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

PROPOSAL

INCLUDES ADDENDUM No.1 DATED 10-8-2026

DATE AND TIME OF BID OPENING: **Nov 17, 2026 AT 02:00 PM**

CONTRACT ID	C205222
WBS	34165.3.8

FEDERAL-AID NO.	STATE FUNDED
COUNTY	BUNCOMBE
T.I.P NO.	I-2513AC
MILES	1.742
ROUTE NO.	I-26/240
LOCATION	I-26/I-240 FROM NORTH OF I-40 TO SR-3548 (HAYWOOD RD).
TYPE OF WORK	GRADING, DRAINAGE, PAVING, SIGNALS, AND STRUCTURES.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $40,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A ROADWAY & STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C205222 IN BUNCOMBE COUNTY, NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C205222** has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with the *2024 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete Contract No. **C205222** in **Buncombe County**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2024* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

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

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

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

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



State Contract Officer

Signed by:
Jonathan H. Weathersbee
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10/08/2026

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PROJECT SPECIAL PROVISIONS

GENERAL

AWARD OF CONTRACT:

(1-16-18)(Rev. 5-28-24) 103 SP1 G01

Revise the *Standard Specifications* as follows:

Page 1-24, 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.

HAUL ROADS:

(7-16-24) 105 SP1 G04

Revise the *Standard Specifications* as follows:

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

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

CONTRACT TIME AND LIQUIDATED DAMAGES:

(8-15-00) (Rev. 5-16-23) 108 SP1 G08 A

The date of availability for this contract is **January 5, 2027**, except that work in jurisdictional waters and wetlands shall not begin until a meeting between the DOT, Regulatory Agencies, and the Contractor is held as stipulated in the permits contained elsewhere in this proposal. This delay in availability has been considered in determining the contract time for this project.

The completion date for this contract is **December 12, 2032**.

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 **January 5, 2027**.

The completion date for this intermediate contract time is **June 15, 2032**.

The liquidated damages for this intermediate contract time are **Eleven Thousand Dollars ($ 11,000.00)** 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-26 (including any associated Ramp or Loop)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 AM to 9:00 PM
Saturday & Sunday, 9:00 AM to 9:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **I-26 (including any associated Ramp or Loop)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

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

2. For **New Year's Day**, between the hours of **6:00 AM** December 31st and **9:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 PM** the following Tuesday.

3. For **Easter**, between the hours of **6:00 AM** Thursday and **9:00 PM** Monday.

4. For **Memorial Day**, between the hours of **6:00 AM** Friday and **9:00 PM** Tuesday.

5. For **Independence Day**, between the hours of **6:00 AM** the day before Independence Day and **9:00 PM** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 AM** the Thursday before Independence Day and **9:00 PM** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 AM** Friday and **9:00 PM** Tuesday.

7. For **Thanksgiving**, between the hours of **6:00 AM** Tuesday and **9:00 PM** Monday.

8. For **Christmas**, between the hours of **6:00 AM** the Friday before the week of Christmas Day and **9:00 PM** the following Tuesday after the week of Christmas Day.

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

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

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

The liquidated damages for are **One Thousand Two Hundred Fifty Dollars ($ 1,250.00)** 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 **NC 191 or Amboy Road** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 AM to 9:00 AM and 4:00 PM to 7:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **Any Road (except I-26 or an associated Ramp or Loop)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

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

2. For **New Year's Day**, between the hours of **6:00 AM** December 31st and **9:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 PM** the following Tuesday.

3. For **Easter**, between the hours of **6:00 AM** Thursday and **9:00 PM** Monday.

4. For **Memorial Day**, between the hours of **6:00 AM** Friday and **9:00 PM** Tuesday.

5. For **Independence Day**, between the hours of **6:00 AM** the day before Independence Day and **9:00 PM** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 AM** the Thursday before Independence Day and **9:00 PM** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 AM** Friday and **9:00 PM** Tuesday.

7. For **Thanksgiving**, between the hours of **6:00 AM** Tuesday and **9:00 PM** Monday.

8. For **Christmas**, between the hours of **6:00 AM** the Friday before the week of Christmas Day and **9:00 PM** the following Tuesday after the week of Christmas Day.

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

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

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

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

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

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow **two (2) lanes** of traffic on **I-26 (including any associated Ramp or Loop)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 6:00 AM to 9:00 PM
Saturday & Sunday, 9:00 AM to 9:00 PM

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

INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 10-15-13) 108 SP1 G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **I-26 (including any associated Ramp or Loop)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday to Sunday, 6:00 AM to 9:00 PM

The road closures allowed by this intermediate contract time are for hanging girders, structure removal operations, overhead sign operations, or signal operations only, and the maximum allowable time is thirty (30) minutes for I-26 (including any associated Ramp or Loop). The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 6 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 10-15-13) 108 SP1 G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **-Y2- (NC 191), -Y8- (Hominy Creek Road), or -Y14- (State Street)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday to Sunday, 6:00 AM to 9:00 PM

The road closures allowed by this intermediate contract time are for hanging girders, structure removal operations, overhead sign operations, or signal operations only, and the maximum allowable time is thirty (30) minutes for -Y2- (NC 191), -Y8- (Hominy Creek Road), or -Y14- (State Street). The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 7 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 **-Y8- (Hominy Creek Road)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday to Sunday, 6:00 AM to 9:00 PM

The road closures allowed by this intermediate contract time are for sewer line installation operations only during Phase I, Step #1E. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 8 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 **Any Road** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 4:00 PM to 9:00 AM (the following morning)

The road closures allowed by this intermediate contract time are for blasting operations only, and the maximum allowable time is twenty (20) minutes for Any Road. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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

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

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

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

The Contractor shall complete all work required of **Phase I, Steps #1A thru #1E** as shown on Sheet **TMP-3** and shall place and maintain traffic on same. **In addition to the installation of the proposed 60" steel casing and proposed 30" sewer carrier pipe as shown on Sheets UC-5A and UC-16, the Contractor shall place the casing spacers and grouting the annular space. The Contractor shall backfill and stabilize the bore and receiving pits to subgrade. The Contractor shall install, test, and place into service proposed Sewer Line #2, including Manholes A2, B2, C2, and D2**.

The date of availability for this intermediate contract time is **January 5, 2027**.

The completion date for this intermediate contract time is **July 1, 2027**.

It is mutually agreed that time is of the essence in completing Intermediate Contract Time Number 9 and opening same to traffic. It is further mutually agreed a delay in completing this work will result in damage due to increased engineering and inspection costs to the Department of Transportation, great hardship to the general public, public inconvenience, obstruction of traffic, interference with business, and increased cost of maintaining traffic.

By reason of necessity of expeditious completion of work included in Intermediate Contract Time Number 9, and placing and maintaining traffic on same, it is mutually agreed, the Contractor shall receive an incentive payment of **Two Thousand Five Hundred Dollars ($ 2,500.00)** per calendar day for each day prior to the completion date established for Intermediate Contract Time Number 9 that this work is completed. Incentive payment shall be limited to a maximum of **One Hundred Fifty Thousand Dollars ($ 150,000.00)**. No incentive payment shall be allowed for any calendar day after the completion date established for Intermediate Contract Time Number 9 that this work remains incomplete. This date shall be utilized in determining incentive payments and it shall not be revised for any reason whatsoever. Incentive payment determined to be due the Contractor shall be paid by the Department within forty-five (45) calendar days after completion of all work. No incentive payment shall be allowed if the contract is terminated under the provisions of Article 108-13 of the 2018 Standard Specifications.

Disincentive of **Two Thousand Five Hundred Dollars ($ 2,500.00)** per calendar day shall be assessed the Contractor for each day beyond the completion date for Intermediate Contract Time Number 9 that the work is not completed.

The Engineer shall withhold the disincentives as they accrue from the amount of monies due on work performed in the contract.

INTERMEDIATE CONTRACT TIME NUMBER 10 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase I, Step #1E** 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 **fourteen (14)** consecutive calendar days after and including the date the Contractor begins this work.

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

INTERMEDIATE CONTRACT TIME NUMBER 11 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

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

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

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

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 12 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase I, Steps #2I thru #2N** 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 **forty-five (45)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Dollars ($ 1,000.00)** per calendar day.

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

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

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

The completion date for this intermediate contract time is the date which is **fourteen (14)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Eleven Thousand Dollars ($ 11,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 14 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase II, Steps #1A thru #4E** as shown on Sheets **TMP-3A and 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 **four hundred twenty (420)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Two Thousand Dollars ($ 2,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 15 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 G

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

The time of availability for this intermediate contract time is the **Friday at 9:00 PM** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the **following Monday at 6:00 AM** after the time of availability.

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

INTERMEDIATE CONTRACT TIME NUMBER 16 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase II, Steps #3A thru #4E** as shown on Sheets **TMP-3A and 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 **forty-five (45)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 17 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **Phase II, Steps #4A thru #4E** as shown on Sheets **TMP-3A and TMP-3B** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time is the **Friday** at **9:00 PM** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the following **Monday** at **6:00 AM** after the time of availability.

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

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

The Contractor shall complete the work required of **Phase III, Steps #1A thru #1E** 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 **seven (7)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Dollars ($ 1,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 19 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase III, Steps #2A thru #2C** 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 **March 1st** that the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **fifty-six (56)** consecutive calendar days after and including the date of availability, **ending no later than May 25th of the same calendar year as the date of availability for this intermediate contract time**.

The liquidated damages are **Twenty Thousand Dollars ($ 20,000.00)** per calendar day.

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

The Contractor shall complete the work required of **Phase III, Steps #2D thru #2F** 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 **March 1st** that the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **twenty-eight (28)** consecutive calendar days after and including the date of availability, **ending no later than May 25th of the same calendar year as the date of availability for this intermediate contract time**.

The liquidated damages are **Twenty Thousand Dollars ($ 20,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 21 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **Phase III, Steps #4B thru #4E** as shown on Sheet **TMP-3B** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time is the **Friday at 9:00 PM** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the following **Monday** at **6:00 AM** after the time of availability.

The liquidated damages are **One Thousand Dollars ($ 1,000.00)** per hour.

