090.45
0338	5679000000-E 12" LINE STOP	1.000	EA	$25,351.7600	$25,351.76
0339	5686500000-E WATER SERVICE LINE	2465.000	LF	$36.6800	$90,416.20

0340	5691300000-E 8" SANITARY GRAVITY SEWER	8921.000	LF	$191.9600	$1,712,475.16
0341	5691600000-E 16" SANITARY GRAVITY SEWER	1586.000	LF	$427.4400	$677,919.84
0342	5768000000-N SANITARY SEWER CLEAN-OUT	21.000	EA	$1,167.8400	$24,524.64
0343	5768500000-E SEWER SERVICE LINE	1240.000	LF	$89.0500	$110,422.00
0344	5775000000-E 4' DIA UTILITY MANHOLE	40.000	EA	$5,025.1300	$201,005.20
0345	5776000000-E 5' DIA UTILITY MANHOLE	18.000	EA	$8,693.4700	$156,482.46
0346	5777000000-E 6' DIA UTILITY MANHOLE	4.000	EA	$11,758.8000	$47,035.20
0347	5781000000-E UTILITY MANHOLE WALL 4' DIA	222.000	LF	$587.9400	$130,522.68
0348	5782000000-E UTILITY MANHOLE WALL 5' DIA	190.000	LF	$848.2400	$161,165.60
0349	5783000000-E UTILITY MANHOLE WALL 6' DIA	12.000	LF	$1,326.6300	$15,919.56
0350	5798000000-E ABANDON **" UTILITY PIPE (15")	1565.000	LF	$18.0900	$28,310.85
0351	5798000000-E ABANDON **" UTILITY PIPE (36")	410.000	LF	$77.3900	$31,729.90
0352	5801000000-E ABANDON 8" UTILITY PIPE	5100.000	LF	$11.4600	$58,446.00
0353	5811000000-E ABANDON 18" UTILITY PIPE	391.000	LF	$28.1400	$11,002.74
0354	5815000000-N REMOVE WATER METER	373.000	EA	$160.8000	$59,978.40
0355	5815500000-N REMOVE FIRE HYDRANT	49.000	EA	$387.9400	$19,009.06
0356	5816000000-N ABANDON UTILITY MANHOLE	102.000	EA	$709.5500	$72,374.10
0357	5828000000-N REMOVE UTILITY MANHOLE	5.000	EA	$954.7700	$4,773.85
0358	5835000000-E **" ENCASEMENT PIPE (54")	330.000	LF	$884.4200	$291,858.60
0359	5835800000-E 18" ENCASEMENT PIPE	1340.000	LF	$88.4400	$118,509.60
0360	5836200000-E 30" ENCASEMENT PIPE	360.000	LF	$349.7500	$125,910.00
0361	5872500000-E BORE AND JACK OF **" (18")	885.000	LF	$631.1600	$558,576.60
0362	5882000000-N GENERIC UTILITY ITEM 36" X 6" TAPPING SLEEVE AND VALVE	1.000	EA	$13,567.8400	$13,567.84
0363	5882000000-N GENERIC UTILITY ITEM 4" COMBINATION AIR VALVE IN MH	1.000	EA	$80,804.0200	$80,804.02
0364	5882000000-N	3.000	EA	$10,653.2700	$31,959.81

	GENERIC UTILITY ITEM STEEL PILE PIER				
0365	6000000000-E TEMPORARY SILT FENCE	242460.000	LF	$2.5000	$606,150.00
0366	6006000000-E STONE FOR EROSION CONTROL, CLASS A	9325.000	TON	$60.6700	$565,747.75
0367	6009000000-E STONE FOR EROSION CONTROL, CLASS B	44570.000	TON	$60.6700	$2,704,061.90
0368	6012000000-E SEDIMENT CONTROL STONE	25840.000	TON	$55.6100	$1,436,962.40
0369	6015000000-E TEMPORARY MULCHING	1404.500	ACR	$816.3300	$1,146,535.49
0370	6018000000-E SEED FOR TEMPORARY SEEDING	54100.000	LB	$7.1400	$386,274.00
0371	6021000000-E FERTILIZER FOR TEMPORARY SEED-ING	270.500	TON	$816.3300	$220,817.27
0372	6024000000-E TEMPORARY SLOPE DRAINS	24585.000	LF	$10.7000	$263,059.50
0373	6029000000-E SAFETY FENCE	5640.000	LF	$2.5500	$14,382.00
0374	6030000000-E SILT EXCAVATION	206860.000	CY	$12.5900	$2,604,367.40
0375	6036000000-E MATTING FOR EROSION CONTROL	771880.000	SY	$1.4800	$1,142,382.40
0376	6037000000-E COIR FIBER MAT	1515.000	SY	$6.1200	$9,271.80
0377	6038000000-E PERMANENT SOIL REINFORCEMENT MAT	18500.000	SY	$4.9000	$90,650.00
0378	6042000000-E 1/4" HARDWARE CLOTH	40410.000	LF	$4.8500	$195,988.50
0379	6045000000-E **" TEMPORARY PIPE (15")	150.000	LF	$165.0000	$24,750.00
0380	6046000000-E TEMPORARY PIPE FOR STREAM CROSSING	100.000	LF	$50.5600	$5,056.00
0381	6048000000-E FLOATING TURBIDITY CURTAIN	165.000	SY	$21.6800	$3,577.20
0382	6069000000-E STILLING BASINS	1016.000	CY	$22.5000	$22,860.00
0383	6070000000-N SPECIAL STILLING BASINS	13.000	EA	$1,250.0000	$16,250.00
0384	6071010000-E WATTLE	1530.000	LF	$9.1800	$14,045.40
0385	6071012000-E COIR FIBER WATTLE	9400.000	LF	$12.2400	$115,056.00
0386	6071013000-E WATTLE BARRIER	28290.000	LF	$11.2200	$317,413.80
0387	6071020000-E POLYACRYLAMIDE (PAM)	14635.000	LB	$5.1000	$74,638.50
0388	6071030000-E COIR FIBER BAFFLE	29710.000	LF	$5.8700	$174,397.70

0389	6071050000-E **" SKIMMER (1-1/2")	58.000	EA	$1,516.6800	$87,967.44
0390	6071050000-E **" SKIMMER (2")	29.000	EA	$1,769.4600	$51,314.34
0391	6071050000-E **" SKIMMER (2-1/2")	8.000	EA	$2,527.8100	$20,222.48
0392	6071050000-E **" SKIMMER (3")	5.000	EA	$3,033.3700	$15,166.85
0393	6071050000-E **" SKIMMER (4")	1.000	EA	$4,044.4900	$4,044.49
0394	6084000000-E SEEDING & MULCHING	747.000	ACR	$2,244.9000	$1,676,940.30
0395	6087000000-E MOWING	858.000	ACR	$178.5700	$153,213.06
0396	6090000000-E SEED FOR REPAIR SEEDING	14250.000	LB	$6.1200	$87,210.00
0397	6093000000-E FERTILIZER FOR REPAIR SEEDING	36.750	TON	$1,836.7300	$67,499.83
0398	6096000000-E SEED FOR SUPPLEMENTAL SEEDING	18275.000	LB	$4.0800	$74,562.00
0399	6108000000-E FERTILIZER TOPDRESSING	548.000	TON	$994.9000	$545,205.20
0400	6111000000-E IMPERVIOUS DIKE	1090.000	LF	$115.0000	$125,350.00
0401	6114500000-N SPECIALIZED HAND MOWING	290.000	MHR	$183.6700	$53,264.30
0402	6117000000-N RESPONSE FOR EROSION CONTROL	150.000	EA	$51.0200	$7,653.00
0403	6117500000-N CONCRETE WASHOUT STRUCTURE	34.000	EA	$1,200.0000	$40,800.00
0404	6120000000-E CULVERT DIVERSION CHANNEL	2650.000	CY	$14.0000	$37,100.00
0405	6123000000-E REFORESTATION	11.000	ACR	$1,683.6700	$18,520.37
0406	6132000000-N GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	185.000	EA	$408.1600	$75,509.60
0407	6132000000-N GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	553.000	EA	$204.0800	$112,856.24
0408	7048500000-E PEDESTRIAN SIGNAL HEAD (16", 1SECTION W/COUNTDOWN)	16.000	EA	$777.7800	$12,444.48
0409	7060000000-E SIGNAL CABLE	15050.000	LF	$2.7800	$41,839.00
0410	7120000000-E VEHICLE SIGNAL HEAD (12", 3 SECTION)	72.000	EA	$811.1100	$58,399.92
0411	7132000000-E VEHICLE SIGNAL HEAD (12", 4 SECTION)	7.000	EA	$1,030.3000	$7,212.10
0412	7144000000-E VEHICLE SIGNAL HEAD (12", 5 SECTION)	10.000	EA	$1,414.1400	$14,141.40
0413	7252000000-E	4600.000	LF	$2.7800	$12,788.00

		MESSENGER CABLE (1/4")			
0414	7264000000-E	2925.000	LF	$4.5500	$13,308.75
	MESSENGER CABLE (3/8")				
0415	7279000000-E	35406.000	LF	$0.8600	$30,449.16
	TRACER WIRE				
0416	7288000000-E	25.000	LF	$45.4500	$1,136.25
	PAVED TRENCHING (**********) (1, 2")				
0417	7300000000-E	4271.000	LF	$6.5700	$28,060.47
	UNPAVED TRENCHING (**********) (1, 2")				
0418	7300000000-E	28788.000	LF	$7.5800	$218,213.04
	UNPAVED TRENCHING (**********) (2, 2")				
0419	7300000000-E	2530.000	LF	$9.3400	$23,630.20
	UNPAVED TRENCHING (**********) (3, 2")				
0420	7300000000-E	440.000	LF	$11.6200	$5,112.80
	UNPAVED TRENCHING (**********) (4, 2")				
0421	7301000000-E	1375.000	LF	$16.1600	$22,220.00
	DIRECTIONAL DRILL (**********) (1, 2")				
0422	7301000000-E	2354.000	LF	$17.9300	$42,207.22
	DIRECTIONAL DRILL (**********) (2, 2")				
0423	7301000000-E	594.000	LF	$20.2000	$11,998.80
	DIRECTIONAL DRILL (**********) (3, 2")				
0424	7324000000-N	98.000	EA	$363.6400	$35,636.72
	JUNCTION BOX (STANDARD SIZE)				
0425	7348000000-N	75.000	EA	$690.0700	$51,755.25
	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)				
0426	7360000000-N	23.000	EA	$1,060.6100	$24,394.03
	WOOD POLE				
0427	7372000000-N	23.000	EA	$606.0600	$13,939.38
	GUY ASSEMBLY				
0428	7384000000-E	11.000	EA	$429.2900	$4,722.19
	" RISER WITH ******* (1-1/2", WEATHERHEAD)				
0429	7408000000-E	2.000	EA	$404.0400	$808.08
	1" RISER WITH WEATHERHEAD				
0430	7420000000-E	2.000	EA	$858.5900	$1,717.18
	2" RISER WITH WEATHERHEAD				
0431	7444000000-E	5625.000	LF	$7.9300	$44,606.25
	INDUCTIVE LOOP SAWCUT				
0432	7456000000-E	13700.000	LF	$1.7700	$24,249.00
	LEAD-IN CABLE (**********) (14-2)				
0433	7481000000-N	2.000	EA	$1,262.6300	$2,525.26
	SITE SURVEY				
0434	7481200000-N	4.000	EA	$606.0600	$2,424.24
	LUMINAIRE ARM FOR VIDEO SYSTEM				
0435	7481240000-N	8.000	EA	$3,232.3200	$25,858.56
	CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT				
0436	7481260000-N	2.000	EA	$6,262.6300	$12,525.26
	EXTERNAL LOOP EMULATOR PRO- CESSING UNIT				
0437	7481280000-N	8.000	EA	$303.0300	$2,424.24
	RELOCATE CAMERA SENSOR UNIT				

0438	7516000000-E	21534.000	LF	$3.7900	$81,613.86
	COMMUNICATIONS CABLE (**FIBER) (144)				
0439	7516000000-E	830.000	LF	$3.2800	$2,722.40
	COMMUNICATIONS CABLE (**FIBER) (24)				
0440	7516000000-E	5425.000	LF	$3.0300	$16,437.75
	COMMUNICATIONS CABLE (**FIBER) (36)				
0441	7516000000-E	21055.000	LF	$3.2800	$69,060.40
	COMMUNICATIONS CABLE (**FIBER) (72)				
0442	7528000000-E	5271.000	LF	$3.0300	$15,971.13
	DROP CABLE				
0443	7540000000-N	19.000	EA	$1,919.1900	$36,464.61
	SPLICE ENCLOSURE				
0444	7552000000-N	21.000	EA	$2,893.9400	$60,772.74
	INTERCONNECT CENTER				
0445	7566000000-N	87.000	EA	$122.2200	$10,633.14
	DELINEATOR MARKER				
0446	7575160000-E	4900.000	LF	$0.9100	$4,459.00
	REMOVE EXISTING COMMUNICATIONSCABLE				
0447	7576000000-N	8.000	EA	$16,666.6700	$133,333.36
	METAL STRAIN SIGNAL POLE				
0448	7588000000-N	6.000	EA	$21,212.1200	$127,272.72
	METAL POLE WITH SINGLE MAST ARM				
0449	7613000000-N	21.000	EA	$833.3300	$17,499.93
	SOIL TEST				
0450	7614100000-E	95.000	CY	$1,060.6100	$100,757.95
	DRILLED PIER FOUNDATION				
0451	7631000000-N	6.000	EA	$252.5300	$1,515.18
	MAST ARM WITH METAL POLE DE- SIGN				
0452	7636000000-N	25.000	EA	$555.5600	$13,889.00
	SIGN FOR SIGNALS				
0453	7642200000-N	18.000	EA	$2,020.2000	$36,363.60
	TYPE II PEDESTAL WITH FOUND- ATION				
0454	7684000000-N	4.000	EA	$2,525.2500	$10,101.00
	SIGNAL CABINET FOUNDATION				
0455	7696000000-N	4.000	EA	$16,464.6500	$65,858.60
	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE MOUNTED)				
0456	7744000000-N	32.000	EA	$121.2100	$3,878.72
	DETECTOR CARD (TYPE 170)				
0457	7901000000-N	4.000	EA	$590.9100	$2,363.64
	CABINET BASE EXTENDER				
0458	7948000000-N	1.000	EA	$4,545.4500	$4,545.45
	TRAFFIC SIGNAL REMOVAL				
0459	7980000000-N	66.000	EA	$252.5300	$16,666.98
	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE				
0460	7980000000-N	7.000	EA	$14,848.4800	$103,939.36
	GENERIC SIGNAL ITEM CCTV METAL POLE (60')				
0461	7980000000-N	8.000	EA	$4,141.4100	$33,131.28
	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY				