INTERMEDIATE CONTRACT TIME NUMBER 22 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase IV, Steps #1A thru #1D** 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 **seven (7)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Nine Thousand Dollars ($ 9,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 23 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase IV, Steps #3A thru #3C** 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 **seven (7)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Dollars ($ 1,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 24 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase IV, Steps #4A thru #4E** as shown on Sheet **TMP-3C** 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 **Nine Thousand Dollars ($ 9,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 25 AND LIQUIDATED DAMAGES FOR FAILURE TO REPAIR A DAMAGED SIGNAL SYSTEM FIBER OPTIC COMMUNICATIONS CABLE AND RESTORE COMMUNICATION

The Contractor shall repair all existing fiber optic communication cables damaged during construction. The Contractor shall immediately report damages to the Engineer, the Division 13 Traffic Engineer (828) 250-3035. The Contractor shall repair all damages within twenty-four (24) hours at no cost to the Department. The Contractor shall bring all affected Signal System fiber optic communication cables back on line within the same twenty-four (24) hours. A "damaged" Signal System fiber optic communications cable is any fiber communications cable that is determined damaged due to an accidental or unscheduled outage event.

Liquidated Damages for failure to repair a damaged Signal System fiber optic communications cable and restore communication within twenty-four (24) hours are Five Hundred Dollars ($ 500.00) per hour, or any portion thereof.

INTERMEDIATE CONTRACT TIME NUMBER 26 AND LIQUIDATED DAMAGES FOR FAILURE TO REPAIR A DAMAGED ITS FIBER OPTIC COMMUNICATIONS CABLE AND RESTORE COMMUNICATION

The Contractor shall repair all existing fiber optic communication cables damaged during construction. The Contractor shall immediately report damages to the Engineer, the Division 13 Traffic Engineer (828) 250-3035. The Contractor shall repair all damages within twenty-four (24) hours at no cost to the Department. The Contractor shall bring all affected ITS fiber optic communication cables back on line within the same twenty-four (24) hours. A "damaged" ITS fiber optic communications cable is any ITS fiber communications cable that is determined damaged due to an accidental or unscheduled outage event.

Liquidated Damages for failure to repair a damaged ITS fiber optic communications cable and restore communication within twenty-four (24) hours are Five Hundred Dollars ($ 500.00) per hour, or any portion thereof.

INTERMEDIATE CONTRACT TIME NUMBERS 27 AND 28 FOR FAILURE TO REESTABLISH SIGNAL SYSTEM FIBER COMMUNICATIONS

During construction, the Contractor shall coordinate any disruption in Signal System fiber optic communications with the Engineer and Division 13 Traffic Engineer. The Contractor shall notify the Engineer and the Division 13 Traffic Engineer a minimum of five (5) calendar days prior to all proposed disruptions in service. A minimum of twenty-one (21) calendar days prior to any disruption in Signal System fiber optic communications, the Contractor shall develop and provide a plan for the Department's approval that defines 1) an anticipated disruption timeframe, and 2) a plan of action for reestablishing Signal System communications within twenty-four (24) hours.

Liquidated Damages for failure to reestablish Signal System fiber optic communications within twenty-four (24) hours are Two Thousand Five Hundred Dollars ($ 2,500.00) per calendar day, or any portion thereof.

Liquidated Damages for failure to provide a plan that defines 1) an anticipated Signal System fiber optic communications disruption timeframe and 2) a plan of action for reestablishing Signal System communications a minimum of twenty-one (21) calendar days prior to a proposed disruption in service are Ten Thousand Dollars ($ 10,000.00) per failure.

INTERMEDIATE CONTRACT TIME NUMBERS 29 AND 30 FOR FAILURE TO REESTABLISH ITS FIBER COMMUNICATIONS

During construction, the Contractor shall coordinate any disruption in ITS fiber optic communications with the Engineer and the Division 13 Traffic Engineer. The Contractor shall notify the Engineer and the Division 13 Traffic Engineer a minimum of five (5) calendar days prior to all proposed disruptions in service. A minimum of twenty-one (21) calendar days prior to any disruption in ITS fiber optic communications, the Contractor shall develop and provide a plan for the Department's approval that defines 1) an anticipated disruption timeframe, and 2) a plan of action for reestablishing ITS communications within twenty-four (24) hours.

Liquidated Damages for failure to reestablish ITS fiber optic communications within twenty-four (24) hours are Two Thousand Five Hundred Dollars ($ 2,500.00) per calendar day, or any portion thereof.

Liquidated Damages for failure to provide a plan that defines 1) an anticipated ITS fiber optic communications disruption timeframe and 2) a plan of action for reestablishing ITS communications a minimum of twenty-one (21) calendar days prior to a proposed disruption in service are Ten Thousand Dollars ($ 10,000.00) per failure.

PERMANENT VEGETATION ESTABLISHMENT:

(2-16-12)(Rev. 1-16-24) 104 SP1 G16

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

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

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

DELAY IN RIGHT OF ENTRY:

(7-1-95) (Rev. 7-15-14) 108 SP1 G22

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

Parcel No.	Property Owner	Date
1	Crossroads Assembly f/k/a West Asheville Assembly of God Church, Inc	12/15/26
2	Asheville Hominy Riverblu LLC	12/15/26
2A	RB P2, LLC	12/15/26
4	Anderson Bear Creek LLC	12/15/26
33	William McDowall Jr. & Sharon Waugh	12/15/26
39	Robert D Sheeran & Sarah M Sheeran	12/15/26
60	Tony M Wilson & Ann Wilson	12/15/26
97	GFFAC Holdings	12/15/26
109	Oneormo, LLC	12/15/26
109A	J N Wesco, Inc	12/15/26
129	Harry Lee Coates Revocable Living Trust	12/15/26
135	Ricky Lee Coats	12/15/26
137	Buncombe Land Holdings, LLC	12/15/26
141	Zachary Michael Masdters & Joahnna Porra-Moreno	12/15/26

MAJOR CONTRACT ITEMS:

(2-19-02)(Rev. 1-16-24) 104 SP1 G28

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

Line #	Description
566	Soil Nail Retaining Walls

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

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

Line #	**Description**
191-205, 215	Guardrail
206-214, 635	Fencing
220-280, 343, 344	Signing
323, 330, 332-340	Long-Life Pavement Markings
313-316	Removable Tape
341, 342	Permanent Pavement Markers
345-369, 371-384	Lighting
385-434	Utility Construction
435-476	Erosion Control
477	Planting
478-552, 642-645	Signals/ITS System
592-600, 657-658	Drilled Piers

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

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

The base index price for DIESEL #2 FUEL is **$ 4.4428** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

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

Description	**Units**	**Fuel Usage Factor Diesel**
Unclassified Excavation	Gal/CY	0.29
Borrow Excavation	Gal/CY	0.29
Class IV Subgrade Stabilization	Gal/Ton	0.55
Aggregate Base Course	Gal/Ton	0.55
Sub-Ballast	Gal/Ton	0.55
Erosion Control Stone	Gal/Ton	0.55
Rip Rap, Class _____	Gal/Ton	0.55
Asphalt Concrete Base Course, Type ____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	0.90 or 2.90
Open-Graded Asphalt Friction Course	Gal/Ton	0.90 or 2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	0.90 or 2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	0.90 or 2.90
Ultra-thin Bonded Wearing Course	Gal/Ton	0.90 or 2.90
Aggregate for Cement Treated Base Course	Gal/Ton	0.55
Portland Cement for Cement Treated Base Course	Gal/Ton	0.55
> 11" Portland Cement Concrete Pavement	Gal/SY	0.327
Concrete Shoulders Adjacent to > 11” Pavement	Gal/SY	0.327
9” to 11" Portland Cement Concrete Pavement	Gal/SY	0.272
Concrete Shoulders Adjacent to 9” to 11” Pavement	Gal/SY	0.272
< 9” Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to < 9” Pavement	Gal/SY	0.245

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

https://connect.ncdot.gov/letting/LetCentral/Fuel%20Usage%20Factor%20Adjustment%20Form%20-%20%20Starting%20Nov%202022%20Lettings.pdf

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

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

STEEL PRICE ADJUSTMENT:
(4-19-22)(Rev. 12-20-22) SP1 G47

Description and Purpose

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

Eligible Items

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

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

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

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

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

Bid Submittal Requirements

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

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

The Contractor shall provide Form SPA-1 listing the Contract Line Number, (with corresponding Item Number, Item Description, and Category) for the steel products they wish to have an adjustment calculated. Only the contract items corresponding to the list of eligible item numbers for steel price adjustment may be entered on Form SPA-1. The Contractor may choose to have steel price adjustment applied to any, all, or none of the eligible items. However, the Contractor's selection of items for steel price adjustment or non-selection (non-participation) may not be changed once Form SPA-1 has been received by the Department. Items the Bidder

chooses for steel price adjustment must be designated by writing the word "Yes" in the column titled "Option" by each Pay Item chosen for adjustment. Should the bidder elect an eligible steel price item, the entire quantity of the line item will be subject to the price adjustment for the duration of the Contract. The Bidder's designations on Form SPA-1 must be written in ink or typed and signed by the Bidder (Prime Contractor) to be considered complete. Items not properly designated, designated with "No", or left blank on the Bidder's Form SPA-1 will automatically be removed from consideration for adjustment. No steel items will be eligible for steel price adjustment on this Project if the Bidder fails to return Form SPA-1 in accordance with this provision.

Establishing the Base Price

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

The bidding index for Category 1 Steel items is **$ 47.50** per hundredweight.
The bidding index for Category 2 Steel items is **$ 72.05** per hundredweight.
The bidding index for Category 3 Steel items is **$ 81.25** per hundredweight.
The bidding index for Category 4 Steel items is **$ 60.53** per hundredweight.
The bidding index for Category 5 Steel items is **$ 63.19** per hundredweight.
The bidding index for Category 6 Steel items is **$ 83.80** per hundredweight.
The bidding index for Category 7 Steel items is **$ 50.35** per hundredweight.

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

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

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

Product Relationship Table

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

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

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

Submittal Requirements

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

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

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

Submit all documentation to the Engineer prior to incorporation of the steel into the completed work. The Department will withhold progress payments for the affected contract line item if the documentation is not provided and at the discretion of the Engineer the work is allowed to proceed. Progress payments will be made upon receipt of the delinquent documentation.

Step 1 (Form SPA -2)

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

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

Step 2 (Monthly Calculator Spreadsheet)

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

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

2) An affidavit signed by the Contractor stating the documentation provided in the NCDOT Steel Price Adjustment Calculator Spreadsheet is true and accurate.

Price Adjustment Conditions

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

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

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

Price Adjustment Calculations

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

Price increase/decrease will be computed as follows:

SPA = ((MI/ BI) -1) * BI *(Q/100)

Where;

SPA = Steel price adjustment in dollars

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

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

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

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

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

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

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

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

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

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

If the price adjustment is based on estimated material quantities for that time, and a revision to the total material quantity is made in a subsequent or final estimate, an appropriate adjustment will be made to the price adjustment previously calculated. The adjustment will be based on the same indices used to calculate the price adjustment which is being revised. If the adjustment date of the revised material quantity cannot be determined, the adjustment for the quantity in question, will be based on the indices utilized to calculate the steel price adjustment for the last initial documentation package submission, for the steel product subject to adjustment, that was incorporated into the particular item of work, for which quantities are being finalized. Example: Structural steel for a particular bridge was provided for in three different shipments with each having a different mill shipping date. The quantity of structural steel actually used for the bridge was calculated and a steel price adjustment was made in a progress payment. At the conclusion of the work an error was found in the plans of the final quantity of structural steel used for the bridge. The quantity to be adjusted cannot be directly related to any one of the three mill shipping dates. The steel price adjustment for the quantity in question would be calculated using the indices that were utilized to calculate the steel price adjustment for the quantity of structural steel represented by the last initial structural steel documentation package submission. The package used will be the one with the greatest sequential number.

Extra Work/Force Account:

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

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

Examples **Form SPA-2**

Steel Price Adjustment Submission Form

Contract Number __C203394_____ Bid Reference Month __January 2019__

Submittal Date ___8/31/2019_____

Contract Line Item _____237_____

Line Item Description __APPROX….LBS Structural Steel_____

Sequential Submittal Number _____2_____

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

Note: Attach the following supporting documentation to this form.

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

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

Printed Name _____ Signature _____

Examples **Form SPA-2**

Steel Price Adjustment Submission Form

Contract Number C203394 Bid Reference Month January 2019

Submittal Date August 31, 2019

Contract Line Item 237

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

Sequential Submittal Number 2

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

Note: Attach the following supporting documentation to this form.

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

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

Printed Name _____ Signature _____

Price Adjustment Sample Calculation (increase)

Project bid on September 17, 2019

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

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

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

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

The Steel Price Adjustment formula is as follows:

SPA = ((MI/ BI) -1) * BI *(Q/100)

Where;

SPA = Steel price adjustment in dollars

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

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

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

BI = $36.12/ CWT

MI = $64.89 / CWT

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

Q = 450,000 lbs.

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

SPA = 0.79651162791* $36.12 *4,500

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

Price Adjustment Sample Calculation (decrease)

Project bid on December 18, 2018

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

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

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

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

The Steel Price Adjustment formula is as follows:

SPA = ((MI/ BI) -1) * BI *(Q/100)

Where; SPA = Steel price adjustment in dollars

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

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

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

BI = $46.72/ CWT

MI = $27.03 / CWT

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

Q = 600,000 lbs.

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

SPA = -0.421446917808 * $46.72 *6,000

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

Price Adjustment Sample Calculation (increase)

Project bid on July 16, 2020

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

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

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

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

The Steel Price Adjustment formula is as follows:

SPA = ((MI/ BI) -1) * BI *(Q/100)

Where; SPA = Steel price adjustment in dollars

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

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

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

BI = $29.21/ CWT

MI = $43.13 / CWT

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

Q = 103932 lbs.

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

SPA = 0. 47654912701 * $29.21 *1,039.32

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

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. 6-16-26) 108-2 SP1 G58

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

Fiscal Year	Progress (% of Dollar Value)
2027 (7/01/26 - 6/30/27)	**15**% of Total Amount Bid
2028 (7/01/27 - 6/30/28)	**26**% of Total Amount Bid
2029 (7/01/28 - 6/30/29)	**24**% of Total Amount Bid
2030 (7/01/29 - 6/30/30)	**16**% of Total Amount Bid
2031 (7/01/30 - 6/30/31)	**12**% of Total Amount Bid
2032 (7/01/31 - 6/30/32)	**7**% of Total Amount Bid

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

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

Description

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

Definitions

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

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

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

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

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

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

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

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

Regular Dealer - A firm that owns (or leases), and operates a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in sufficient quantities, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, concrete or concrete products, gravel, stone, asphalt and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Any supplement of regular dealers' own distribution equipment shall be by a long-term operating lease and not on an ad hoc or contract-by-contract basis.

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

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

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program in accordance with 49 CFR Part 26.

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

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

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

Forms and Websites Referenced in this Provision

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

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

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

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

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

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

Listing of MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet the Combined MBE/WBE goal. This form is for paper bids only. http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).docx

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

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

Combined MBE/WBE Goal

There is NO MBE/WBE Goal for this project.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as MBE and WBE certified shall be used to meet the Combined MBE/WBE Goal. The Directory can be found at the following link.

https://www.ebs.nc.gov/VendorDirectory/default.html

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

Listing of MBE/WBE Subcontractors

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

(A) Electronic Bids

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

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

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

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

(B) Paper Bids

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

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

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

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

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

MBE or WBE Prime Contractor

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

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

Written Documentation – Letter of Intent

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

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

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

Banking MBE/WBE Credit

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

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

Submission of Good Faith Effort

If the bidder fails to meet or exceed the Combined MBE/WBE Goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal.

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

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

Consideration of Good Faith Effort for Projects with a Combined MBE/WBE Goal More Than Zero

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

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

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

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

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

(2) Negotiate with subcontractors to assume part of the responsibility to meet the advertised goal when the work to be sublet includes potential for MBE/WBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested certified MBEs/WBEs that are also prequalified subcontractors with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

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

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

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

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

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

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

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

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

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the Combined MBE/WBE Goal.

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

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

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

Non-Good Faith Appeal

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

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

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by

a committed MBE/WBE will be based upon the value of work performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

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

(C) Subcontracts (Non-Trucking)

A MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the anticipated MBE participation. The same holds true for work that a WBE subcontracts to another WBE firm. Work that a MBE/WBE subcontracts to a non-MBE/WBE firm does not count toward the contract goal requirement. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the MBE or WBE participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified firms and there is no interest or availability, and they can get assistance from other certified firms, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE breakdown. If a MBE or WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function.

(D) Joint Venture

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

(E) Manufacturer, Regular Dealer, Distributor

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

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

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

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

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

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE/WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors. If it is determined that a MBE or WBE is not performing a Commercially Useful Function, the contractor may present evidence to rebut this presumption to the Department.

(B) MBE/WBE Utilization in Trucking

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

(1) The MBE/WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and

there shall not be a contrived arrangement for the purpose of meeting the Combined MBE/WBE Goal.

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

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

(4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE participation breakdown.

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

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

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

MBE/WBE Replacement

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

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

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

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

(j) Other documented good cause that compels the termination of the MBE/WBE subcontractor.

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

(A) Performance Related Replacement

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

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

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

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

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

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

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

(B) Decertification Replacement

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

(i) If the MBE/WBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract. The Department may

continue to count participation equal to the remaining work performed by the decertified firm which will count toward the contract goal requirement and overall goal.

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

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

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

Changes in the Work

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

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

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

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

Reports and Documentation

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

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

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

Reporting Minority and Women Business Enterprise Participation

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

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

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

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

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

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

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

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

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

Failure to Meet Contract Requirements

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

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

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

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):
(8-20-19)(Rev. 3-17-26) SP1 G092

The Contractor shall adhere to all Federal, State and Local regulations and guidelines for the use of Unmanned Aircraft Systems (UAS). This includes but is not limited to US 14 CFR Part 107, NC GS 15A-300, American Security Drone Act of 2023 (ASDA), Office of Management and Budget (OMB) Memorandum M-26-02, all FAA rules, regulations and policies and all NCDOT UAS Policies. The required operator certifications include possessing a current Federal Aviation Administration (FAA) Remote Pilot Certificate, as well as operating a UAS registered with the FAA.

All UAS operations shall be approved by the Engineer prior to beginning the operations.

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

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

CONSTRUCTION EQUIPMENT EMISSIONS:
(1-1-20) (Rev. 1-18-22) SP1 G94

Reporting Requirements

During construction, within 60 days after the end of each calendar year, the Contractor shall submit to the Department a list of nonroad diesel-powered construction equipment that was used for construction work for more than 40 hours during that calendar year. Such list shall be submitted each year through the final acceptance of the project. The list shall be submitted on a form supplied by the Department and shall include the following information for each applicable piece of non-road construction equipment:

- equipment type and manufacturer;
- engine manufacturer and model;
- engine model number;
- engine family name and model year;
- engine horsepower or kilowatts;
- engine serial number; and
- engine EPA Tier number.

The submittal shall include the Tier (0, 1, 2, 3 or 4) Nonroad Exhaust Emission Standard that the equipment's engine currently satisfies in accordance with EPA current standards. This list shall be updated and submitted annually.

Failure to provide the equipment list by the timeframe provided above may result in the Department withholding money from the Contractor due for work performed by that entity in the next partial payment until the necessary assurances are made consistent with this provision.

Minimum Tier Requirements

A minimum of fifty percent (50%) of the reported construction equipment used on the project must meet Tier 4 or Tier 4i requirements.

Incentive

The Department will pay a Fifty Thousand and 0/100 Dollars ($50,000.00) incentive to the Contractor if, at the conclusion of the project, each calendar year's report reflects that both items below were accomplished:

(1) More than seventy-five percent (75.0%) of the total number of pieces of applicable construction equipment used on the project meets Tier 4 Final requirements, and
(2) Less than twenty-five percent (25.0%) of the total number of pieces of applicable construction equipment used on the project is categorized as Tier 0 or 1.