0462	7980000000-N	5.000 EA	$8,585.8600	$42,929.30
	GENERIC SIGNAL ITEM DMS ACCESS LADDER			
0463	7980000000-N	5.000 EA	$66,666.6700	$333,333.35
	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE			
0464	7980000000-N	5.000 EA	$75,757.5800	$378,787.90
	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE-2C)			
0465	7980000000-N	11.000 EA	$1,313.1300	$14,444.43
	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT			
0466	7980000000-N	17.000 EA	$1,515.1500	$25,757.55
	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH			
0467	7980000000-N	8.000 EA	$5,454.5500	$43,636.40
	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET			
0468	7980000000-N	1.000 EA	$24,747.4700	$24,747.47
	GENERIC SIGNAL ITEM HUB CABINET			
0469	7980000000-N	1.000 EA	$1,262.6300	$1,262.63
	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER			
0470	7980000000-N	1.000 EA	$2,525.2500	$2,525.25
	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION			
0471	7980000000-N	12.000 EA	$1,515.1500	$18,181.80
	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER- SIZED)			
0472	7980000000-N	11.000 EA	$2,323.2300	$25,555.53
	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA-TION PANEL			
0473	7980000000-N	1.000 EA	$11,919.1900	$11,919.19
	GENERIC SIGNAL ITEM SOLAR POWER ASSEMBLY			
0474	7980000000-N	11.000 EA	$227.2700	$2,499.97
	GENERIC SIGNAL ITEM WOOD PEDESTAL			
0475	7990000000-E	660.000 LF	$10.6100	$7,002.60
	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDINGCONDUCTOR			
0476	7990000000-E	1675.000 LF	$5.5600	$9,313.00
	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC- TORS			
0477	7990000000-E	3570.000 LF	$6.0600	$21,634.20
	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC- TORS			
Section 0001 Total				$168,490,656.16

Section 0002
CULVERT ITEMS

0478	8056000000-N	1.000 LS	$30,332.4800	$30,332.48
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (30+13.47 -Y115REV-)			
0479	8065000000-N	1.000 LS	$5,000.0000	$5,000.00
	ASBESTOS ASSESSMENT			
0480	8126000000-N	1.000 LS	$91,946.9000	$91,946.90
	CULVERT EXCAVATION, STA ****** (18+22.67 -Y5B-)			
0481	8126000000-N	1.000 LS	$34,773.5400	$34,773.54
	CULVERT EXCAVATION, STA ****** (19+75.11 -Y5B-)			
0482	8126000000-N	1.000 LS	$127,508.0600	$127,508.06
	CULVERT EXCAVATION, STA ****** (30+13.47 -Y115REV-)			
0483	8126000000-N	1.000 LS	$74,937.3800	$74,937.38
	CULVERT EXCAVATION, STA ****** (35+53.70 -Y15RPDREV-)			

0484	8126000000-N	1.000	LS	$63,865.8800	$63,865.88
	CULVERT EXCAVATION, STA ****** (43+66.60 -Y15FLYCA-)				
0485	8126000000-N	1.000	LS	$268,837.1000	$268,837.10
	CULVERT EXCAVATION, STA ****** (768+62.23 -L-)				
0486	8126000000-N	1.000	LS	$96,061.6600	$96,061.66
	CULVERT EXCAVATION, STA ****** (792+88.12 -L-)				
0487	8133000000-E	6207.000	TON	$67.0900	$416,427.63
	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT				
0488	8196000000-E	4604.700	CY	$593.3700	$2,732,290.84
	CLASS A CONCRETE (CULVERT)				
0489	8245000000-E	799380.000	LB	$1.8400	$1,470,859.20
	REINFORCING STEEL (CULVERT)				
0490	8590000000-E	85.000	TON	$81.9200	$6,963.20
	RIP RAP, CLASS ** (A)				
0491	8594000000-E	85.000	TON	$81.9200	$6,963.20
	RIP RAP, CLASS B				
0492	8622000000-E	2990.000	SY	$7.3500	$21,976.50
	GEOTEXTILE FOR DRAINAGE				
Section 0002 Total					$5,448,743.57

Section 0003
WALL ITEMS

0493	8801000000-E	4090.000	SF	$98.4900	$402,824.10
	MSE RETAINING WALL NO **** (1)				
0494	8801000000-E	3250.000	SF	$97.6900	$317,492.50
	MSE RETAINING WALL NO **** (2)				
0495	8847000000-E	555368.000	SF	$2.1000	$1,166,272.80
	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREAT- MENT				
0496	8847000000-E	56818.000	SF	$29.4100	$1,671,017.38
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 1				
0497	8847000000-E	85427.000	SF	$29.3700	$2,508,990.99
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 2				
0498	8847000000-E	87297.000	SF	$29.5300	$2,577,880.41
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 3				
0499	8847000000-E	108020.000	SF	$29.6300	$3,200,632.60
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 4				
Section 0003 Total					$11,845,110.78

Section 0004
STRUCTURE ITEMS

0500	8091000000-N	1.000	LS	$15,082.4400	$15,082.44
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 22+26.35 -Y1B-)				
0501	8091000000-N	1.000	LS	$35,948.2800	$35,948.28
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 58+33.94 -Y15FLYCA-)				
0502	8091000000-N	1.000	LS	$27,643.2600	$27,643.26

	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 60+66.06 - Y15FLYAC-)				
0503	8091000000-N	1.000	LS	$17,732.1900	$17,732.19
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (2, 47+63.62 - Y15FLYBD-)				
0504	8091000000-N	1.000	LS	$15,528.2000	$15,528.20
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (2, 60+66.06 - Y15FLYAC-)				
0505	8091000000-N	1.000	LS	$23,622.6500	$23,622.65
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (3, 47+63.62 - Y15FLYBD-)				
0506	8091000000-N	1.000	LS	$27,245.1500	$27,245.15
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (3, 58+33.94 - Y15FLYCA-)				
0507	8091000000-N	1.000	LS	$13,683.4300	$13,683.43
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (3, 60+66.06 - Y15FLYAC-)				
0508	8091000000-N	1.000	LS	$18,719.5900	$18,719.59
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (4, 47+63.62 - Y15FLYBD-)				
0509	8091000000-N	1.000	LS	$33,346.9700	$33,346.97
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (4, 58+33.94 - Y15FLYCA-)				
0510	8091000000-N	1.000	LS	$13,681.4200	$13,681.42
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (4, 60+66.06 - Y15FLYAC-)				
0511	8091000000-N	1.000	LS	$27,212.1200	$27,212.12
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (5, 47+63.62 - Y15FLYBD-)				
0512	8091000000-N	1.000	LS	$15,879.5200	$15,879.52
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (5, 58+33.94 - Y15FLYCA-)				
0513	8091000000-N	1.000	LS	$21,367.7000	$21,367.70
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (5, 60+66.06 - Y15FLYAC-)				
0514	8091000000-N	1.000	LS	$19,829.2100	$19,829.21
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (6, 47+63.62 - Y15FLYBD-)				
0515	8091000000-N	1.000	LS	$37,299.5200	$37,299.52
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (6, 58+33.94 - Y15FLYCA-)				
0516	8091000000-N	1.000	LS	$19,923.3000	$19,923.30
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (6, 60+66.06 - Y15FLYAC-)				
0517	8091000000-N	1.000	LS	$14,083.7800	$14,083.78
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (7, 58+33.94 - Y15FLYCA-)				
0518	8091000000-N	1.000	LS	$6,194.4400	$6,194.44
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (8, 60+66.06 - Y15FLYAC-)				
0519	8091000000-N	1.000	LS	$22,168.4200	$22,168.42
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (9, 60+66.06- Y15FLYAC-)				
0520	8096000000-E	115.000	LF	$127.2100	$14,629.15

		PILE EXCAVATION IN SOIL			
0521	8097000000-E	185.000	LF	$128.3700	$23,748.45
	PILE EXCAVATION NOT IN SOIL				
0522	8105500000-E	56.000	LF	$1,072.1800	$60,042.08
	'-" DIA DRILLED PIERS IN SOIL (4'-6")				
0523	8105500000-E	47.000	LF	$1,272.9300	$59,827.71
	'-" DIA DRILLED PIERS IN SOIL (6'-0")				
0524	8105560000-E	98.500	LF	$1,086.9300	$107,062.61
	4'-0" DIA DRILLED PIERS IN SOIL				
0525	8105600000-E	56.000	LF	$1,072.1800	$60,042.08
	'-" DIA DRILLED PIERS NOT IN SOIL (4'-6")				
0526	8105600000-E	140.000	LF	$1,279.3300	$179,106.20
	'-" DIA DRILLED PIERS NOT IN SOIL (5'-6")				
0527	8105660000-E	212.000	LF	$1,063.4600	$225,453.52
	4'-0" DIA DRILLED PIERS NOT IN SOIL				
0528	8112730000-N	2.000	EA	$2,775.0000	$5,550.00
	PDA TESTING				
0529	8113000000-N	5.000	EA	$510.2000	$2,551.00
	SID INSPECTIONS				
0530	8114000000-N	8.000	EA	$816.3300	$6,530.64
	SPT TESTING				
0531	8115000000-N	4.000	EA	$2,551.0200	$10,204.08
	CSL TESTING				
0532	8147000000-E	294675.000	SF	$44.0000	$12,965,700.00
	REINFORCED CONCRETE DECK SLAB				
0533	8161000000-E	268594.000	SF	$0.5200	$139,668.88
	GROOVING BRIDGE FLOORS				
0534	8175000000-E	9485.300	CY	$1,200.0000	$11,382,360.00
	CLASS AA CONCRETE (BRIDGE)				
0535	8182000000-E	2195.600	CY	$783.5800	$1,720,428.25
	CLASS A CONCRETE (BRIDGE)				
0536	8210000000-N	1.000	LS	$40,455.9800	$40,455.98
	BRIDGE APPROACH SLABS, STATION********** (22+26.35 -Y1B-)				
0537	8210000000-N	1.000	LS	$38,428.3200	$38,428.32
	BRIDGE APPROACH SLABS, STATION********** (23+43.03 -Y16-)				
0538	8210000000-N	1.000	LS	$144,311.9300	$144,311.93
	BRIDGE APPROACH SLABS, STATION********** (30+67.66 -Y4-)				
0539	8210000000-N	1.000	LS	$233,807.0800	$233,807.08
	BRIDGE APPROACH SLABS, STATION********** (47+28.33 -Y15REV-)				
0540	8210000000-N	1.000	LS	$55,192.7600	$55,192.76
	BRIDGE APPROACH SLABS, STATION********** (47+63.62 -Y15FLYBD-)				
0541	8210000000-N	1.000	LS	$55,355.5300	$55,355.53
	BRIDGE APPROACH SLABS, STATION********** (58+33.94 -Y15FLYCA-)				
0542	8210000000-N	1.000	LS	$55,871.1900	$55,871.19
	BRIDGE APPROACH SLABS, STATION********** (60+66.06 -Y15FLYAC-)				
0543	8217000000-E	2090775.000	LB	$1.2700	$2,655,284.25
	REINFORCING STEEL (BRIDGE)				
0544	8238000000-E	29987.000	LB	$3.6400	$109,152.68
	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)				