Exclusions

A piece of applicable construction equipment operated by DBE firms (federally funded projects) or MBE/WBE firms (state funded projects) may be excluded from the Reporting Requirements and Minimum Tier Requirements sections above, provided the applicable piece of equipment meets at least the Tier 1 requirements. However, to be eligible for the incentive, the Contractor must include all of these firms' applicable construction equipment in the percentage calculations provided in the Incentive section above.

Regardless of Tier level, cranes are subject to the Reporting Requirements section above. However, any crane may be excluded from the calculations provided under the Minimum Tier Requirements and Incentive sections above, provided that crane meets Tier 1 or higher requirements.

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

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

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

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

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

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

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

PORTABLE CONCRETE BARRIER - (Partial Payments for Materials):
(7-1-95)(Rev. 1-16-24) 1170-4 SP1 G121

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

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

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

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

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

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

MAINTENANCE OF THE PROJECT:
(11-20-07)(Rev. 1-16-24) 104-10 SP1 G125

Revise the *Standard Specifications* as follows:

Page 1-35, Article 104-10 Maintenance of the Project, line 3, add the following after the first sentence of the first paragraph:

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

Page 1-35, Article 104-10 MAINTENANCE OF THE PROJECT, line 8, add the following as the last sentence of the first paragraph:

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

Page 1-35, Article 104-10 MAINTENANCE OF THE PROJECT, lines 20-22, 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)(Rev. 1-16-24) 105-7 SP1 G133

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

HL-0003 (C205049) is located adjacent to this project. C205049 is currently under construction and not anticipated to be completed prior to the letting of this project.

I-2513B / I-2513D (C204953) is located adjacent to this project. C204953 is currently under construction and not anticipated to be completed prior to the letting of this project.

I-2513AA / I-2513AB (C204878) is located in the vicinity of this project. C204878 is currently under construction and not anticipated to be completed 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:
(8-18-26) 101, 102, 103 SP1 G140

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

BID DOCUMENTATION:
(1-1-02) (Rev.8-20-24) 103 SP1 G142

General

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

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

Terms

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

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

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

Escrow Agreement Information

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

Failure to Provide Bid Documentation

The Bidder's failure to provide the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation within 14 days after the notice of award is received may be just cause for rescinding the award of the contract and may result in the removal of the Bidder from the Department's list of qualified bidders for a period of up to 180 days. Award may then be made to the next lowest responsible bidder or the work may be readvertised and constructed under the contract or otherwise, as the Department may decide.

Submittal of Bid Documentation

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

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

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

Affidavit

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

Verification

Upon delivery of the bid documentation, the State Contract Officer acting directly or through a duly authorized representative and the Bidder's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Bidder's representative shall immediately furnish the State Contract Officer acting directly or through a duly authorized representative with any other needed bid documentation. The State Contract Officer acting directly or through a duly authorized representative upon determining that the bid documentation is complete will, in the presence of the Bidder's representative, immediately place the complete bid documentation and affidavit in the container and seal it.

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

Confidentiality of Bid Documentation

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

Any portion or portions of the bid documentation designated by the Bidder as a *trade secret* at the time the bid documentation is delivered to the State Contract Officer acting directly or through a duly authorized representative shall be protected from disclosure as provided by *G.S. 132-1.2*.

Duration and Use

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

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

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

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

Release of Bid Documentation to the Contractor

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

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

Payment

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

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

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

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

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

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

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

OUTSOURCING OUTSIDE THE USA:

(9-21-04) (Rev. 5-16-06) SP1 G150

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

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

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

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev. 10-15-24) 105-16, 225-2, 16 SP1 G180

General

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

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

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

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

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

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

Roles and Responsibilities

(A) *Certified Erosion and Sediment Control/Stormwater Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring the erosion and sediment control/stormwater plan is adequately implemented and maintained on the project and for conducting the quality control program. The Certified Supervisor shall be on the project

within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. Perform the following duties:

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

(a) Oversee the work of subcontractors so that appropriate erosion and sediment control/stormwater preventive measures are conformed to at each stage of the work.
(b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.
(c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.
(d) Implement the erosion and sediment control/stormwater site plans requested.
(e) Provide any needed erosion and sediment control/stormwater practices for the Contractor's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
(f) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Contractor in jurisdictional areas.
(g) Conduct all erosion and sediment control/stormwater work in a timely and workmanlike manner.
(h) Fully perform and install erosion and sediment control/stormwater work prior to any suspension of the work.
(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.
(j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces or any location where sediment leaves the Right-of-Way.
(k) Have available a set of erosion and sediment control/stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel as well as regulatory agencies.

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

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

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

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

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

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

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

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

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

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

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

(a) Follow permit requirements related to the Contractor and subcontractors' construction activities.

(b) Ensure that all operators and subcontractors on site have the proper erosion and sediment control/stormwater certification.

(c) Notify the Engineer when the required certified erosion and sediment control/stormwater personnel are not available on the job site when needed.

(d) Conduct the inspections required by the NPDES permit.

(e) Take corrective actions in the proper timeframe as required by the NPDES permit for problem areas identified during the NPDES inspections.

(f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch/seed or vegetative cover on a section-by-section basis.

(g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.
(h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.
(i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
(j) The Contractor's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.

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

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

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

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

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

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

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

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

Preconstruction Meeting

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

Ethical Responsibility

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

Revocation or Suspension of Certification

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

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

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

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

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

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

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

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

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

Measurement and Payment

All work described within this provision and the role of Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers and Certified Designer will be incidental to the project for which no direct compensation will be made.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 1-16-24) 105-16, 230, 801 SP1 G181

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

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

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

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

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

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

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

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

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

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

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

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

NOTES TO CONTRACTOR:

The Contractor's attention is directed to the Special Conditions within the permit, in particular number 2, bullet 3. These documents can be found on the NCDOT bidding website under Supplemental Information. The Contractor shall adhere to project commitments within the ROD and the Biological Opinion relating to Section 7 of the Endangered Species Act.

*-Temporary lighting shall be indirect in nature and shall not project into adjacent forested areas, or over the water surface of Hominy Creek.

*-Nighttime construction within 50' of Hominy Creek between April 1st and October 15th shall only be permitted for causeway construction, drilled shafts, concrete pours, beam setting, or traffic shifts.

*-No night work shall be performed over Hominy Creek between June 1st and June 14th of any year. The contractor shall work no more than twenty-eight (28) nights in total, with no more than four (4) consecutive nights of work, over Hominy Creek between June 15th and August 1st of any given year. Lighting used for construction shall only be directed towards active work areas.

The Contractor shall notify the Engineer thirty (30) calendar days prior to commencing bridge demolition operations if bridge demolition is performed between April 1st and October 15th of any given year. The Contractor shall notify the Engineer thirty (30) calendar days prior to rehabilitation or repair of any culvert five (5) feet tall or greater, and two hundred (200) feet in length or longer, scheduled to occur between March 15th and November 15th of any given year. The Department will have a biologist inspect the bridge or culvert within thirty (30) calendar days of the associated operation to determine if bats are present. If federally listed or proposed bats are found, the Contractor shall halt any associated operation while the Department contacts the U.S Fish and Wildlife Service (USFWS) for further coordination. After coordination, the Engineer may direct the Contractor to install Bat Exclusion Measures in accordance with the special provision found elsewhere in the contract. Demolition of the existing bridge, culvert rehabilitation, or culvert repair operations shall not commence until approval is given by the Engineer.

*-The Contractor shall use clean rock free of debris and pollutants and shall not use construction fabric during the construction of causeways. The Contractor shall place concrete barrier at the downstream edge of the causeway to limit downstream movement of causeway material during high flow events. The Contractor shall utilize clean, non-leaking equipment on the causeways and shall keep fueling diapers and spill kits on-site readily available for use as necessary.

*-If the final causeway plan is staged, causeway material shall be added / removed as needed for each stage to minimize the causeway footprint through the duration of the project. Causeways shall not restrict more than 50% of the river or stream flow. Upon completion, the causeway material shall be removed to the extent practicable and either disposed of offsite or used in areas that require stone protection within the project limits.

*-All hazardous materials including fuel, lubricating oils, grease etc. located within the 100-year floodplain shall be protected with secondary containment (i.e., containment pallets). During refueling of equipment inside the 100-year floodplain, the contractor shall provide spill response materials (such as spill blankets and fueling diapers). In the event of a major storm, the contractor shall take appropriate actions for the project including, but not limited to, securing or removing stored materials as directed by the Engineer.

*-Areas used for temporary construction stockpiles, including but not limited to, soil and temporary surplus rip rap between causeway phases and excavated material generated during construction, shall not be located within waters of the U.S. and shall be sited outside of and at least 50 feet from streams and 25 feet from wetlands to avoid and minimize potential impacts.

The contractor shall report any dead bats found on the construction site to the Engineer.

The Contractor shall meet with NCDOT personnel and USFWS representatives after the execution of the contract and prior to commencement of construction activities. At this time the project will be reviewed along with the project commitments and the permit. After the contractor submits plans for various stages (outlined in post BO coordination section 2.3.5.2) of the project, USFWS biologist will review and provide comments within fifteen (15) calendar days upon acknowledgment of receipt of notice on the plans and shall be invited to attend any meetings to discuss implementation of the plans. Additionally, the Contractor shall provide the Engineer with the construction phasing plan for each bridge thirty (30) calendar days prior to construction. The Engineer will submit the phasing plan to USFWS for their review.

*-In accordance with 36 CFR 800.11(a), If the NCDOT identifies additional cultural resource(s) during construction activities, all work shall be halted within the limits of the resource(s) and the Engineer will contact the FHWA and SHPO. The NCDOT and FHWA will initiate the appropriate agency and / or Tribal coordination required for a determination of eligibility or recovery effort. If after consultation between agencies and concurring parties' additional mitigation is deemed necessary, the NCDOT, in consultation with agencies and concurring parties, will develop and implement appropriate protection / mitigation measures for the resources. Inadvertent or accidental discovery of human remains will be handled in accordance with North Carolina General Statutes 65 and 70.