0545	8265000000-E	1763.700	LF	$273.9500	$483,165.62
	54" PRESTRESSED CONCRETE GIR- DERS				
0546	8280000000-E	1.000	LS	$31,874,000.0000	$31,874,000.00
	APPROX ..... LBS STRUCTURALSTEEL				
0547	8328200000-E	114.000	EA	$2,119.2900	$241,599.06
	PILE DRIVING EQUIPMENT SETUP (HP 12 X 53)				
0548	8328200000-E	805.000	EA	$2,358.1200	$1,898,286.60
	PILE DRIVING EQUIPMENT SETUP (HP 14 X 73)				
0549	8364000000-E	4420.000	LF	$58.0800	$256,713.60
	HP12X53 STEEL PILES				
0550	8384000000-E	40416.000	LF	$68.3900	$2,764,050.24
	HP14X73 STEEL PILES				
0551	8391000000-N	39.000	EA	$369.1500	$14,396.85
	STEEL PILE POINTS				
0552	8392500000-E	96.000	LF	$315.0400	$30,243.84
	PREDRILLING FOR PILES				
0553	8475000000-E	1617.200	LF	$117.0300	$189,260.92
	TWO BAR METAL RAIL				
0554	8503000000-E	10618.700	LF	$71.5700	$759,980.36
	CONCRETE BARRIER RAIL				
0555	8505000000-E	423.500	LF	$112.6900	$47,724.22
	VERTICAL CONCRETE BARRIER RAIL				
0556	8510000000-E	309.700	LF	$95.4300	$29,554.67
	CONCRETE MEDIAN BARRIER				
0557	8517000000-E	354.100	LF	$77.1600	$27,322.36
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-3 1/2")				
0558	8517000000-E	832.980	LF	$75.1300	$62,581.79
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-6")				
0559	8517000000-E	481.400	LF	$99.4900	$47,894.49
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 3'-3 3/4")				
0560	8531000000-E	4824.200	SY	$70.0000	$337,694.00
	4" SLOPE PROTECTION				
0561	8654000000-N	1.000	LS	$1,084,398.7100	$1,084,398.71
	DISC BEARINGS				
0562	8657000000-N	1.000	LS	$217,337.0600	$217,337.06
	ELASTOMERIC BEARINGS				
0563	8706000000-N	1.000	LS	$438,267.2700	$438,267.27
	EXPANSION JOINT SEALS				
0564	8713000000-N	1.000	LS	$400,140.2000	$400,140.20
	MODULAR EXPANSION JOINT SEALS				
0565	8860000000-N	1.000	LS	$62,639.4800	$62,639.48
	GENERIC STRUCTURE ITEM POST TENSIONING ENCASEMENT				
0566	8860000000-N	1.000	LS	$41,963.5200	$41,963.52
	GENERIC STRUCTURE ITEM POST TENSIONING TENDONS				
0567	8867000000-E	4566.330	LF	$338.0300	$1,543,556.53
	GENERIC STRUCTURE ITEM 63" PRESTRESSED CONCRETE FLORIDA I-BEAM GIRDERS				
0568	8881000000-E	95.200	CY	$1,637.6700	$155,906.18
	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE				

0569	8897000000-N	196.000 EA	$10,765.3100	$2,110,000.76
	GENERIC STRUCTURE ITEM 9-5/8" DIA MICROPILES			
0570	8897000000-N	1.000 EA	$26,734.6900	$26,734.69
	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES			
0571	8897000000-N	8.000 EA	$4,591.8400	$36,734.72
	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS			
0572	8897000000-N	1.000 EA	$20,408.1600	$20,408.16
	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS			
Section 0004 Total				$75,979,511.86
Item Total				$261,764,022.37

ELECTRONIC BID SUBMISSION

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

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NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION

The prequalified bidder declares (or certifies, verifies, or states) under penalty of perjury under the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating N.C.G.S. §133-24 within the last three years, and that the prequalified bidder intends to do the work with his own bonafide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. §133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

DEBARMENT CERTIFICATION OF PREQUALIFIED BIDDER

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.

2. The terms covered transaction, debarred, suspended, ineligible, lower tier

covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal- Aid Provision titled Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

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

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or

commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder’s bid being considered non-responsive.

EXPLANATION:

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Award Limits on Multiple Projects

By answering YES to this statement, the bidder acknowleges that they are using the award limits on multiple projects? **Yes** ○**No** ◉

A bidder who desires to bid on more than one project on which bids are to be opened on the same date, and who also desires to avoid receiving an award of more projects than he is equipped to handle, may bid on any number of projects but may limit the total amount of work awarded to him on selected projects by completing the AWARD LIMITS ON MULTIPLE PROJECTS.

The Award Limits on Multiple Projects must be filled in on each project bid for which the Bidder desires protection.

It is the desire of the Bidder to be awarded contracts, the value of which

will not exceed a total of for those

projects indicated herein, for which bids will be opened on (MM/DD/YY)

The Award Limits shall apply to the following projects:

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

It is agreed that if I am (we are) the low Bidder(s) on indicated projects, the total value of which is more than the above stipulated award limits, the Board of Transportation will award me (us) projects from among those indicated

that have a total value not to exceed the award limit and will result in the lowest total bids to the Department of Transportation.

DBE List Summary

Project: NHPIM-0040(68)
Bid Total: 261,764,022.37
Goal: 8.00% (20,941,121.79)
Total Entered: 8.00% (20,945,186.47)

Bidder ID: 12078
Business Name: Webber, LLC

ID	Name	Is Supplier?	Item Count	Amount	Is Complete?
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	13	6,012,967.97	True
3230	HIATT & MASON ENTERPRISES INC	False	3	7,793,429.50	True
3376	REYNOLDS FENCE & GUARDRAIL INC	False	16	1,949,410.00	True
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	52	4,307,751.50	True
12836	SKYROCK CONCRETE FINISHING INC	False	7	881,627.50	True

Name: GOSALIA CONCRETE CONSTRUCTORS INC. ID: 15755

Address: SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607

Used As: SubContractor DBE Items Total:$6,012,967.97

Items for GOSALIA CONCRETE CONSTRUCTORS INC.

0001 ROADWAY ITEMS - NPAR (CITY OF WINSTON SALEM)					
0001	0000100000-N MOBILIZATION	1.000	LS	$270,000.0000	$270,000.00
0147	2703000000-E CONCRETE BARRIER, TYPE ******* (T)	9670.000	LF	$141.0000	$1,363,470.00
0148	2703000000-E CONCRETE BARRIER, TYPE ******* (T1)	1850.000	LF	$174.0000	$321,900.00
0149	2703000000-E CONCRETE BARRIER, TYPE ******* (T2)	2750.000	LF	$367.0000	$1,009,250.00
0150	2710000000-N CONCRETE BARRIER TRANSITION SECTION	9.000	EA	$23,520.0000	$211,680.00
0151	2724000000-E PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	17520.000	LF	$92.5000	$1,620,600.00
0154	2752000000-E GENERIC PAVING ITEM DDI BARRIER	710.000	LF	$360.0000	$255,600.00
Section 0001 Total					$5,052,500.00
0004 STRUCTURE ITEMS					
0554	8503000000-E CONCRETE BARRIER RAIL	10618.700	LF	$70.5000	$748,618.35
0555	8505000000-E VERTICAL CONCRETE BARRIER RAIL	423.500	LF	$111.0000	$47,008.50
0556	8510000000-E CONCRETE MEDIAN BARRIER	309.700	LF	$94.0000	$29,111.80
0557	8517000000-E 1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-3 1/2")	354.100	LF	$76.0000	$26,911.60
0558	8517000000-E 1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-6")	832.980	LF	$74.0000	$61,640.52
0559	8517000000-E 1'-**"X *****" CONCRETE PARA- PET (1'-2" X 3'-3 3/4")	481.400	LF	$98.0000	$47,177.20
Section 0004 Total					$960,467.97
Item Total					$6,012,967.97

Name: HIATT & MASON ENTERPRISES INC ID: 3230

Address: POST OFFICE BOX 1378 , MOUNT AIRY, NC 27030

Used As: SubContractor DBE Items Total:$7,793,429.50

Items for HIATT & MASON ENTERPRISES INC

0004 STRUCTURE ITEMS					
0532	8147000000-E	294675.000	SF	$17.7900	$5,242,268.25
	REINFORCED CONCRETE DECK SLAB				
0543	8217000000-E	2090775.000	LB	$1.1700	$2,446,206.75
	REINFORCING STEEL (BRIDGE)				
0544	8238000000-E	29987.000	LB	$3.5000	$104,954.50
	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)				
Section 0004 Total					$7,793,429.50
Item Total					$7,793,429.50

Name: REYNOLDS FENCE & GUARDRAIL INC ID: 3376

Address: 9320 MACHADO DRIVE , INDIAN TRAIL, NC 28079

Used As: SubContractor DBE Items Total:$1,949,410.00

Items for REYNOLDS FENCE & GUARDRAIL INC

0001 ROADWAY ITEMS - NPAR (CITY OF WINSTON SALEM)					
0159	3030000000-E STEEL BEAM GUARDRAIL	53000.000	LF	$27.5000	$1,457,500.00
0160	3045000000-E STEEL BEAM GUARDRAIL, SHOP CURVED	150.000	LF	$29.0000	$4,350.00
0161	3150000000-N ADDITIONAL GUARDRAIL POSTS	10.000	EA	$56.0000	$560.00
0162	3180000000-N GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)	1.000	EA	$2,900.0000	$2,900.00
0163	3210000000-N GUARDRAIL END UNITS, TYPE CAT-1	51.000	EA	$1,050.0000	$53,550.00
0164	3215000000-N GUARDRAIL ANCHOR UNITS, TYPE III	8.000	EA	$2,000.0000	$16,000.00
0165	3287000000-N GUARDRAIL END UNITS, TYPE TL-3	52.000	EA	$3,100.0000	$161,200.00
0166	3288000000-N GUARDRAIL END UNITS, TYPE TL-2	13.000	EA	$3,000.0000	$39,000.00
0167	3317000000-N GUARDRAIL ANCHOR UNITS, TYPE B-77	30.000	EA	$2,900.0000	$87,000.00
0168	3360000000-E REMOVE EXISTING GUARDRAIL	8650.000	LF	$1.5000	$12,975.00
0169	3365000000-E REMOVE EXISTING GUIDERAIL	15390.000	LF	$2.5000	$38,475.00
0170	3380000000-E TEMPORARY STEEL BEAM GUARDRAIL	2950.000	LF	$10.0000	$29,500.00
0171	3389150000-N TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-2)	10.000	EA	$2,500.0000	$25,000.00
0172	3389400000-E DOUBLE FACED CABLE GUIDERAIL	1300.000	LF	$13.0000	$16,900.00
0173	3389500000-N ADDITIONAL GUIDERAIL POSTS	5.000	EA	$100.0000	$500.00
0174	3389600000-N CABLE GUIDERAIL ANCHOR UNITS	1.000	EA	$4,000.0000	$4,000.00
Section 0001 Total					$1,949,410.00

Item Total	$1,949,410.00

Name: TRAFFIC CONTROL SAFETY SERVICES, INC. ID: 4761

Address: POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114

Used As: SubContractor DBE Items Total:$4,307,751.50

Items for TRAFFIC CONTROL SAFETY SERVICES, INC.

0001 ROADWAY ITEMS - NPAR (CITY OF WINSTON SALEM)					
0001	0000100000-N MOBILIZATION	1.000	LS	$255,000.0000	$255,000.00
0187	4048000000-E REINFORCED CONCRETE SIGN FOUN-DATIONS	15.000	CY	$950.0000	$14,250.00
0188	4054000000-E PLAIN CONCRETE SIGN FOUNDA- TIONS	3.000	CY	$950.0000	$2,850.00
0189	4057000000-E OVERHEAD FOOTING	727.000	CY	$300.0000	$218,100.00
0190	4060000000-E SUPPORTS, BREAKAWAY STEEL BEAM	15077.000	LB	$6.0000	$90,462.00
0191	4066000000-E SUPPORTS, SIMPLE STEEL BEAM	4418.000	LB	$6.0000	$26,508.00
0192	4072000000-E SUPPORTS, 3-LB STEEL U-CHANNEL	4723.000	LF	$8.0000	$37,784.00
0193	4078000000-E SUPPORTS, 2-LB STEEL U-CHANNEL	14.000	EA	$100.0000	$1,400.00
0194	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (155+88 -Y15-)	1.000	LS	$110,000.0000	$110,000.00
0195	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (160+00 -Y15-)	1.000	LS	$95,500.0000	$95,500.00
0196	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (160+85 -Y15-)	1.000	LS	$95,500.0000	$95,500.00
0197	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (17+50 -Y15REV-)	1.000	LS	$95,500.0000	$95,500.00
0198	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (20+87 -Y4-)	1.000	LS	$180,000.0000	$180,000.00
0199	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (24+50 -Y15-)	1.000	LS	$95,000.0000	$95,000.00
0200	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (26+00 -Y4-)	1.000	LS	$150,000.0000	$150,000.00
0201	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (26+37 -Y15FLYBD-)	1.000	LS	$135,000.0000	$135,000.00
0202	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (29+41 -Y4-)	1.000	LS	$78,500.0000	$78,500.00
0203	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (31+94 -Y4-)	1.000	LS	$78,500.0000	$78,500.00

0204	4082100000-N	1.000	LS	$86,500.0000	$86,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (32+00 -Y15-)				
0205	4082100000-N	1.000	LS	$135,000.0000	$135,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (32+00 -Y15FLYAC-)				
0206	4082100000-N	1.000	LS	$160,000.0000	$160,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (34+68 -Y15FLYCA-)				
0207	4082100000-N	1.000	LS	$78,000.0000	$78,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (47+00 -Y15FLYAC-)				
0208	4082100000-N	1.000	LS	$150,000.0000	$150,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (50+46 -Y15-)				
0209	4082100000-N	1.000	LS	$79,000.0000	$79,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (52+00 -Y15FLYCA-)				
0210	4082100000-N	1.000	LS	$86,000.0000	$86,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (56+00 -Y15REV-)				
0211	4082100000-N	1.000	LS	$135,000.0000	$135,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (666+00 -L-)				
0212	4082100000-N	1.000	LS	$102,500.0000	$102,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (686+00 -L-)				
0213	4082100000-N	1.000	LS	$156,500.0000	$156,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (702+30 -L-)				
0214	4082100000-N	1.000	LS	$96,000.0000	$96,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (706+00 -L-)				
0215	4082100000-N	1.000	LS	$96,000.0000	$96,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (737+50 -L- EB)				
0216	4082100000-N	1.000	LS	$125,000.0000	$125,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (737+50 -L- WB)				
0217	4082100000-N	1.000	LS	$86,000.0000	$86,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (757+00 -L-)				
0218	4082100000-N	1.000	LS	$79,500.0000	$79,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (76+25 -Y15FLYBD-)				
0219	4082100000-N	1.000	LS	$125,000.0000	$125,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (763+84 -L-)				
0220	4082100000-N	1.000	LS	$135,000.0000	$135,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (794+00 -L-)				
0221	4082100000-N	1.000	LS	$125,000.0000	$125,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (819+00 -L-)				
0222	4082100000-N	1.000	LS	$114,000.0000	$114,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (826+00 -L-)				
0223	4082100000-N	1.000	LS	$125,000.0000	$125,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (835+50 -L-)				
0224	4082100000-N	1.000	LS	$105,000.0000	$105,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (89+70 -Y15REV-)				
0225	4082100000-N	1.000	LS	$125,000.0000	$125,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (91+50 -Y15REV-)				
0226	4096000000-N	7.000	EA	$150.0000	$1,050.00
	SIGN ERECTION, TYPE D				
0227	4102000000-N	255.000	EA	$68.5000	$17,467.50
	SIGN ERECTION, TYPE E				
0228	4108000000-N	7.000	EA	$150.0000	$1,050.00

		SIGN ERECTION, TYPE F			
0229	4109000000-N	56.000	EA	$10.0000	$560.00
		SIGN ERECTION, TYPE *** (OVER-HEAD) (A)			
0230	4109000000-N	29.000	EA	$10.0000	$290.00
		SIGN ERECTION, TYPE *** (OVER-HEAD) (B)			
0231	4110000000-N	18.000	EA	$650.0000	$11,700.00
		SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)			
0232	4110000000-N	2.000	EA	$450.0000	$900.00
		SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)			
0233	4114000000-N	12.000	EA	$150.0000	$1,800.00
		SIGN ERECTION, MILEMARKERS			
0234	4116100000-N	3.000	EA	$750.0000	$2,250.00
		SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)			
0235	4138000000-N	6.000	EA	$500.0000	$3,000.00
		DISPOSAL OF SUPPORT, STEEL BEAM			
0236	4152000000-N	5.000	EA	$500.0000	$2,500.00
		DISPOSAL OF SIGN SYSTEM, STEELBEAM			
0237	4155000000-N	33.000	EA	$10.0000	$330.00
		DISPOSAL OF SIGN SYSTEM, U- CHANNEL			
Section 0001 Total					$4,307,751.50
Item Total					$4,307,751.50

Name: SKYROCK CONCRETE FINISHING INC ID: 12836

Address: P. O. BOX 2278 , SHELBY, NC 28151

Used As: SubContractor DBE Items Total:$881,627.50

Items for SKYROCK CONCRETE FINISHING INC

0001 ROADWAY ITEMS - NPAR (CITY OF WINSTON SALEM)					
0134	2451000000-N	6.000	EA	$4,750.0000	$28,500.00
	CONCRETE TRANSITIONAL SECTION FOR DROP INLET				
0136	2542000000-E	3290.000	LF	$29.7500	$97,877.50
	1'-6" CONCRETE CURB & GUTTER				
0139	2577000000-E	550.000	LF	$85.0000	$46,750.00
	CONCRETE EXPRESSWAY GUTTER				
0141	2605000000-N	33.000	EA	$6,000.0000	$198,000.00
	CONCRETE CURB RAMPS				
0142	2612000000-E	1200.000	SY	$250.0000	$300,000.00
	6" CONCRETE DRIVEWAY				
0145	2655000000-E	1350.000	SY	$150.0000	$202,500.00
	5" MONOLITHIC CONCRETE ISLANDS(KEYED IN)				
0146	2657000000-E	20.000	SY	$400.0000	$8,000.00
	**" MONOLITHIC CONCRETE MEDIAN(*****) (8", NON-MOUNTABLE)				
Section 0001 Total					$881,627.50
Item Total					$881,627.50

THIS PROPOSAL CONTAINS THE FOLLOWING ERRORS/WARNINGS (IF ANY)

This Bid contains 2 amendment files

000001 12/09/2021 MODIFY CULVERT QUANTITIES
000002 12/15/2021 MODIFY ITEMS

Electronic Bid Submission

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

I hereby certify that I have the authority to submit this bid.

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Contract Item Sheets For C204633

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum LS	13,500,000.00	13,500,000.00
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum LS	5,000,000.00	5,000,000.00
0003	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum LS	13,500,000.00	13,500,000.00
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUB-BING	5 ACR	8,854.73	44,273.65
0005	0022000000-E	225	UNCLASSIFIED EXCAVATION	3,192,000 CY	4.94	15,768,480.00
0006	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (22+26.35 -Y1B-)	Lump Sum LS	30,500.41	30,500.41
0007	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (23+43.03 -Y16-)	Lump Sum LS	30,689.69	30,689.69
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (47+28.33 -Y15REV-)	Lump Sum LS	91,890.66	91,890.66
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (47+63.62 -Y15FLYBD-)	Lump Sum LS	42,821.42	42,821.42
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (58+33.94 -Y15FLYCA-)	Lump Sum LS	52,200.66	52,200.66
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (60+66.06 -Y15FLYAC-)	Lump Sum LS	46,435.40	46,435.40
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (30+67.66 -Y4-)	Lump Sum LS	123,127.96	123,127.96
0013	0036000000-E	225	UNDERCUT EXCAVATION	10,000 CY	8.09	80,900.00
0014	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	4 EA	1,000.00	4,000.00
0015	0134000000-E	240	DRAINAGE DITCH EXCAVATION	162,460 CY	12.13	1,970,639.80
0016	0141000000-E	240	BERM DITCH CONSTRUCTION	6,820 LF	10.11	68,950.20
0017	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	64,350 SY	7.49	481,981.50

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0018	0163000000-E	250	REMOVAL OF EXISTING CONCRETE PAVEMENT	75,130 SY	18.20	1,367,366.00
0019	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	16,650 SY	5.06	84,249.00
0020	0185000000-E	250	BREAKING OF EXISTING CONCRETE PAVEMENT	9,630 SY	6.07	58,454.10
0021	0192000000-N	260	PROOF ROLLING	120 HR	500.00	60,000.00
0022	0194000000-E	265	SELECT GRANULAR MATERIAL, CLASS III	28,900 CY	60.67	1,753,363.00
0023	0195000000-E	265	SELECT GRANULAR MATERIAL	10,000 CY	45.50	455,000.00
0024	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA-TION	74,600 SY	3.03	226,038.00
0025	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO-LEUM CONTAMINATED SOIL	500 TON	151.67	75,835.00
0026	0318000000-E	300	FOUNDATION CONDITIONING MATE-RIAL, MINOR STRUCTURES	7,124 TON	62.47	445,036.28
0027	0320000000-E	300	FOUNDATION CONDITIONING GEO-TEXTILE	25,560 SY	3.12	79,747.20
0028	0343000000-E	310	15" SIDE DRAIN PIPE	1,416 LF	57.27	81,094.32
0029	0344000000-E	310	18" SIDE DRAIN PIPE	344 LF	67.68	23,281.92
0030	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (42", V)	362 LF	390.45	141,342.90
0031	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (54", V)	292 LF	572.67	167,219.64
0032	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (60", V)	620 LF	645.55	400,241.00
0033	0360000000-E	310	12" RC PIPE CULVERTS, CLASS III	124 LF	52.06	6,455.44
0034	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	9,040 LF	52.06	470,622.40

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0035	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	12,832 LF	67.68	868,469.76
0036	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	6,288 LF	93.71	589,248.48
0037	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	3,838 LF	124.95	479,558.10
0038	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	2,832 LF	187.42	530,773.44
0039	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	1,756 LF	255.10	447,955.60
0040	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	704 LF	312.36	219,901.44
0041	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	212 LF	520.60	110,367.20
0042	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	744 LF	598.70	445,432.80
0043	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	56 LF	1,041.21	58,307.76
0044	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	168 LF	390.45	65,595.60
0045	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	292 LF	572.67	167,219.64
0046	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	360 LF	624.73	224,902.80
0047	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	4,348 LF	62.47	271,619.56
0048	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	2,932 LF	67.68	198,437.76
0049	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	1,232 LF	104.12	128,275.84
0050	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	92 LF	135.36	12,453.12
0051	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	784 LF	197.83	155,098.72

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0052	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	348 LF	260.30	90,584.40
0053	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (36", 0.079")	164 LF	260.30	42,689.20
0054	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (42", 0.109")	80 LF	343.60	27,488.00
0055	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	2,390 LF	93.71	223,966.90
0056	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	688 LF	104.12	71,634.56
0057	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	752 LF	114.53	86,126.56
0058	0600000000-E	310	30" CS PIPE CULVERTS, 0.079" THICK	580 LF	229.07	132,860.60
0059	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	86 EA	520.60	44,771.60
0060	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	26 EA	572.67	14,889.42
0061	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (24", 0.064")	20 EA	624.73	12,494.60
0062	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (30", 0.079")	18 EA	1,041.21	18,741.78
0063	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (36", 0.079")	2 EA	1,041.21	2,082.42
0064	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (42", 0.109")	2 EA	1,561.82	3,123.64
0065	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (24", 0.375")	54 LF	104.12	5,622.48
0066	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (30", 0.375")	102 LF	130.15	13,275.30

Contract Item Sheets For C204633

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0067	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (42", 0.500")	192 LF	156.18	29,986.56
0068	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (48", 0.500")	114 LF	182.21	20,771.94
0069	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (24", 0.375")	54 LF	156.18	8,433.72
0070	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (30", 0.375")	102 LF	182.21	18,585.42
0071	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (42", 0.500")	192 LF	208.24	39,982.08
0072	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (48", 0.500")	114 LF	260.30	29,674.20
0073	0995000000-E	340	PIPE REMOVAL	14,480 LF	15.62	226,177.60
0074	0996000000-N	350	PIPE CLEAN OUT	10 EA	5,206.05	52,060.50
0075	1011000000-N	500	FINE GRADING	Lump Sum LS	3,225,000.00	3,225,000.00
0076	1077000000-E	SP	#57 STONE	20 TON	46.85	937.00
0077	1099500000-E	505	SHALLOW UNDERCUT	8,000 CY	10.15	81,200.00
0078	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	98,565 TON	43.03	4,241,251.95
0079	1110000000-E	510	STABILIZER AGGREGATE	500 TON	43.03	21,515.00
0080	1111000000-E	SP	CLASS IV AGGREGATE STABILIZATION	9,500 TON	44.26	420,470.00
0081	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STABILIZATION	187,400 SY	4.30	805,820.00
0082	1121000000-E	520	AGGREGATE BASE COURSE	15,800 TON	46.72	738,176.00
0083	1220000000-E	545	INCIDENTAL STONE BASE	1,000 TON	40.44	40,440.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0084	1231000000-E	560	SHOULDER BORROW	21,700 CY	15.17	329,189.00
0085	1275000000-E	600	PRIME COAT	6,216 GAL	5.25	32,634.00
0086	1330000000-E	607	INCIDENTAL MILLING	3,520 SY	2.00	7,040.00
0087	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	139,930 TON	55.00	7,696,150.00
0088	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	94,040 TON	53.00	4,984,120.00
0089	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	50,950 TON	59.25	3,018,787.50
0090	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	38,290 TON	60.00	2,297,400.00
0091	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	16,525 TON	518.00	8,559,950.00
0092	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	1,355 TON	162.89	220,715.95
0093	1735000000-E	723	REPAIR OF JOINTED CONCRETE PAVEMENT SLABS	1,250 SY	451.66	564,575.00
0094	1736000000-E	723	SELECT MATERIAL, CLASS IV	50 TON	1,165.27	58,263.50
0095	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	57,550 LF	0.18	10,359.00
0096	1847000000-E	710	***** PORT CEM CONC PAVEMENT, THROUGH LANES (WITH DOWELS) (12")	132,215 SY	73.42	9,707,225.30
0097	1858000000-E	710	***** PORT CEM CONC PAVEMENT, RAMPS (WITH DOWELS) (12")	9,980 SY	75.87	757,182.60
0098	1869000000-E	710	***** PORT CEM CONC PAVEMENT, MISCELLANEOUS (WITHOUT DOWELS) (12")	3,470 SY	91.04	315,908.80
0099	1891000000-E	SP	GENERIC PAVING ITEM 7" JOINTED CONCRETE TRUCK APRON	380 SY	90.77	34,492.60
0100	1891000000-E	SP	GENERIC PAVING ITEM DIAMOND GRINDING PCC PAVEMENT	45,730 SY	5.03	230,021.90