The Contractor shall notify the Engineer fifteen (15) calendar days prior to beginning ground disturbing activities at Parcels 2 and 5 on Roadway Sheet 6 adjacent to Hominy Creek. The Engineer will contact Damon Jones, NCDOT Environmental Analysis Unit at (919) 707-6076 or (901) 340-7921, to coordinate placement of iron markers at archaeological site 31BN623.

** The Contractor shall not begin construction operations along -Y2RPC- until the existing utility lines are relocated as described in the UbO Special Provision found elsewhere in this Proposal.

(*) Green Sheet Commitment
(**) UbO Special Provision Commitment

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING - METHOD III:

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

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

BURNING RESTRICTIONS:

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

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

TEMPORARY DETOURS:

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

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

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

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

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

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02)(Rev. 1-16-24) 235, 560 SP2 R45 B

Description

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

Measurement and Payment

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

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

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

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

ROADWAY EXCAVATION:

(10-20-26) 225 SP2 R50

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

MANUFACTURED QUARRY FINES IN EMBANKMENTS:

(01-17-17)(Rev. 4-16-24) 235 SP02 R72

Description

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

Materials

Manufactured Quarry Fines.

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

The following MQFs are unacceptable:

(A) Frozen material,

(B) Material with a maximum dry unit weight of less than 90 pounds per cubic foot when tested in accordance with AASHTO T 99 Method A or C.

(C) Material with greater than 80% by weight Passing the #200 sieve

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

Preconstruction Requirements

When MQFs are to be used as a substitute for earth borrow material, request written approval from the Engineer at least ninety (90) days in advance of the intent to use MQFs and include the following details:

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

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

Construction Methods

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

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

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

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *Standard Specifications*. As an alternate weigh tickets can be provided and payment made by converting weight to cubic yards based on the verifiable unit weight. Where the pay item for *Borrow Excavation* is not included in the original contract then no separate payment will be made for this item and payment will be included in the lump sum price bid for *Grading*.

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

not included in the original contract then no payment will be made for this item and will be considered incidental to the use of MQFs in embankment.

FLOWABLE FILL:
(9-17-02) (Rev. 1-16-24) 300, 340, 1000, 1530, 1540, 1550 SP3 R30

Description

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

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Flowable Fill	1000-7

Construction Methods

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

Measurement and Payment

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

Payment will be made under:

Pay Item	Pay Unit
Flowable Fill	Cubic Yard

CORRUGATED ALUMINUM ALLOY CULVERT PIPE:
(9-21-21)(Rev. 1-16-24) 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 26:

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 10-11, 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.

BRIDGE APPROACH FILLS:

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

Description

Bridge approach fills consist of backfilling behind bridge end bents with select material or aggregate to support all or part of bridge approach slabs. Install outlets and grade bridge approach fills to drain water through and away from approach fills. Install geotextiles to allow for possible future slab jacking and separate approach fills from embankment fills, natural ground and pavement sections as required. For bridge approach fills behind end bents with mechanically stabilized earth (MSE) abutment walls, reinforce bridge approach fills with MSE wall reinforcement connected to end bent caps as required. Construct bridge approach fills in accordance with the contract, accepted submittals and bridge approach fill *Roadway Standard Drawings*.

Define bridge approach fill types as follows:

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

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

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

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

At the Contractors option, use Type 1A or 2A approach fills instead of Type 1 or 2 approach fills, respectively, for integral bridge abutments. Type 1A and 2A approach fills consists of constructing an approach fill with a temporary geotextile wall before placing all or a portion of

the concrete for the backwall and wing walls of the integral end bent cap. The temporary geotextile wall is designed for a construction surcharge, remains in place and is aligned so the wall face functions as a form for the integral end bent cap backwall and wing walls.

Materials

Refer to Division 10 of the *Standard Specifications*.

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

Provide Type 1 geotextile for separation geotextiles, Type 4a geotextile for under bridge approach slabs and Class B concrete for outlet pads. Use Class V or Class VI select material for Type 1 and 1A approach fills and the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal for Type 2 and 2A approach fills. For MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide outlet pipes and fittings for subsurface drainage materials. Provide 1/4" hardware cloth with 1/4 inch openings constructed from 24 gauge wire.

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

Construction Methods

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

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

For Type 2 approach fills, cast MSE wall reinforcement or connectors into end bent cap backwalls within 3 inches of locations shown in the accepted MSE wall submittals. Install MSE wall reinforcement with the orientation, dimensions and number of layers shown in the accepted MSE wall submittals. If a Type 2 approach fill is designed with geogrid reinforcement embedded in an end bent cap, cut geogrids to the required lengths and after securing ends of geogrids in place, reroll and rewrap portions of geogrids not embedded in the cap to protect geogrids from damage. Before placing aggregate over any MSE wall geosynthetic reinforcement, pull reinforcement taut so that it is in tension and free of kinks, folds, wrinkles or creases.

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

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent geotextiles of the same type at least 18 inches. Cover select material or aggregate with Type 4a geotextile at an elevation 6 inches below the bridge approach slab. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geotextiles or MSE wall reinforcement.

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

Place select material or aggregate in 6 inch to 8 inch thick lifts. Compact fine aggregate for Type 2 and 2A approach fills in accordance with Subarticle 235-3(C) of the *Standard Specifications* except compact fine aggregate to a density of at least 98%. Compact select material for Type 1 and 1A approach fills and coarse aggregate for Type 2 and 2A approach fills

with at least 4 passes of a trench roller in a direction parallel to the end bent cap backwall. Do not displace or damage geosynthetics or MSE wall reinforcement when placing and compacting select material or aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics until they are covered with at least 8 inches of select material or aggregate. Replace any damaged geosynthetics to the satisfaction of the Engineer. When approach fills extend beyond bridge approach slabs, wrap Type 4a geotextiles over select material or aggregate and back under approach slabs as shown in *Roadway Standard Drawing* No. 423.03 or 423.04.

Measurement and Payment

Type 1 and 1A approach fills will be paid for at the contract lump sum price for *Type 1 Bridge Approach Fill, Station* _____ and Type 2 and 2A approach fills will be paid for at the contract lump sum price for *Type 2 Bridge Approach Fill, Station* _____. The lump sum price for each approach fill will be full compensation for providing labor, tools, equipment and approach fill materials, excavating, backfilling, hauling and removing excavated materials, installing wall facing, geotextiles and outlets, compacting backfill and supplying select material, aggregate, geotextiles, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct approach fills behind bridge end bents.

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

The contract lump sum price for *Type 2 Bridge Approach Fill, Station* _____ will also be full compensation for supplying and connecting MSE wall reinforcement to end bent caps but not designing MSE wall reinforcement and connectors. The cost of designing reinforcement and connectors for Type 2 approach fills behind bridge end bents with MSE abutment walls will be incidental to the contract unit price for *MSE Retaining Wall No.* _____.

Payment will be made under:

Pay Item	**Pay Unit**
Type 1 Bridge Approach Fill, Station _____	Lump Sum
Type 2 Bridge Approach Fill, Station _____	Lump Sum

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

(11-21-00)(Rev. 1-16-24) 620 SP6 R25

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

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

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

FINAL SURFACE TESTING REQUIRED:
(1-20-25) 610 SP6 R045B

Perform final surface testing in accordance with Article 610-13 of the *Standard Specifications* in areas that meet the criteria outlined in Article 610-13 of the *Standard Specifications* or otherwise delineated in the contract.

FINAL SURFACE TESTING ASPHALT PAVEMENT:
(11-18-25) 610 SP6 R048

Revise the *Standard Specifications* as follows:

Page 6-24, Article 610-13 FINAL SURFACE TESTING AND ACCEPTANCE, line 35, delete the last sentence of the first paragraph of the Article and replace with the following:

Final surface testing is not required on SR-designated routes, on any alignment where the speed limit is less than 45 mph, on roundabouts, ramps, loops and turn lanes, or where the paving limits are less than one mile in length.

MILLED RUMBLE STRIPS ON ASPHALT CONCRETE SHOULDERS:
(11-19-24)(Rev. 6-17-25) 665 SP6 R56

Revise the *Standard Specifications* as follows:

Page 6-53, Article 665-3 CONSTRUCTION METHODS, lines 20-21, delete and replace the first sentence of the second paragraph with the following:

Provide rumble strips that have finished dimensions of 7 inches ± 1/2 inch wide in the direction of travel and the length measured perpendicular to the direction of travel as specified in the contract.

Page 6-53, Article 665-4 MEASUREMENT AND PAYMENT, lines 30-33, delete and replace with the following:

Milled Rumble Strips (Asphalt Concrete), ___" will be measured and paid at the contract unit price per linear foot for the actual number of linear feet, measured longitudinally along the surface of each shoulder and/or edgeline, where rumble strips have been constructed.

Payment will be made under:

Pay Item	**Pay Unit**
Milled Rumble Strips (Asphalt Concrete), ___"	Linear Foot

___" ROLLED CONCRETE CURB:
(10-20-26) SP8 R04

Revise the *Standard Specifications* as follows:

Page 8-28, Article 846-4, MEASUREMENT AND PAYMENT, add the following after line 32:

___" *Rolled Concrete Curb* will be measured and paid for in linear feet, accepted in place, along the surface of the top of the curb.

Page 8-28, Article 846-4, MEASUREMENT AND PAYMENT, add the following after line 36:

Pay Item	**Pay Unit**
___" Rolled Concrete Curb	Linear Foot

CONCRETE TRUCK APRON, ROLLED CONCRETE CURB AND CURB AND GUTTER (MODIFIED):

(1-21-24)(Rev. 10-20-26) SP8 R05

Description

Construct the concrete truck apron in accordance with the appliable requirements of Division 7 of the *Standard Specifications*, the plans and this special provision.

Construct rolled concrete curb and concrete curb and gutter (modified) in accordance with Section 846 of the *Standard Specifications*, the *Roadway Standard Drawings* No. 846.01 as modified by the typical section in the plans and this special provision.

Materials

Use materials meeting the applicable requirements of Article 710-2 and Section 700 of the *Standard Specifications* except all rolled concrete curb and curb and gutter (modified) in the roundabout and the concrete truck apron respectively shall be Class AA.

Portland cement concrete shall meet the requirements of Section 1000 of the *Standard Specifications.*

Wire welded reinforcement shall meet the requirements of Section 1070 of the *Standard Specifications*.