Contract Item Sheets For C204633

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0101	1913000000-E	720	CONCRETE SHOULDERS ADJACENT TO ******" PAVEMENT (12")	75,440 SY	64.56	4,870,406.40
0102	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum LS	925,000.00	925,000.00
0103	1925000000-E	730	MILLED RUMBLE STRIPS (CONCRETE SHOULDERS)	60,240 LF	2.50	150,600.00
0104	2000000000-N	806	RIGHT-OF-WAY MARKERS	278 EA	108.33	30,115.74
0105	2020000000-N	806	CONTROL-OF-ACCESS MARKERS	8 EA	214.00	1,712.00
0106	2022000000-E	815	SUBDRAIN EXCAVATION	5,174.4 CY	15.68	81,134.59
0107	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	15,400 SY	3.92	60,368.00
0108	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	2,587.2 CY	102.49	265,162.13
0109	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	15,400 LF	24.37	375,298.00
0110	2070000000-N	815	SUBDRAIN PIPE OUTLET	31 EA	609.23	18,886.13
0111	2077000000-E	815	6" OUTLET PIPE	186 LF	39.73	7,389.78
0112	2099000000-E	816	SHOULDER DRAIN	22,060 LF	7.27	160,376.20
0113	2110000000-E	816	4" SHOULDER DRAIN PIPE	22,060 LF	2.12	46,767.20
0114	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	1,780 LF	16.98	30,224.40
0115	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	40 EA	626.26	25,050.40
0116	2143000000-E	818	BLOTTING SAND	20 TON	30.00	600.00
0117	2209000000-E	838	ENDWALLS	56.374 CY	1,561.70	88,039.28
0118	2220000000-E	838	REINFORCED ENDWALLS	50 CY	2,082.42	104,121.00
0119	2253000000-E	840	PIPE COLLARS	21.554 CY	1,561.52	33,657.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0120	2275000000-E	SP	FLOWABLE FILL	31 CY	468.54	14,524.74
0121	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	502 EA	4,164.84	2,090,749.68
0122	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	96.64 CY	3,644.23	352,178.39
0123	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	518.6 LF	1,041.21	539,971.51
0124	2354000000-N	840	FRAME WITH GRATE, STD 840.22	4 EA	780.91	3,123.64
0125	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	19 EA	885.03	16,815.57
0126	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	106 EA	780.91	82,776.46
0127	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	176 EA	780.91	137,440.16
0128	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	4 EA	780.91	3,123.64
0129	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	7 EA	937.09	6,559.63
0130	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	45 EA	1,041.21	46,854.45
0131	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	46 EA	937.09	43,106.14
0132	2396000000-N	840	FRAME WITH COVER, STD 840.54	44 EA	780.91	34,360.04
0133	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	69 EA	3,123.63	215,530.47
0134	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	6 EA	4,750.00	28,500.00
0135	2473000000-N	SP	GENERIC DRAINAGE ITEM OUTLET CONTROL STUCTURE	2 EA	52,060.47	104,120.94
0136	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	3,290 LF	29.75	97,877.50
0137	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	13,160 LF	35.45	466,522.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0138	2556000000-E	846	SHOULDER BERM GUTTER	10,080 LF	59.41	598,852.80
0139	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	550 LF	108.01	59,405.50
0140	2591000000-E	848	4" CONCRETE SIDEWALK	2,550 SY	87.25	222,487.50
0141	2605000000-N	848	CONCRETE CURB RAMPS	33 EA	6,000.00	198,000.00
0142	2612000000-E	848	6" CONCRETE DRIVEWAY	1,200 SY	260.83	312,996.00
0143	2619000000-E	850	4" CONCRETE PAVED DITCH	390 SY	92.56	36,098.40
0144	2627000000-E	852	4" CONCRETE ISLAND COVER	6,020 SY	80.00	481,600.00
0145	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	1,350 SY	150.00	202,500.00
0146	2657000000-E	852	**" MONOLITHIC CONCRETE MEDIAN (*****) (8", NON-MOUNTABLE)	20 SY	407.09	8,141.80
0147	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T)	9,670 LF	143.15	1,384,260.50
0148	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	1,850 LF	176.65	326,802.50
0149	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	2,750 LF	372.59	1,024,622.50
0150	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	9 EA	23,878.17	214,903.53
0151	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	17,520 LF	93.91	1,645,303.20
0152	2738000000-E	SP	GENERIC PAVING ITEM FILL AND CAP BEHIND BARRIER	270 SY	192.00	51,840.00
0153	2752000000-E	SP	GENERIC PAVING ITEM 2'-0" MODIFIED VALLEY GUTTER	230 LF	92.65	21,309.50
0154	2752000000-E	SP	GENERIC PAVING ITEM DDI BARRIER	710 LF	365.48	259,490.80
0155	2759000000-N	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	4 EA	51,624.37	206,497.48

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0156	2815000000-N	858	ADJUSTMENT OF DROP INLETS	2 EA	1,561.82	3,123.64
0157	2860000000-N	859	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX	1 EA	5,206.05	5,206.05
0158	2905000000-N	859	CONVERT EXISTING DROP INLET TO JUNCTION BOX	6 EA	5,206.05	31,236.30
0159	3030000000-E	862	STEEL BEAM GUARDRAIL	53,000 LF	27.50	1,457,500.00
0160	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	150 LF	29.00	4,350.00
0161	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA	56.00	560.00
0162	3180000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)	1 EA	2,900.00	2,900.00
0163	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	51 EA	1,050.00	53,550.00
0164	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	8 EA	2,000.00	16,000.00
0165	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	52 EA	3,100.00	161,200.00
0166	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	13 EA	3,000.00	39,000.00
0167	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	30 EA	2,900.00	87,000.00
0168	3360000000-E	863	REMOVE EXISTING GUARDRAIL	8,650 LF	1.50	12,975.00
0169	3365000000-E	863	REMOVE EXISTING GUIDERAIL	15,390 LF	2.50	38,475.00
0170	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	2,950 LF	10.00	29,500.00
0171	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-2)	10 EA	2,500.00	25,000.00
0172	3389400000-E	865	DOUBLE FACED CABLE GUIDERAIL	1,300 LF	13.00	16,900.00
0173	3389500000-N	865	ADDITIONAL GUIDERAIL POSTS	5 EA	100.00	500.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0174	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	1 EA	4,000.00	4,000.00
0175	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	51,900 LF	6.50	337,350.00
0176	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	3,256 EA	32.00	104,192.00
0177	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	825 EA	45.00	37,125.00
0178	3559000000-E	866	** STRAND BARBED WIRE FENCE WITH POSTS (5)	3,230 LF	15.00	48,450.00
0179	3564000000-E	866	SINGLE GATES, **" HIGH, **' WIDE, **' OPENING (47", 12', 12')	6 EA	3,000.00	18,000.00
0180	3628000000-E	876	RIP RAP, CLASS I	8,220 TON	50.00	411,000.00
0181	3635000000-E	876	RIP RAP, CLASS II	210 TON	55.00	11,550.00
0182	3642000000-E	876	RIP RAP, CLASS A	10 TON	40.00	400.00
0183	3649000000-E	876	RIP RAP, CLASS B	4,780 TON	50.00	239,000.00
0184	3651000000-E	SP	BOULDERS	40 TON	200.00	8,000.00
0185	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	35,825 SY	3.12	111,774.00
0186	3659000000-N	873	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	11 EA	6,247.26	68,719.86
0187	4048000000-E	902	REINFORCED CONCRETE SIGN FOUN-DATIONS	15 CY	1,018.56	15,278.40
0188	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDA-TIONS	3 CY	1,018.56	3,055.68
0189	4057000000-E	SP	OVERHEAD FOOTING	727 CY	321.65	233,839.55
0190	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	15,077 LB	6.43	96,945.11
0191	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	4,418 LB	6.43	28,407.74
0192	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	4,723 LF	8.58	40,523.34

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0193	4078000000-E	903	SUPPORTS, 2-LB STEEL U-CHANNEL	14 EA	107.22	1,501.08
0194	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (155+88 -Y15-)	Lump Sum LS	117,938.14	117,938.14
0195	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (160+00 -Y15-)	Lump Sum LS	102,391.75	102,391.75
0196	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (160+85 -Y15-)	Lump Sum LS	102,391.75	102,391.75
0197	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (17+50 -Y15REV-)	Lump Sum LS	101,855.67	101,855.67
0198	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (20+87 -Y4-)	Lump Sum LS	192,989.69	192,989.69
0199	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (24+50 -Y15-)	Lump Sum LS	101,855.67	101,855.67
0200	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (26+00 -Y4-)	Lump Sum LS	160,824.74	160,824.74
0201	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (26+37 -Y15FLYBD-)	Lump Sum LS	144,742.27	144,742.27
0202	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (29+41 -Y4-)	Lump Sum LS	84,164.95	84,164.95
0203	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (31+94 -Y4-)	Lump Sum LS	84,164.95	84,164.95
0204	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (32+00 -Y15-)	Lump Sum LS	92,742.27	92,742.27
0205	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (32+00 -Y15FLYAC-)	Lump Sum LS	144,742.27	144,742.27
0206	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (34+68 -Y15FLYCA-)	Lump Sum LS	171,546.39	171,546.39

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0207	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (47+00 -Y15FLYAC-)	Lump Sum LS	83,628.87	83,628.87
0208	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (50+46 -Y15-)	Lump Sum LS	160,824.74	160,824.74
0209	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (52+00 -Y15FLYCA-)	Lump Sum LS	84,701.03	84,701.03
0210	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (56+00 -Y15REV-)	Lump Sum LS	92,206.19	92,206.19
0211	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (666+00 -L-)	Lump Sum LS	144,742.27	144,742.27
0212	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (686+00 -L-)	Lump Sum LS	109,896.91	109,896.91
0213	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (702+30 -L-)	Lump Sum LS	167,793.81	167,793.81
0214	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (706+00 -L-)	Lump Sum LS	102,927.84	102,927.84
0215	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (737+50 -L- EB)	Lump Sum LS	102,927.84	102,927.84
0216	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (737+50 -L- WB)	Lump Sum LS	134,020.62	134,020.62
0217	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (757+00 -L-)	Lump Sum LS	92,206.19	92,206.19
0218	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (76+25 -Y15FLYBD-)	Lump Sum LS	85,237.11	85,237.11
0219	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (763+84 -L-)	Lump Sum LS	134,020.62	134,020.62

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0220	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (794+00 -L-)	Lump Sum LS	144,742.27	144,742.27
0221	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (819+00 -L-)	Lump Sum LS	134,020.62	134,020.62
0222	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (826+00 -L-)	Lump Sum LS	122,226.80	122,226.80
0223	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (835+50 -L-)	Lump Sum LS	134,020.62	134,020.62
0224	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (89+70 -Y15REV-)	Lump Sum LS	112,577.32	112,577.32
0225	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (91+50 -Y15REV-)	Lump Sum LS	134,020.62	134,020.62
0226	4096000000-N	904	SIGN ERECTION, TYPE D	7 EA	160.82	1,125.74
0227	4102000000-N	904	SIGN ERECTION, TYPE E	255 EA	73.44	18,727.20
0228	4108000000-N	904	SIGN ERECTION, TYPE F	7 EA	160.82	1,125.74
0229	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	56 EA	10.72	600.32
0230	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	29 EA	10.72	310.88
0231	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	18 EA	696.91	12,544.38
0232	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	2 EA	482.48	964.96
0233	4114000000-N	904	SIGN ERECTION, MILEMARKERS	12 EA	160.83	1,929.96
0234	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	3 EA	804.12	2,412.36

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0235	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	6 EA	536.08	3,216.48
0236	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	5 EA	536.08	2,680.40
0237	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	33 EA	10.72	353.76
0238	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	562 SF	6.24	3,506.88
0239	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	2,452 SF	13.52	33,151.04
0240	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	565 SF	9.36	5,288.40
0241	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	16 SF	12.48	199.68
0242	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	380 SF	6.76	2,568.80
0243	4415000000-N	1115	FLASHING ARROW BOARD	8 EA	2,600.00	20,800.00
0244	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	10 EA	11,232.00	112,320.00
0245	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	10 EA	4,160.00	41,600.00
0246	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	56 EA	2,600.00	145,600.00
0247	4430000000-N	1130	DRUMS	410 EA	40.82	16,736.20
0248	4432000000-N	SP	HIGH VISIBILITY DRUMS	510 EA	75.40	38,454.00
0249	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	60 EA	104.00	6,240.00
0250	4435000000-N	1135	CONES	74 EA	20.80	1,539.20
0251	4445000000-E	1145	BARRICADES (TYPE III)	936 LF	23.40	21,902.40
0252	4447000000-E	SP	PEDESTRIAN CHANNELIZING DE-VICES	45 LF	57.20	2,574.00
0253	4455000000-N	1150	FLAGGER	106 DAY	385.08	40,818.48

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0254	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	9 EA	10,632.91	95,696.19
0255	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	14 EA	2,987.34	41,822.76
0256	4480000000-N	1165	TMA	6 EA	57,200.00	343,200.00
0257	4485000000-E	1170	PORTABLE CONCRETE BARRIER	31,326 LF	36.81	1,153,110.06
0258	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	250 LF	63.61	15,902.50
0259	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	45,830 LF	6.23	285,520.90
0260	4510000000-N	1190	LAW ENFORCEMENT	64 HR	53.22	3,406.08
0261	4570000000-E	SP	TEMPORARY GLARE SCREEN	4,977 LF	16.15	80,378.55
0262	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	9 EA	172.00	1,548.00
0263	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8 EA	2,300.00	18,400.00
0264	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM FLASHING BEACON AND DETECTION SYSTEM	2 EA	38,496.00	76,992.00
0265	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	3,165 EA	5.78	18,293.70
0266	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	44,152 LF	0.72	31,789.44
0267	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	156,846 LF	0.75	117,634.50
0268	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	2,728 LF	1.64	4,473.92
0269	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	18,414 LF	1.54	28,357.56
0270	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	108 EA	143.00	15,444.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0271	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	288 EA	171.60	49,420.80
0272	4775000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (IV)	1,646 LF	7.70	12,674.20
0273	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (IV)	1,632 LF	13.20	21,542.40
0274	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	200,932 LF	0.46	92,428.72
0275	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	7,767 LF	1.40	10,873.80
0276	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	134 LF	6.99	936.66
0277	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	4,594 LF	2.17	9,968.98
0278	4840000000-N	1205	PAINT PAVEMENT MARKING CHARAC-TER	60 EA	73.46	4,407.60
0279	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	465 EA	76.22	35,442.30
0280	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	268,270 LF	1.09	292,414.30
0281	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	9,332 LF	2.94	27,436.08
0282	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	22,125 LF	3.03	67,038.75
0283	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	164,490 LF	0.43	70,730.70
0284	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	490 LF	1.83	896.70
0285	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	3,829 LF	3.55	13,592.95
0286	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	319 LF	9.63	3,071.97

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0287	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	27 EA	110.00	2,970.00
0288	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12" 30 MILS (STANDARD GLASS BEADS)	13,967 LF	2.04	28,492.68
0289	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 30 MILS (STANDARD GLASS BEADS)	4,479 LF	2.15	9,629.85
0290	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 30 MILS (STANDARD GLASS BEADS)	138,443 LF	1.54	213,202.22
0291	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 8", 30 MILS (STANDARD GLASS BEADS)	124 LF	14.15	1,754.60
0292	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	1,989 LF	7.21	14,340.69
0293	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	4,352 EA	45.10	196,275.20
0294	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	145 EA	8.80	1,276.00
0295	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA	30,303.03	90,909.09
0296	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA	3,636.36	3,636.36
0297	5025000000-E	SP	HIGH MOUNT FOUNDATIONS	21 CY	1,111.11	23,333.31
0298	5030000000-N	SP	HIGH MOUNT LUMINAIRES ******** (560W LED)	18 EA	1,818.18	32,727.24
0299	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' SA, 15' ARM)	13 EA	5,050.51	65,656.63
0300	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)	8 EA	5,454.55	43,636.40

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0301	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R1)	19 EA	878.79	16,697.01
0302	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R2)	2 EA	888.89	1,777.78
0303	5080000000-N	SP	LIGHT STANDARD LUMINAIRES, TYPE ********** (RDW, 285W LED)	29 EA	752.53	21,823.37
0304	5120000000-N	1407	ELECTRIC SERVICE POLE **** ******** (30' CLASS 4)	1 EA	3,686.87	3,686.87
0305	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 1/0 USE)	25 LF	50.51	1,262.75
0306	5145000000-N	1408	LIGHT CONTROL EQUIPMENT, TYPE RW ********** (240/480 V)	1 EA	17,676.77	17,676.77
0307	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	470 LF	6.57	3,087.90
0308	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")	655 LF	15.91	10,421.05
0309	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")	315 LF	22.73	7,159.95
0310	5170000000-E	1410	** #8 W/G FEEDER CIRCUIT (2)	460 LF	2.83	1,301.80
0311	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2)	600 LF	3.59	2,154.00
0312	5180000000-E	1410	** #4 W/G FEEDER CIRCUIT (2)	190 LF	4.29	815.10
0313	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	5,230 LF	8.84	46,233.20
0314	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	3,040 LF	9.09	27,633.60

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0315	5215000000-E	1410	** #4 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	2,635 LF	10.86	28,616.10
0316	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (CS36)	1 EA	1,060.61	1,060.61
0317	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM18)	3 EA	378.79	1,136.37
0318	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG18)	13 EA	404.04	5,252.52
0319	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG30)	5 EA	707.07	3,535.35
0320	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS18)	19 EA	373.74	7,101.06
0321	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS30)	2 EA	707.07	1,414.14
0322	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum LS	124,875.60	124,875.60
0323	5325000000-E	1510	**" WATER LINE (36")	1,303 LF	917.59	1,195,619.77
0324	5325200000-E	1510	2" WATER LINE	271 LF	36.98	10,021.58
0325	5325600000-E	1510	6" WATER LINE	5,887 LF	122.61	721,805.07
0326	5326200000-E	1510	12" WATER LINE	35 LF	550.75	19,276.25
0327	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	41,890 LB	17.24	722,183.60
0328	5540000000-E	1515	6" VALVE	41 EA	2,160.80	88,592.80
0329	5558000000-E	1515	12" VALVE	1 EA	4,788.94	4,788.94
0330	5571600000-E	1515	6" TAPPING SLEEVE & VALVE	1 EA	4,992.96	4,992.96

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0331	5600000000-E	1515	**" BLOW OFF (3/4")	1 EA	1,715.58	1,715.58
0332	5648000000-N	1515	RELOCATE WATER METER	48 EA	1,801.01	86,448.48
0333	5649000000-N	1515	RECONNECT WATER METER	4 EA	1,527.64	6,110.56
0334	5666000000-N	1515	FIRE HYDRANT	24 EA	4,645.23	111,485.52
0335	5672000000-N	1515	RELOCATE FIRE HYDRANT	1 EA	4,498.49	4,498.49
0336	5673000000-E	1515	FIRE HYDRANT LEG	503 LF	74.77	37,609.31
0337	5678400000-E	1515	6" LINE STOP	1 EA	18,090.45	18,090.45
0338	5679000000-E	1515	12" LINE STOP	1 EA	25,351.76	25,351.76
0339	5686500000-E	1515	WATER SERVICE LINE	2,465 LF	36.68	90,416.20
0340	5691300000-E	1520	8" SANITARY GRAVITY SEWER	8,921 LF	191.96	1,712,475.16
0341	5691600000-E	1520	16" SANITARY GRAVITY SEWER	1,586 LF	427.44	677,919.84
0342	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	21 EA	1,167.84	24,524.64
0343	5768500000-E	1520	SEWER SERVICE LINE	1,240 LF	89.05	110,422.00
0344	5775000000-E	1525	4' DIA UTILITY MANHOLE	40 EA	5,025.13	201,005.20
0345	5776000000-E	1525	5' DIA UTILITY MANHOLE	18 EA	8,693.47	156,482.46
0346	5777000000-E	1525	6' DIA UTILITY MANHOLE	4 EA	11,758.80	47,035.20
0347	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	222 LF	587.94	130,522.68
0348	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	190 LF	848.24	161,165.60
0349	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	12 LF	1,326.63	15,919.56
0350	5798000000-E	1530	ABANDON **" UTILITY PIPE (15")	1,565 LF	18.09	28,310.85

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0351	5798000000-E	1530	ABANDON **" UTILITY PIPE (36")	410 LF	77.39	31,729.90
0352	5801000000-E	1530	ABANDON 8" UTILITY PIPE	5,100 LF	11.46	58,446.00
0353	5811000000-E	1530	ABANDON 18" UTILITY PIPE	391 LF	28.14	11,002.74
0354	5815000000-N	1530	REMOVE WATER METER	373 EA	160.80	59,978.40
0355	5815500000-N	1530	REMOVE FIRE HYDRANT	49 EA	387.94	19,009.06
0356	5816000000-N	1530	ABANDON UTILITY MANHOLE	102 EA	709.55	72,374.10
0357	5828000000-N	1530	REMOVE UTILITY MANHOLE	5 EA	954.77	4,773.85
0358	5835000000-E	1540	**" ENCASEMENT PIPE (54")	330 LF	884.42	291,858.60
0359	5835800000-E	1540	18" ENCASEMENT PIPE	1,340 LF	88.44	118,509.60
0360	5836200000-E	1540	30" ENCASEMENT PIPE	360 LF	349.75	125,910.00
0361	5872500000-E	1550	BORE AND JACK OF **" (18")	885 LF	631.16	558,576.60
0362	5882000000-N	SP	GENERIC UTILITY ITEM 36" X 6" TAPPING SLEEVE AND VALVE	1 EA	13,567.84	13,567.84
0363	5882000000-N	SP	GENERIC UTILITY ITEM 4" COMBINATION AIR VALVE IN MH	1 EA	80,804.02	80,804.02
0364	5882000000-N	SP	GENERIC UTILITY ITEM STEEL PILE PIER	3 EA	10,653.27	31,959.81
0365	6000000000-E	1605	TEMPORARY SILT FENCE	242,460 LF	2.50	606,150.00
0366	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	9,325 TON	60.67	565,747.75
0367	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	44,570 TON	60.67	2,704,061.90
0368	6012000000-E	1610	SEDIMENT CONTROL STONE	25,840 TON	55.61	1,436,962.40

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0369	6015000000-E	1615	TEMPORARY MULCHING	1,404.5 ACR	816.33	1,146,535.49
0370	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	54,100 LB	7.14	386,274.00
0371	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEED-ING	270.5 TON	816.33	220,817.27
0372	6024000000-E	1622	TEMPORARY SLOPE DRAINS	24,585 LF	10.70	263,059.50
0373	6029000000-E	SP	SAFETY FENCE	5,640 LF	2.55	14,382.00
0374	6030000000-E	1630	SILT EXCAVATION	206,860 CY	12.59	2,604,367.40
0375	6036000000-E	1631	MATTING FOR EROSION CONTROL	771,880 SY	1.48	1,142,382.40
0376	6037000000-E	SP	COIR FIBER MAT	1,515 SY	6.12	9,271.80
0377	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	18,500 SY	4.90	90,650.00
0378	6042000000-E	1632	1/4" HARDWARE CLOTH	40,410 LF	4.85	195,988.50
0379	6045000000-E	SP	**" TEMPORARY PIPE (15")	150 LF	165.00	24,750.00
0380	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	100 LF	50.56	5,056.00
0381	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	165 SY	21.68	3,577.20
0382	6069000000-E	1638	STILLING BASINS	1,016 CY	22.50	22,860.00
0383	6070000000-N	1639	SPECIAL STILLING BASINS	13 EA	1,250.00	16,250.00
0384	6071010000-E	SP	WATTLE	1,530 LF	9.18	14,045.40
0385	6071012000-E	SP	COIR FIBER WATTLE	9,400 LF	12.24	115,056.00
0386	6071013000-E	SP	WATTLE BARRIER	28,290 LF	11.22	317,413.80
0387	6071020000-E	SP	POLYACRYLAMIDE (PAM)	14,635 LB	5.10	74,638.50
0388	6071030000-E	1640	COIR FIBER BAFFLE	29,710 LF	5.87	174,397.70

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0389	6071050000-E	SP	**" SKIMMER (1-1/2")	58 EA	1,516.68	87,967.44
0390	6071050000-E	SP	**" SKIMMER (2")	29 EA	1,769.46	51,314.34
0391	6071050000-E	SP	**" SKIMMER (2-1/2")	8 EA	2,527.81	20,222.48
0392	6071050000-E	SP	**" SKIMMER (3")	5 EA	3,033.37	15,166.85
0393	6071050000-E	SP	**" SKIMMER (4")	1 EA	4,044.49	4,044.49
0394	6084000000-E	1660	SEEDING & MULCHING	747 ACR	2,244.90	1,676,940.30
0395	6087000000-E	1660	MOWING	858 ACR	178.57	153,213.06
0396	6090000000-E	1661	SEED FOR REPAIR SEEDING	14,250 LB	6.12	87,210.00
0397	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	36.75 TON	1,836.73	67,499.83
0398	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	18,275 LB	4.08	74,562.00
0399	6108000000-E	1665	FERTILIZER TOPDRESSING	548 TON	994.90	545,205.20
0400	6111000000-E	SP	IMPERVIOUS DIKE	1,090 LF	115.00	125,350.00
0401	6114500000-N	1667	SPECIALIZED HAND MOWING	290 MHR	183.67	53,264.30
0402	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	150 EA	51.02	7,653.00
0403	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	34 EA	1,200.00	40,800.00
0404	6120000000-E	SP	CULVERT DIVERSION CHANNEL	2,650 CY	14.00	37,100.00
0405	6123000000-E	1670	REFORESTATION	11 ACR	1,683.67	18,520.37
0406	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	185 EA	408.16	75,509.60
0407	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	553 EA	204.08	112,856.24

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0408	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	16 EA	777.78	12,444.48
0409	7060000000-E	1705	SIGNAL CABLE	15,050 LF	2.78	41,839.00
0410	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	72 EA	811.11	58,399.92
0411	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	7 EA	1,030.30	7,212.10
0412	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	10 EA	1,414.14	14,141.40
0413	7252000000-E	1710	MESSENGER CABLE (1/4")	4,600 LF	2.78	12,788.00
0414	7264000000-E	1710	MESSENGER CABLE (3/8")	2,925 LF	4.55	13,308.75
0415	7279000000-E	1715	TRACER WIRE	35,406 LF	0.86	30,449.16
0416	7288000000-E	1715	PAVED TRENCHING (**********) (1, 2")	25 LF	45.45	1,136.25
0417	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	4,271 LF	6.57	28,060.47
0418	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	28,788 LF	7.58	218,213.04
0419	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 2")	2,530 LF	9.34	23,630.20
0420	7300000000-E	1715	UNPAVED TRENCHING (**********) (4, 2")	440 LF	11.62	5,112.80
0421	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,375 LF	16.16	22,220.00
0422	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	2,354 LF	17.93	42,207.22
0423	7301000000-E	1715	DIRECTIONAL DRILL (**********) (3, 2")	594 LF	20.20	11,998.80
0424	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	98 EA	363.64	35,636.72
0425	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	75 EA	690.07	51,755.25