Construction Methods

Construct concrete truck apron in accordance with the applicable requirements of Article 710-3 and Section 700 of the *Standard Specifications*, the plans and as directed by the Engineer. Final surface testing is not required.

Construct rolled concrete curb and concrete curb and gutter (modified) and in accordance with Article 846-3 of the *Standard Specifications*, the plans and as directed by the Engineer.

Construct concrete truck apron consisting of Portland cement concrete pavement reinforced with steel welded wire reinforcement, size 4x4 W5.5XW5.5 or 6x6 W8.5X8.5. A heavier wire reinforcement, approved by the Engineer, may be used at no additional cost to the Department. Position the steel welded wire reinforcement at mid-depth of the slab. Joints for the concrete truck apron shall be radial. Expansion joint spacing shall not exceed 60 feet and contraction

joint spacing shall not exceed 15 feet on centers, measured at the outside edge of the apron, or as directed by the Engineer.

Measurement and Payment

___" *Concrete Truck Apron* will be measured and paid for in square yards, measured along the surface of the completed and accepted work. Such price and payment will be full compensation for all work of constructing the truck apron, including but not limited to excavating and backfilling, furnishing and placing concrete, and constructing joints.

2' 6" Concrete Curb and Gutter (Modified) will be measured and paid for in accordance with Article 846-4 of the *Standard Specifications*.

___" *Rolled Concrete Curb* will be measured and paid for in accordance with Article 846-4 of the *Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
___" Concrete Truck Apron	Square Yard
2' 6" Concrete Curb and Gutter (Modified)	Linear Foot

CONCRETE CAP FOR SINGLE FACED BARRIER FILL:

Description

Furnish and install *Concrete Cap For Single Faced Barrier Fill* as shown in the plans, in accordance with the detail in the plans, and as directed by the Engineer.

Measurement and Payment

Concrete Cap For Single Faced Barrier Fill will be measured and paid for per linear foot that has been 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, and concrete cover) and all incidentals necessary to construct the *Concrete Cap For Single Faced Barrier Fill*.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Cap For Single Faced Barrier Fill	Linear Foot

CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX:
(1-1-02)(Rev. 1-16-23) 840, 859 SP8 R50

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

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

Payment will be made under:

Pay Item	**Pay Unit**
Convert Existing Catch Basin to Traffic Bearing Junction Box	Each

CONVERT EXISTING TRAFFIC BEARING DROP INLET TO TRAFFIC BEARING JUNCTION BOX:
(1-1-02)(Rev. 1-16-23) 840, 859 SP8 R50

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

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

Payment will be made under:

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

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

Description

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

Materials

Detectable warning surface materials shall consist of raised truncated domes found on the NCDOT APL, meet the requirements of Article 848-2 of the *Standard Specifications* and be

capable of being affixed to or anchored in the concrete sidewalk, including green concrete defined as concrete that has set but not appreciably hardened, cured concrete, or asphalt pavement. Surface applied such as glued or stick down applications are prohibited for permanent installations unless approved by the Engineer.

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

Construction Methods

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

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

Measurement and Payment

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

MEDIAN HAZARD PROTECTION

Construct Median Hazard Protection at the locations shown in the plans using Single Face Single Slope Concrete Barrier in lieu of the Precast Reinforced Concrete Barrier, Single Faced shown on *Roadway Standard Drawing* No. 854.06.

STAMPED CONCRETE MEDIAN ISLAND: (SPECIAL)

Provide Stamped Concrete Median Island that complies with the plans and Section 852 of the *Standard Specifications*. *Stamped Concrete Median Island* will be measured and paid for in square yards, once it has been completed and accepted. Materials Concrete shall be Class A Concrete meeting the requirements of Section 1000 of the Standard Specifications. No concrete shall be

placed until the forms and base have been inspected and approved by the Department of Transportation.

The color and pattern shall be approved by the Engineer prior to construction.

Such price and payment will be full compensation for all work of constructing the apron, including but not limited to excavating and backfilling, furnishing and placing tinted concrete, wire mesh, constructing joints, and sealing.

Payment will be made under:

Pay Item	**Pay Unit**
Stamped Concrete Median Island	Square Yard

WOOD RUB RAIL:

Description

Construct wood rub rail at areas indicated in the plans and as directed by the Engineer

Construction

Construct Wood Rub Rail in accordance with the details in the plans.

Measurement and Payment

Wood Rub Rail will be measured and paid in linear feet of wood rub rail that has been satisfactorily completed and accepted by the Engineer. Measurement will be made from center to center of the outermost post in the length of wood rub rail being measured..

Payment will be made under:

Pay Item	**Pay Unit**
Wood Rub Rail	Linear Foot

WEATHERING STEEL BEAM GUARDRAIL:

(12-18-09) (Rev. 1-16-24)(Rev. 9-8-26) 862 SPI 8-33 (Revised)

Description

Install weathering steel beam guardrail and components at locations shown on the plans in accordance with Section 862 of the *Standard Specifications* and this special provision.

Materials

Guardrail posts shall be hot dipped galvanized in accordance with Subarticle 1046-3(B) of the *Standard Specifications*. All portion of the post above ground shall be a weathered steel finish.

Material used in the weathering steel beam guardrail and all portions of the post above ground shall meet the corrosion requirements of unpainted structural steel found in ASTM A242. The rails, terminal sections and all portions of the post above ground shall meet the requirements of AASHTO M 180 Type IV, Class B. The bolts and nuts for Type IV beams shall meet the requirements of an approved corrosion resistant material and conform to or exceed the requirements of AASHTO M 180.

Submit Type 1 Certified Mill Test Report in accordance with Section 106-3 of the *Standard Specifications*. The Engineer reserves the right to sample the materials.

All organic zinc repair paint shall be on the NCDOT Approved Products List before use.

Construction Methods

Construct in accordance with the applicable requirements of Article 862-3 of the *Standard Specifications* and this special provision.

Install weathering steel beam guardrail with a uniform color appearance on the outside surfaces on the roadway face of the guardrail. A brush-off blast cleaning or brushing in the field shall be required after erection if weathering of the sections has not been consistent after a period of time as determined by the Engineer.

Use delineators on curved rail elements in accordance with Section 862 of the *Standard Specifications*.

At locations where the guardrail is lapped, use inserts made of zinc foil with a nominal thickness of 20 mils. Punch holes and shape inserts to conform to the dimensions as given in AASHTO M 180, Figure 3 for standard W-Beam, and/or Figure 4 for Thrie-Beam guardrail. The zinc foil inserts shall be made to the minimum width of the W-Beam and/or Thrie-Beam guardrail and a minimum length of 12.5 inches. Use zinc meeting the requirements of ASTM B6, Standard Specification for Zinc and shall also meet the requirements of ASTM B69, Standard Specification for Rolled Zinc. The material shall be Special High Grade, with a minimum of 99.99% Zinc as shown in Table 1 of ASTM B6.

As an alternate to using zinc inserts, the ends of both sections to be lapped shall be coated with 2 coats of 3.0-5.0 mils dry film thickness (DFT) of an approved Department organic zinc repair paint.

The coated back on the end of one rail shall be placed over the end with a coated front on the adjacent rail. Only the side of the rail that is in contact with the adjacent rail shall be coated and each rail shall be coated for the entire length of the lap. Apply all coatings in accordance with Section 442 of the *Standard Specifications*, and the coating manufacturer's instructions. In the event of conflict between manufacturer's instructions and the *Standard Specifications*, the more restrictive requirements shall apply.

Measurement and Payment

Steel Beam Guardrail, Weathering will be measured and paid for in linear feet of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that is within the pay limits of guardrail anchors. Measurement will be made from center to center of the outermost post in the length of guardrail being measured.

Steel Beam Guardrail, Shop Curved, Weathering will be measured and paid for in linear feet of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that is within the pay limits of guardrail anchors. Measurement will be made from center to center of the outermost post in the length of guardrail being measured.

Steel Beam Guardrail Terminal Sections, Weathering will be measured and paid in units of each completed and accepted, exclusive of terminal sections that are within the pay limits of guardrail anchors.

Additional Guardrail Posts, Weathering will be measured and paid in units of each for additional posts required but not shown in the plans.

Such price and payment will be full compensation for all work covered by this provision including but not limited to furnishing and erecting painted posts, offset blocks, rail, miscellaneous hardware, painting of laps and all other materials and all incidentals necessary to complete the work satisfactorily.

Payment will be made under:

Pay Item	**Pay Unit**
Steel Beam Guardrail, Weathering	Linear Foot
Steel Beam Guardrail, Shop Curved, Weathering	Linear Foot
Steel Beam Guardrail Terminal Sections, Weathering	Each
Additional Guardrail Posts, Weathering	Each

POWDER COATED GALVANIZED STEEL BEAM GUARDRAIL:

(5-3-13)(Rev. 6-16-26)(Rev. 9-8-26) 862 SPI 8-40 Revised

Description

Furnish and install powder coated galvanized steel beam guardrail and components in accordance with the plans and the applicable requirements of Section 862 of the *Standard Specifications*, and this special provision at locations shown on the plans.

Furnish and install powder coated galvanized impact attenuator units and any components necessary to connect the impact attenuator units in accordance with the manufacturer's recommendations, the details in the plans and this special provision at locations shown in the plans.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Galvanizing	1076
Reflective sheeting	1088-3

Supply guardrail materials meeting the applicable requirements of Article 862-2 of the *Standard Specifications* except that guardrail materials shall not be water quenched or treated with chromate conversion coatings. Use guardrail listed on the NCDOT APL.

Furnish attenuator units listed on the NCDOT APL. Units shall not be modified by the manufacturer and installer once approved and on the NCDOT APL. Prior to installation the Contractor shall submit to the Engineer certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the *Standard Specifications*.

Use coating facilities approved by the Department. A complete listing of approved facilities can be found on the Department's pre-approved producer/supplier list. The preapproved list is available on the Department's website.