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0426	7360000000-N	1720	WOOD POLE	23 EA	1,060.61	24,394.03
0427	7372000000-N	1721	GUY ASSEMBLY	23 EA	606.06	13,939.38
0428	7384000000-E	1722	***" RISER WITH ********** (1-1/2", WEATHERHEAD)	11 EA	429.29	4,722.19
0429	7408000000-E	1722	1" RISER WITH WEATHERHEAD	2 EA	404.04	808.08
0430	7420000000-E	1722	2" RISER WITH WEATHERHEAD	2 EA	858.59	1,717.18
0431	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	5,625 LF	7.93	44,606.25
0432	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	13,700 LF	1.77	24,249.00
0433	7481000000-N	SP	SITE SURVEY	2 EA	1,262.63	2,525.26
0434	7481200000-N	SP	LUMINAIRE ARM FOR VIDEO SYSTEM	4 EA	606.06	2,424.24
0435	7481240000-N	SP	CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT	8 EA	3,232.32	25,858.56
0436	7481260000-N	SP	EXTERNAL LOOP EMULATOR PRO-CESSING UNIT	2 EA	6,262.63	12,525.26
0437	7481280000-N	SP	RELOCATE CAMERA SENSOR UNIT	8 EA	303.03	2,424.24
0438	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (144)	21,534 LF	3.79	81,613.86
0439	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (24)	830 LF	3.28	2,722.40
0440	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (36)	5,425 LF	3.03	16,437.75
0441	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (72)	21,055 LF	3.28	69,060.40
0442	7528000000-E	1730	DROP CABLE	5,271 LF	3.03	15,971.13
0443	7540000000-N	1731	SPLICE ENCLOSURE	19 EA	1,919.19	36,464.61
0444	7552000000-N	1731	INTERCONNECT CENTER	21 EA	2,893.94	60,772.74

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0445	7566000000-N	1733	DELINEATOR MARKER	87 EA	122.22	10,633.14
0446	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	4,900 LF	0.91	4,459.00
0447	7576000000-N	SP	METAL STRAIN SIGNAL POLE	8 EA	16,666.67	133,333.36
0448	7588000000-N	SP	METAL POLE WITH SINGLE MAST ARM	6 EA	21,212.12	127,272.72
0449	7613000000-N	SP	SOIL TEST	21 EA	833.33	17,499.93
0450	7614100000-E	SP	DRILLED PIER FOUNDATION	95 CY	1,060.61	100,757.95
0451	7631000000-N	SP	MAST ARM WITH METAL POLE DE-SIGN	6 EA	252.53	1,515.18
0452	7636000000-N	1745	SIGN FOR SIGNALS	25 EA	555.56	13,889.00
0453	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	18 EA	2,020.20	36,363.60
0454	7684000000-N	1750	SIGNAL CABINET FOUNDATION	4 EA	2,525.25	10,101.00
0455	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE MOUNTED)	4 EA	16,464.65	65,858.60
0456	7744000000-N	1751	DETECTOR CARD (TYPE 170)	32 EA	121.21	3,878.72
0457	7901000000-N	1753	CABINET BASE EXTENDER	4 EA	590.91	2,363.64
0458	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	1 EA	4,545.45	4,545.45
0459	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	66 EA	252.53	16,666.98
0460	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE (60')	7 EA	14,848.48	103,939.36
0461	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	8 EA	4,141.41	33,131.28
0462	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	5 EA	8,585.86	42,929.30

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0463	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	5 EA	66,666.67	333,333.35
0464	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE-2C)	5 EA	75,757.58	378,787.90
0465	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	11 EA	1,313.13	14,444.43
0466	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	17 EA	1,515.15	25,757.55
0467	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	8 EA	5,454.55	43,636.40
0468	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET	1 EA	24,747.47	24,747.47
0469	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET BASE EXTENDER	1 EA	1,262.63	1,262.63
0470	7980000000-N	SP	GENERIC SIGNAL ITEM HUB CABINET FOUNDATION	1 EA	2,525.25	2,525.25
0471	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER-SIZED)	12 EA	1,515.15	18,181.80
0472	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA-TION PANEL	11 EA	2,323.23	25,555.53
0473	7980000000-N	SP	GENERIC SIGNAL ITEM SOLAR POWER ASSEMBLY	1 EA	11,919.19	11,919.19
0474	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	11 EA	227.27	2,499.97
0475	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR	660 LF	10.61	7,002.60
0476	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC-TORS	1,675 LF	5.56	9,313.00
0477	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC-TORS	3,570 LF	6.06	21,634.20

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0478	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (30+13.47 -Y115REV-)	Lump Sum LS	30,332.48	30,332.48
0479	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum LS	5,000.00	5,000.00
0480	8126000000-N	414	CULVERT EXCAVATION, STA ****** (18+22.67 -Y5B-)	Lump Sum LS	91,946.90	91,946.90
0481	8126000000-N	414	CULVERT EXCAVATION, STA ****** (19+75.11 -Y5B-)	Lump Sum LS	34,773.54	34,773.54
0482	8126000000-N	414	CULVERT EXCAVATION, STA ****** (30+13.47 -Y115REV-)	Lump Sum LS	127,508.06	127,508.06
0483	8126000000-N	414	CULVERT EXCAVATION, STA ****** (35+53.70 -Y15RPDREV-)	Lump Sum LS	74,937.38	74,937.38
0484	8126000000-N	414	CULVERT EXCAVATION, STA ****** (43+66.60 -Y15FLYCA-)	Lump Sum LS	63,865.88	63,865.88
0485	8126000000-N	414	CULVERT EXCAVATION, STA ****** (768+62.23 -L-)	Lump Sum LS	268,837.10	268,837.10
0486	8126000000-N	414	CULVERT EXCAVATION, STA ****** (792+88.12 -L-)	Lump Sum LS	96,061.66	96,061.66
0487	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	6,207 TON	67.09	416,427.63
0488	8196000000-E	420	CLASS A CONCRETE (CULVERT)	4,604.7 CY	593.37	2,732,290.84
0489	8245000000-E	425	REINFORCING STEEL (CULVERT)	799,380 LB	1.84	1,470,859.20
0490	8590000000-E	876	RIP RAP, CLASS ** (A)	85 TON	81.92	6,963.20
0491	8594000000-E	876	RIP RAP, CLASS B	85 TON	81.92	6,963.20
0492	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,990 SY	7.35	21,976.50

Contract Item Sheets For C204633

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0493	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	4,090 SF	98.49	402,824.10
0494	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	3,250 SF	97.69	317,492.50
0495	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREAT-MENT	555,368 SF	2.10	1,166,272.80
0496	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 1	56,818 SF	29.41	1,671,017.38
0497	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 2	85,427 SF	29.37	2,508,990.99
0498	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 3	87,297 SF	29.53	2,577,880.41
0499	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL 4	108,020 SF	29.63	3,200,632.60

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0500	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 22+26.35 -Y1B-)	Lump Sum LS	15,082.44	15,082.44
0501	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 58+33.94 -Y15FLYCA-)	Lump Sum LS	35,948.28	35,948.28
0502	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 60+66.06 -Y15FLYAC-)	Lump Sum LS	27,643.26	27,643.26
0503	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (2, 47+63.62 -Y15FLYBD-)	Lump Sum LS	17,732.19	17,732.19
0504	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (2, 60+66.06 -Y15FLYAC-)	Lump Sum LS	15,528.20	15,528.20
0505	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 47+63.62 -Y15FLYBD-)	Lump Sum LS	23,622.65	23,622.65
0506	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 58+33.94 -Y15FLYCA-)	Lump Sum LS	27,245.15	27,245.15
0507	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 60+66.06 -Y15FLYAC-)	Lump Sum LS	13,683.43	13,683.43
0508	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 47+63.62 -Y15FLYBD-)	Lump Sum LS	18,719.59	18,719.59
0509	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 58+33.94 -Y15FLYCA-)	Lump Sum LS	33,346.97	33,346.97
0510	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 60+66.06 -Y15FLYAC-)	Lump Sum LS	13,681.42	13,681.42
0511	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 47+63.62 -Y15FLYBD-)	Lump Sum LS	27,212.12	27,212.12
0512	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 58+33.94 -Y15FLYCA-)	Lump Sum LS	15,879.52	15,879.52

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0513	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (5, 60+66.06 -Y15FLYAC-)	Lump Sum LS	21,367.70	21,367.70
0514	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 47+63.62 -Y15FLYBD-)	Lump Sum LS	19,829.21	19,829.21
0515	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 58+33.94 -Y15FLYCA-)	Lump Sum LS	37,299.52	37,299.52
0516	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (6, 60+66.06 -Y15FLYAC-)	Lump Sum LS	19,923.30	19,923.30
0517	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (7, 58+33.94 -Y15FLYCA-)	Lump Sum LS	14,083.78	14,083.78
0518	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (8, 60+66.06 -Y15FLYAC-)	Lump Sum LS	6,194.44	6,194.44
0519	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (9, 60+66.06-Y15FLYAC-)	Lump Sum LS	22,168.42	22,168.42
0520	8096000000-E	450	PILE EXCAVATION IN SOIL	115 LF	127.21	14,629.15
0521	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	185 LF	128.37	23,748.45
0522	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (4'-6")	56 LF	1,072.18	60,042.08
0523	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (6'-0")	47 LF	1,272.93	59,827.71
0524	8105560000-E	411	4'-0" DIA DRILLED PIERS IN SOIL	98.5 LF	1,086.93	107,062.61
0525	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (4'-6")	56 LF	1,072.18	60,042.08
0526	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (5'-6")	140 LF	1,279.33	179,106.20

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0527	8105660000-E	411	4'-0" DIA DRILLED PIERS NOT IN SOIL	212 LF	1,063.46	225,453.52
0528	8112730000-N	450	PDA TESTING	2 EA	2,775.00	5,550.00
0529	8113000000-N	411	SID INSPECTIONS	5 EA	510.20	2,551.00
0530	8114000000-N	411	SPT TESTING	8 EA	816.33	6,530.64
0531	8115000000-N	411	CSL TESTING	4 EA	2,551.02	10,204.08
0532	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	294,675 SF	44.00	12,965,700.00
0533	8161000000-E	420	GROOVING BRIDGE FLOORS	268,594 SF	0.52	139,668.88
0534	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	9,485.3 CY	1,200.00	11,382,360.00
0535	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	2,195.6 CY	783.58	1,720,428.25
0536	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (22+26.35 -Y1B-)	Lump Sum LS	40,455.98	40,455.98
0537	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (23+43.03 -Y16-)	Lump Sum LS	38,428.32	38,428.32
0538	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (30+67.66 -Y4-)	Lump Sum LS	144,311.93	144,311.93
0539	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (47+28.33 -Y15REV-)	Lump Sum LS	233,807.08	233,807.08
0540	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (47+63.62 -Y15FLYBD-)	Lump Sum LS	55,192.76	55,192.76
0541	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (58+33.94 -Y15FLYCA-)	Lump Sum LS	55,355.53	55,355.53
0542	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (60+66.06 -Y15FLYAC-)	Lump Sum LS	55,871.19	55,871.19
0543	8217000000-E	425	REINFORCING STEEL (BRIDGE)	2,090,775 LB	1.27	2,655,284.25

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0544	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	29,987 LB	3.64	109,152.68
0545	8265000000-E	430	54" PRESTRESSED CONCRETE GIRDERS	1,763.7 LF	273.95	483,165.62
0546	8280000000-E	440	APPROX ..... LBS STRUCTURAL STEEL	11,906,699 LS	31,874,000.00	31,874,000.00
0547	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	114 EA	2,119.29	241,599.06
0548	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)	805 EA	2,358.12	1,898,286.60
0549	8364000000-E	450	HP12X53 STEEL PILES	4,420 LF	58.08	256,713.60
0550	8384000000-E	450	HP14X73 STEEL PILES	40,416 LF	68.39	2,764,050.24
0551	8391000000-N	450	STEEL PILE POINTS	39 EA	369.15	14,396.85
0552	8392500000-E	450	PREDRILLING FOR PILES	96 LF	315.04	30,243.84
0553	8475000000-E	460	TWO BAR METAL RAIL	1,617.2 LF	117.03	189,260.92
0554	8503000000-E	460	CONCRETE BARRIER RAIL	10,618.7 LF	71.57	759,980.36
0555	8505000000-E	460	VERTICAL CONCRETE BARRIER RAIL	423.5 LF	112.69	47,724.22
0556	8510000000-E	460	CONCRETE MEDIAN BARRIER	309.7 LF	95.43	29,554.67
0557	8517000000-E	460	1'-**"X *****" CONCRETE PARAPET (1'-2" X 2'-3 1/2")	354.1 LF	77.16	27,322.36
0558	8517000000-E	460	1'-**"X *****" CONCRETE PARAPET (1'-2" X 2'-6")	832.98 LF	75.13	62,581.79
0559	8517000000-E	460	1'-**"X *****" CONCRETE PARAPET (1'-2" X 3'-3 3/4")	481.4 LF	99.49	47,894.49
0560	8531000000-E	462	4" SLOPE PROTECTION	4,824.2 SY	70.00	337,694.00
0561	8654000000-N	SP	DISC BEARINGS	Lump Sum LS	1,084,398.71	1,084,398.71