Notification of Work

Give the Materials and Tests Unit 3 business days' notice for in-state producers and 8 business days' notice for out-of-state producers before beginning work in the shop. A copy of the Notification of Beginning Of Work Form can be found on the Departments Materials and Tests webpage:
https://connect.ncdot.gov/resources/Materials/MaterialsResources/MT%20Form%20M4000%20Notification%20of%20Beginning%20Work.pdf

Powder Coat Color

Use powder coat color meeting the requirements of AMS-STD-595. AMS-STD-595 color standard products such as fan decks and color chipsets, may be obtained from www.sae.org. Use

the AMS-STD-595 color indicated in the plans or as directed by the Engineer. The Contractor must not paint the guardrail or impact attenuator unit to satisfy powder coat requirements.

Construction Methods

Construct in accordance with the applicable requirements of Article 862-3 of the *Standard Specifications* and this special provision.

(A) Preparation of Galvanized Beams, Impact Attenuator Units and Hardware for Powder Coating

In no case shall the surface preparation be less than specified by the powder manufacturer's recommendations or produce a powder applied film that does not demonstrate the minimum adhesion required herein.

All components to be coated shall be prepared in accordance with Article 442-13 of the *Standard Specifications.* All drainage spikes, high spots, protrusions, or other surface defects shall be removed using hand or power tools. Do not remove the galvanization below the limits set forth in AASHTO M 111.

Remove grease, oils, moisture, scale, rust or any other foreign matter prior to powder coating to ensure ideal adhesion and coating performance. Prepare hot dipped galvanized steel surfaces in accordance with ASTM D7803.

(B) Powder Coating Application and Curing

Prior to application, the coating facilities shall take representative dry film thickness readings for each batch and type of product being powder coated.

Follow the powder manufacturer's recommendations regarding steel temperature, application, and curing.

Apply the coating so the final product has a uniform and smooth surface which adheres well to the galvanized surface.

The final product shall be free of over spray, mud cracking, runs, sags, cracks, holidays, pinholes, or any other defects.

(C) Quality Control

Provide all test reports and documentation and inspect all coated material in accordance with Sections 442, 1072, 1076, and 1080 of the *Standard Specifications*. Ensure that the quality control inspector is separate from production functions.

(D) Storage, Shipping and Handling

All powder coated material shall be stored inside unless there is no facility present or as approved by the Engineer.

All shipping and handling either from powder facility to project site and or storage site to area(s) to construction location shall be protected from incurring damage to the product. In no case shall the product be stored directly on the ground, in areas where pooling water may occur; the Engineer determines the effectiveness of all storage, shipping and handling methods.

(E) Repair of Powder Coated Material

Use the utmost of care in handling, packaging, shipping, and installing these products. The process in which this coating was applied cannot be duplicated in a field environment; thus any repairs are considered detrimental to the longevity of the coating system. The Department has specified the following for repairing powder coating.

All damage to the coating which occurs or is discovered in the shop shall be repaired by the original method of application as outlined in the coating facilities repair procedure. All repair areas shall meet the original requirements for adhesion as stated herein.

All damaged discovered upon delivery to the project site prior to unloading shall be recorded by pictures and documentation by the Engineer or their authorized representative and shall be reported to the applicator. The Engineer has the authority to accept or reject the material as outlined in the Article 105-3 of the *Standard Specifications*.

For damaged coatings which occur during storage, transporting, handling or installation, submit a repair procedure to the Engineer. The Contractor shall use a liquid paint approved by the Department and compatible with the powder applied product. All repair areas shall meet an adhesion rating of 400 psi in accordance with ASTM D4541. Acceptance on the final finish shall be determined by the Engineer.

(F) Guardrail Installation

Install guardrail in accordance with Section 862 of the *Standard Specifications*, the plans, and assembling instructions furnished by the manufacturer. Guardrail end delineation shall be applied to the entire end section of all approach and trailing end sections.

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 *Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

(G) Impact Attenuator Unit Installation

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

Measurement and Payment

Steel Beam Guardrail, Powder Coated Galvanized and *Steel Beam Guardrail, Shop Curved, Powder Coated Galvanized* will be measured and paid in linear feet of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that is within the pay limits of guardrail anchors. Measurement will be made from center to center of the outermost post or the w-beam midspan panel splice point of the guardrail in the length of guardrail being measured.

Guardrail Anchor Units, Type ____, Powder Coated Galvanized 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.

Guardrail End Units, Type ____, Powder Coated Galvanized 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.

25' Clear Span Guardrail Sections, Powder Coated Galvanized will be measured and paid in units of each completed and accepted.

Steel Beam Guardrail Terminal Sections, Powder Coated Galvanized will be measured and paid in units of each completed and accepted, exclusive of terminal sections that are within the pay limits of guardrail anchors.

Additional Guardrail Posts, Powder Coated Galvanized will be measured and paid in units of each for additional posts required but not shown in the plans.

There will be no measurement or payment made for guardrail delineators or guardrail end delineation as they are incidental to the other pay items herein.

Such price and payment include, but is not limited to, furnishing and erecting posts, offset blocks, rail, terminal sections, miscellaneous hardware, and all other materials, field curving and shop curving of the rail; excavation; furnishing and installing guardrail posts and offset blocks; backfilling; fabrication; welding; powder coating; galvanizing; furnishing and installing guardrail delineators and end delineation.

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

Payment will be made under:

Pay Item	Pay Unit
Steel Beam Guardrail, Powder Coated Galvanized	Linear Foot
Steel Beam Guardrail, Shop Curved, Powder Coated Galvanized	Linear Foot
Guardrail Anchor Units, Type ____, Powder Coated Galvanized	Each
Guardrail End Units, Type ____, Powder Coated Galvanized	Each
25' Clear Span Guardrail Sections, Powder Coated Galvanized	Each
Steel Beam Guardrail Terminal Sections, Powder Coated Galvanized	Each
Additional Guardrail Posts, Powder Coated Galvanized	Each
Impact Attenuator Units, Type TL-___, Powder Coated Galvanized	Each

VINYL COATED CHAIN LINK FENCE:

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

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

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

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

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

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

54" SHARED USE PATH SAFETY RAIL

Furnish and install steel pipe handrail at locations as shown in the plans, in accordance with the details in the plans and as directed by the Engineer.

After fabrication and installation, all exposed surfaces shall be painted with a compatible black vinyl paint. The contractor shall submit the paint type with the working drawings.

Measurement and Payment

Shared-Use Path Safety Rail will be measured and paid as the actual number of linear feet of steel pipe handrail measured along the top of the handrail to the nearest 0.1 of a foot. Such price and payment shall be full compensation for fabricating, furnishing, installing, painting, anchoring and all incidentals necessary to satisfactorily install the handrail.

Payment will be made under:

Pay Item	Pay Unit
54" Shared-Use Path Safety Rail	Linear Foot

BOLLARDS:

(6-17-25) SP8 R103

Description

Construct bollards at locations indicated in the plans in accordance with the *Standard Specifications*, plans and as directed by the Engineer.

Materials

Bollard material shall meet the requirements of the *Roadway Standard Drawings* No. 867.02 or details provided in the plans and the applicable requirements of the *Standard Specifications*.

Construction Methods

Construct bollards in accordance with the details in the plans and as directed by the Engineer.

Measurement and Payment

Bollards will be measured and paid for per each bollard satisfactorily installed on the project.

Payment will be made under:

Pay Item	Pay Unit
Bollards	Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12)(Rev. 1-16-24) 9, 14, 17 SP9 R05

Description

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

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

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

Materials

Refer to the *Standard Specifications*.

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

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

materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

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

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

(A) Straight anchor rods,

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

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

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

Construction Methods

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

(A) Drilled Piers

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

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

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

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

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

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

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

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

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

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

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

(1) Inspections for tip resistance and bottom cleanliness are not required,
(2) Temporary casings may remain in place if approved, and

(3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or

(4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

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

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

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

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

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

(B) Footings, Pedestals, Grade Beams and Wings

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

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for

pedestal and grade beam edges exposed above finished grade. Place concrete against undisturbed soil or backfill and fill in accordance with Article 410-8 of the *Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces.

(C) Anchor Rod Assemblies

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

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

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

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

(1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
(2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
(3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
(4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
(5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
(6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.

(7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.

(8) Repeat (7) for leveling nuts.

(9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).

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

NUT ROTATION REQUIREMENTS
(Turn-of-Nut Pretensioning Method)

Anchor Rod Diameter, inch	Requirement
≤ 1 1/2	1/3 turn (2 flats)
> 1 1/2	1/6 turn (1 flat)

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

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

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

TORQUE REQUIREMENTS

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

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

(13) Do not grout under base plate.

Measurement and Payment

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

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

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

(1-16-18)(Rev. 1-16-24) 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 *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 Footing 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 *Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Overhead Footing	Cubic Yard

HIGH STRENGTH CONCRETE FOR DRIVEWAYS:

(11-21-00)(Rev. 1-16-24) 848 SP10 R02

Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-6 of the *Standard Specifications*.

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

ELECTRONIC TICKETING SYSTEM:

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

Description

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

Electronic Ticketing Requirements

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

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

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

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

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

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

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

h. The electronic ticket shall contain the following information:

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

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

Measurement and Payment

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

TIMBER AND LUMBER:

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

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

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

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

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

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

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

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

Certifications in accordance with Article 106-3. Type 6 – Supplier's Certifications are required for each producer/supplier to include any chain of custody changes from the mill to the Department.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Treated timber piles shall meet the requirements of Section 1082.

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

Pressure treat wood posts in accordance with Section 1082.

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

ELECTRICAL JUNCTION BOXES:

(6-18-24) 1091 SP10 R91

Revise the *Standard Specifications* as follows:

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

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

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

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

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

For PC junction boxes, use polymer concrete material made of an aggregate consisting of sand and gravel bound together with a polymer and reinforced with glass strands to fabricate box and cover components.

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

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

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

Bodies of junction boxes shall be a single piece.

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

GROUND MOUNTED SIGN SUPPORTS:

(9-15-26) 1094 SP10 R94

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

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

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

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

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

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

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

TEMPORARY SHORING:

(2-20-07)(Rev. 1-16-24) SP11 R02

Description

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

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

(A) Cantilever and Braced Shoring

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

(B) Anchored Shoring

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

(C) Temporary MSE Walls

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

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

geogrid wall" as a temporary geosynthetic wall with geogrid reinforcement and "temporary geostrip wall" as a temporary geosynthetic wall with geostrip reinforcement.