Contract Item Sheets For C204633

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0562	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum LS	217,337.06	217,337.06
0563	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum LS	438,267.27	438,267.27
0564	8713000000-N	SP	MODULAR EXPANSION JOINT SEALS	Lump Sum LS	400,140.20	400,140.20
0565	8860000000-N	SP	GENERIC STRUCTURE ITEM POST TENSIONING ENCASEMENT	Lump Sum LS	62,639.48	62,639.48
0566	8860000000-N	SP	GENERIC STRUCTURE ITEM POST TENSIONING TENDONS	Lump Sum LS	41,963.52	41,963.52
0567	8867000000-E	SP	GENERIC STRUCTURE ITEM 63" PRESTRESSED CONCRETE FLORIDA I-BEAM GIRDERS	4,566.33 LF	338.03	1,543,556.53
0568	8881000000-E	SP	GENERIC STRUCTURE ITEM 6000 PSI CONCRETE	95.2 CY	1,637.67	155,906.18
0569	8897000000-N	SP	GENERIC STRUCTURE ITEM 9-5/8" DIA MICROPILES	196 EA	10,765.31	2,110,000.76
0570	8897000000-N	SP	GENERIC STRUCTURE ITEM DEMONSTRATION MICROPILES	1 EA	26,734.69	26,734.69
0571	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE PROOF TESTS	8 EA	4,591.84	36,734.72
0572	8897000000-N	SP	GENERIC STRUCTURE ITEM MICROPILE VERIFICATION TESTS	1 EA	20,408.16	20,408.16

TOTAL AMOUNT OF BID FOR ENTIRE PROJECT **$261,764,022.37**

Contract No. C204633
County Forsyth

Rev. 1-16-18

EXECUTION OF CONTRACT
NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION

LIMITED LIABILITY COMPANY

The Contractor declares (or certifies, verifies, or states) under penalty of perjuryunder the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with this Contract, that the Contractor has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Contractor intends to do the work with its own bonafide employees or subcontractors and did not bid for the benefit of another contractor.
By submitting this Execution of Contract, Non-Collusion and Debarment Certification, the Contractor is certifying his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Webber, LLC

Full Name of Firm

1725 Hughes Landing Blvd., Suite 1200 The Woodlands, TX 77380

Address as Prequalified

Laura Kurz

Signature of Witness

Laura Kurz

Print or type Signer's name

Signature ~~of Member~~/Manager/~~Authorized Agent~~
Select appropriate title

Jose Carlos Esteban

Print or type Signer's Name

Contract No. C204633
County Forsyth

Rev. 1-16-18

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal,* and *voluntarily excluded,* as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR* 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

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

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

Contract No. C204633

County Forsyth

Rev. 1-16-18

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

Contract No. **C204633**

County (ies): **Forsyth**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Ronald E. Davenport, Jr.
F81B6038A47A442...

Contract Officer

01/20/2022

Date

Execution of Contract and Bonds
Approved as to Form:

DocuSigned by:
646E313577A7476...

Attorney General

01/20/2022

Date

Contract No. C204633
County Forsyth

Rev 5-17-11

Bond #K40450609, 47-SUR-300076-01-0037, 30149052, 285068238, & 9393508

CONTRACT PAYMENT BOND

Date of Payment Bond Execution	01/05/2022
Name of Principal Contractor	Webber, LLC
Name of Surety:	Federal Insurance Company, Berkshire Hathaway Specialty Insurance Company, The Continental Casualty Insurance Company, Liberty Mutual Insurance Company and Zurich American Insurance Company
Name of Contracting Body:	**North Carolina Department of Transportation**
	Raleigh, North Carolina
Amount of Bond:	$261,764,022.37
Contract ID No.:	C204633
County Name:	Forsyth

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C204633
County Forsyth

Rev 5-17-11

CONTRACT PAYMENT BOND

Affix Seal of Surety Company

Federal Insurance Company, Berkshire Hathaway Specialty Insurance Company, The Continental Casualty Insurance Company, Liberty Mutual Insurance Company and Zurich American Insurance Company

Print or type Surety Company Name

By Tannis Mattson, Attorney-in-Fact

Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

Sandra Parker, Witness

Print or type Signer's name

2929 Allen Parkway, Suite 2500, Houston, TX 77019

Address of Attorney-in-Fact

Contract No. C204633
County Forsyth

Rev 5-17-11

CONTRACT PAYMENT BOND

LIMITED LIABILITY COMPANY

SIGNATURE OF CONTRACTOR (Principal)

Name of Contractor Webber, LLC
Full name of Firm

1725 Hughes Landing Blvd., Suite 1200, The Woodlands, TX 77380
Address as prequalified

By: _____
Signature of ~~Member~~, Manager, ~~Authorized Agent~~
Select appropriate title

Jose Carlos Esteban
Print or type Signer's name

Contract No. C204633
County Forsyth

Rev 5-17-11

Bond #K40450609, 47-SUR-300076-01-0037, 30149052, 285068238, & 9393508

CONTRACT PERFORMANCE BOND

Date of Performance Bond Execution: 01/05/2022

Name of Principal Contractor: Webber, LLC

Name of Surety: Federal Insurance Company, Berkshire Hathaway Specialty Insurance Company, The Continental Casualty Insurance Company, Liberty Mutual Insurance Company and Zurich American Insurance Company

Name of Contracting Body: **North Carolina Department of Transportation**

Raleigh, North Carolina

Amount of Bond: $261,764,022.37

Contract ID No.: C204633

County Name: Forsyth

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C204633
County Forsyth

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Affix Seal of Surety Company

Federal Insurance Company, Berkshire Hathaway Specialty Insurance Company, The Continental Casualty Insurance Company, Liberty Mutual Insurance Company and Zurich American Insurance Company

Print or type Surety Company Name

By Tannis Mattson, Attorney-in-Fact

Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

Sandra Parker, Witness

Print or type Signer's name

2929 Allen Parkway, Suite 2500, Houston, TX 77019

Address of Attorney-in-Fact

Contract No. C204633
County Forsyth

Rev 5-17-11

CONTRACT PERFORMANCE BOND

LIMITED LIABILITY COMPANY

SIGNATURE OF CONTRACTOR (Principal)

Name of Contractor Webber, LLC
Full name of Firm

1725 Hughes Landing Blvd., Suite 1200, The Woodlands, TX 77380
Address as prequalified

By: _____
Signature of ~~Member~~, Manager, ~~Authorized Agent~~
Select appropriate title

Jose Carlos Esteban
Print or type Signer's name

CHUBB

Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, **PACIFIC INDEMNITY COMPANY**, a Wisconsin corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint Orlando Aguirre, Mario Arzamendi Sr., Mary Ann Garcia, Tannis Mattson, Barbie Norton, Sandra Parker, Laura E. Sudduth, Amanda Turman-Avina and Misty Witt of Houston, Texas

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this **27th** day of **April, 2020.**

Dawn M. Chloros

Dawn M. Chloros, Assistant Secretary

Stephen M. Haney

Stephen M. Haney, Vice President

STATE OF NEW JERSEY
County of Hunterdon ss.

On this **27th** day of **April, 2020**, before me, a Notary Public of New Jersey, personally came Dawn M. Chloros and Stephen M. Haney, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros and Stephen M. Haney, being by me duly sworn, severally and each for herself and himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal

KATHERINE J. ADELAAR
NOTARY PUBLIC OF NEW JERSEY
No. 2316685
Commission Expires July 16, 2024

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2016; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

(1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Dawn M. Chloros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(i) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
(ii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 01/05/2022

Dawn M. Chloros

Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF A CLAIM, PLEASE CONTACT US AT:
Telephone (908) 903-3493 Fax (908) 903-3656 e-mail: [illegible]

Berkshire Hathaway Specialty Insurance

Power Of Attorney

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY
NATIONAL INDEMNITY COMPANY / NATIONAL LIABILITY & FIRE INSURANCE COMPANY

Know all men by these presents, that **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at One Lincoln Street, 23rd Floor, Boston, Massachusetts 02111, **NATIONAL INDEMNITY COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at 3024 Harney Street, Omaha, Nebraska 68131 and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Connecticut and having an office at 100 First Stamford Place, Stamford, Connecticut 06902 (hereinafter collectively the "Companies"), pursuant to and by the authority granted as set forth herein, do hereby name, constitute and appoint: **Tannis Mattson, Sandra Parker, Mary Ann Garcia, Amanda Turman-Avina, Laura E. Sudduth, Barbie Norton, 2929 Allen Parkway, Suite 2500 of the city of Houston, State of Texas,** their true and lawful attorney(s)-in-fact to make, execute, seal, acknowledge, and deliver, for and on their behalf as surety and as their act and deed, any and all undertakings, bonds, or other such writings obligatory in the nature thereof, in pursuance of these presents, the execution of which shall be as binding upon the Companies as if it has been duly signed and executed by their regularly elected officers in their own proper persons. **This authority for the Attorney-in-Fact shall be limited to the execution of the attached bond(s) or other such writings obligatory in the nature thereof.**

In witness whereof, this Power of Attorney has been subscribed by an authorized officer of the Companies, and the corporate seals of the Companies have been affixed hereto this date of December 20, 2018. This Power of Attorney is made and executed pursuant to and by authority of the Bylaws, Resolutions of the Board of Directors, and other Authorizations of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, which are in full force and effect, each reading as appears on the back page of this Power of Attorney, respectively. **The following signature by an authorized officer of the Company may be a facsimile, which shall be deemed the equivalent of and constitute the written signature of such officer of the Company for all purposes regarding this Power of Attorney, including satisfaction of any signature requirements on any and all undertakings, bonds, or other such writings obligatory in the nature thereof, to which this Power of Attorney applies.**

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY,

By: _____
David Fields, Executive Vice President

NATIONAL INDEMNITY COMPANY, NATIONAL LIABILITY & FIRE INSURANCE COMPANY,

By: _____
David Fields, Vice President

NOTARY
State of Massachusetts, County of Suffolk, ss:
On this 20th day of December, 2018, before me appeared David Fields, Executive Vice President of BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY and Vice President of NATIONAL INDEMNITY COMPANY and NATIONAL LIABILITY & FIRE INSURANCE COMPANY, who being duly sworn, says that his capacity is as designated above for such Companies; that he knows the corporate seals of the Companies; that the seals affixed to the foregoing instrument are such corporate seals; that they were affixed by order of the board of directors or other governing body of said Companies pursuant to its Bylaws, Resolutions and other Authorizations, and that he signed said instrument in that capacity of said Companies.

[Notary Seal]

GEOFFERY A. DELISIO
Notary Public
Commonwealth of Massachusetts
My Comm. Expires November 29, 2024

_____
Notary Public

I, Ralph Tortorella, the undersigned, Officer of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies which is in full force and effect and has not been revoked. IN TESTIMONY WHEREOF, see hereunto affixed the seals of said Companies this January 5, 2022.

_____
Officer

To verify the authenticity of this Power of Attorney please contact us at: BHSI Surety Department, Berkshire Hathaway Specialty Insurance Company, One Lincoln Street, 23rd Floor Boston, MA 02111 | (770) 625-2516 or by email at jennifer.Porter@bhspecialty.com *THIS POWER OF ATTORNEY IS VOID IF ALTERED*

To notify us of a claim please contact us on our 24-hour toll free number at (855) 453-9675, via email at claimsnotice@bhspecialty.com, via fax to (617) 507-8259, or via mail.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8202570 - 022029**

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Orlando Aguirre, Mario Arzamendi, Mary Ann Garcia, Tannis Mattson, Sandra Parker, Gina A. Rodriguez, Laura E. Sudduth, Amanda Turman-Avina, Misty Witt

all of the city of Houston state of TX each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 12th day of November, 2019.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY

On this 12th day of November, 2019 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 5th day of January, 2022.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Sandra PARKER, Mary Ann GARCIA, Gina A. RODRIGUEZ, Tannis MATTSON, Mario ARZAMENDI, Laura E. SUDDUTH, Amanda TURMAN-AVINA, Misty M WITT and Barbie NORTON, all of Houston, Texas,** EACH, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland, and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland, in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 30th day of March, A.D. 2020.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 30th day of March, A.D. 2020, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Secretary of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 5th day of January, 2022.

Brian M Hodges

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That The Continental Insurance Company, a Pennsylvania insurance company, is a duly organized and existing insurance company having its principal office in the City of Chicago, and State of Illinois, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Tannis Mattson , Individually

of Houston , Texas , its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

– In Unlimited Amounts –

Surety Bond Number: 30149052
Principal: Webber, LLC
Obligee: North Carolina Department of Transportation

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the insurance company and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Board of Directors of the insurance company.

In Witness Whereof, The Continental Insurance Company has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 3rd day of June, 2015.

The Continental Insurance Company

Paul T. Bruflat — Vice President

State of South Dakota, County of Minnehaha, ss:

On this 3rd day of June, 2015, before me personally came Paul T. Bruflat to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of The Continental Insurance Company, a Pennsylvania insurance company, described in and which executed the above instrument; that he knows the seal of said insurance company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said insurance company and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said insurance company.

S. EICH
NOTARY PUBLIC
SOUTH DAKOTA

My Commission Expires February 12, 2021

S. Eich — Notary Public

CERTIFICATE

I, D. Bult, Assistant Secretary of The Continental Insurance Company, a Pennsylvania insurance company, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the insurance company printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said insurance company this 5th day of January , 2022 .

The Continental Insurance Company

D. Bult — Assistant Secretary

Form F6850-4-2012