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

(D) Embedment

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

(E) Positive Protection

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

Materials

Refer to the *Standard Specifications*.

Item	**Section**
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-7
Geosynthetics	1056
Grout, Type 1	1003
Portland Cement	1024-1
Portland Cement Concrete	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Water	1024-4
Welded Wire Reinforcement	1070-3

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

(A) Shoring Backfill

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

(B) Anchors

Store anchor materials on blocking a minimum of 12 inches above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store anchor materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

(1) Ground Anchors

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

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

(2) Helical Anchors

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

(3) Anchorages

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

(C) Temporary Walls

(1) Welded Wire Facing

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

(2) Geotextiles

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

(3) Geogrid and Geostrip Reinforcement

Use geogrids with a roll width of at least 4 feet. Use geogrids for geogrid reinforcement and geostrips for geostrip reinforcement with an "approved" status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids and geostrips is available from:

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

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

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

(4) Welded Wire Grid and Metallic Strip Reinforcement

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

Preconstruction Requirements

(A) Concrete Barrier

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

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and temporary shoring. At the Contractor's option or if clear distance for

cantilever, braced and anchored shoring is less than 4 feet, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above temporary walls.

(C) Temporary Shoring Designs

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

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

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

(1) Soil Parameters

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

(a) Unit weight (γ) = 120 pcf,

(b)

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

(c) Cohesion (c) = 0 psf.

(2) Traffic Surcharge

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

(3) Cantilever, Braced and Anchored Shoring Designs

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

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

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

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

(4) Temporary Wall Designs

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

Design temporary walls in accordance with the plans and Article 11.10 of the *AASHTO LRFD Bridge Design Specifications*. Embed temporary walls at least 18

inches except for walls on structures or rock as determined by the Engineer. Use a uniform reinforcement length throughout the wall height of at least 0.7H or 6 feet, whichever is longer. Extend the reinforced zone at least 6 inches beyond end of reinforcement. Do not locate the reinforced zone outside right-of-way or easement limits.

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

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

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

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

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction, inspection and testing of the temporary shoring. If required and if this meeting occurs before all shoring submittals have been accepted, additional preconstruction meetings may be required before beginning construction of temporary shoring without accepted submittals. The Resident, District or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend preconstruction meetings.

Construction Methods

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

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

(A) Tolerances

Construct shoring with the following tolerances:

(1) Horizontal wires of welded wire facing are level in all directions,

(2) Shoring location is within 6 inches of horizontal and vertical alignment shown in the accepted submittals, and

(3) Shoring plumbness (batter) is not negative and within 2 degrees of vertical.

(B) Cantilever, Braced and Anchored Shoring Installation

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

(1) Pile Installation

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

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

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

(2) Excavation

Excavate in front of piles from the top down in accordance with the accepted

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

(3) Anchor Installation

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

(a) Materials in accordance with this provision are required instead of materials conforming to Articles 6.4 and 6.5.3 of the AASHTO LRFD Specifications,

(b) Encapsulation-protected ground anchors in accordance with Article 6.4.1.2 of the AASHTO LRFD specifications are not required, and

(c) Corrosion protection for unbonded lengths of ground anchors and anchorage covers are not required.

(d) Mix and place neat cement grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute/American Petroleum Institute Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

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

(4) Anchor Testing

Proof test and lock-off anchors in accordance with the accepted submittals and Article 6.5.5 of the *AASHTO LRFD Bridge Construction Specifications* except for the acceptance criteria in Article 6.5.5.5. For the AASHTO LRFD specifications,

"ground anchor" refers to a ground or helical anchor and "tendon" refers to a bar, strand or shaft.

(a) Anchor Acceptance

Anchor acceptance is based in part on the following criteria.

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

(b) Anchor Test Results

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

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

(C) Temporary Wall Installation

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

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

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

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

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

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

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

Measurement and Payment

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

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

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

measurements or site conditions.

PCB will be measured and paid in accordance with Article 1170-4 of the *Standard Specifications*. No additional payment will be made for anchoring PCB for temporary shoring. Costs for anchoring PCB will be incidental to temporary shoring.

Temporary guardrail will be measured and paid for in accordance with Article 862-6 of the *Standard Specifications*.

Payment will be made under:

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

WORK ZONE INSTALLER:

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

Revise the *Standard Specifications* as follows:

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

When temporary traffic control consists of more than flagging operations, the Contractor shall provide the service of at least one qualified work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way.

TEMPORARY CRASH CUSHIONS:

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

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

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

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

Revise the *Standard Specifications* as follows:

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

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

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

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

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

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

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

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

(A) Automated Flagging Assistance Devices (AFAD)

(1) AFAD General

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

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

(2) AFAD Type I System: RED/YELLOW

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

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

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

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

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

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

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

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

(3) AFAD Type II System: STOP/SLOW

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

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

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

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

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

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

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

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

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

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

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

To stop traffic, the AFAD will transition from the SLOW face to the STOP face by initiating a minimum 5 second change cycle. First, the warning beacon is to be

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

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

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

(B) Portable Traffic Signals (PTS) Units

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

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

Communication Requirements

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

Fault Mode Requirements

Revert PTS units to a flashing red mode upon system default unless otherwise specified by the Engineer. Equip the PTS units with a remote monitoring system. Where cell communication availability exists, the remote monitoring system shall adhere to the remote monitoring system section of this provision.

Remote Monitoring System

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

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

Trailer / Cart

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

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

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

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

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

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

Power System

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

Provide equipment that is solar powered and supplemented with a battery backup system that includes a minimum 110/120 VAC powered on-board charging system capable of powering the unit for 7 continuous days with no solar power. Each unit shall also be capable of being powered by standard 110/120 VAC power sources, if applicable.

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

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

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

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

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

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

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

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

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

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

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

If AFADs or PTS units become inoperative, be prepared at all times to replace the unit with the same type and model of AFAD or PTS units, revert to human flagging operations or terminate all construction activities requiring the use of the AFAD or PTS units until the AFAD or PTS units become operative or qualified human flaggers are available.

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

At the end of each workday, remove all AFADs or PTS units from the roadway and shoulder areas.

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

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

AFAD Specific Construction Methods

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

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

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

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

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

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

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

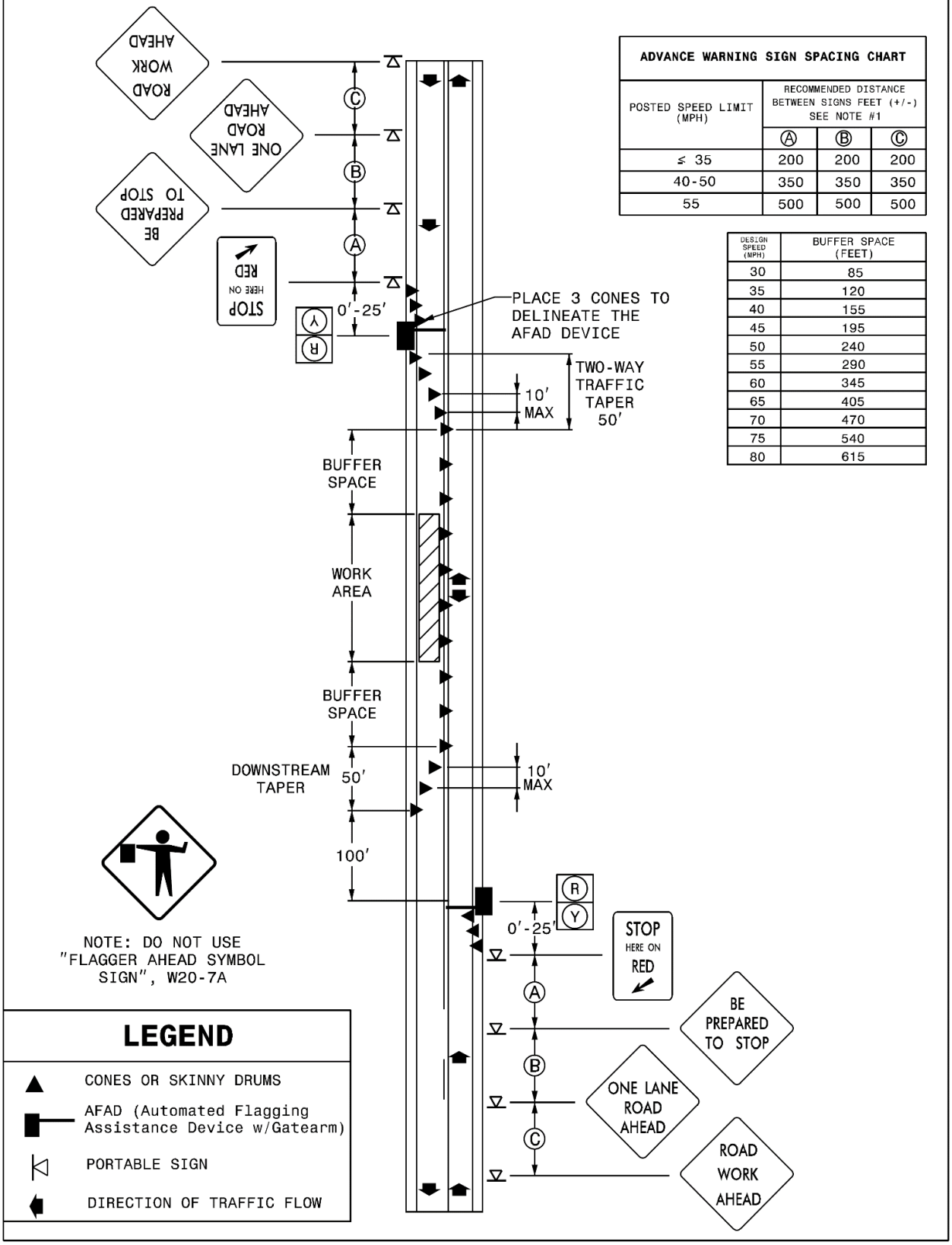
Page 11-14, Article 1150-4, MEASUREMENT AND PAYMENT, add the following after line 24:

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

required to control a single approach, these units will collectively be considered as replacing one flagger.

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

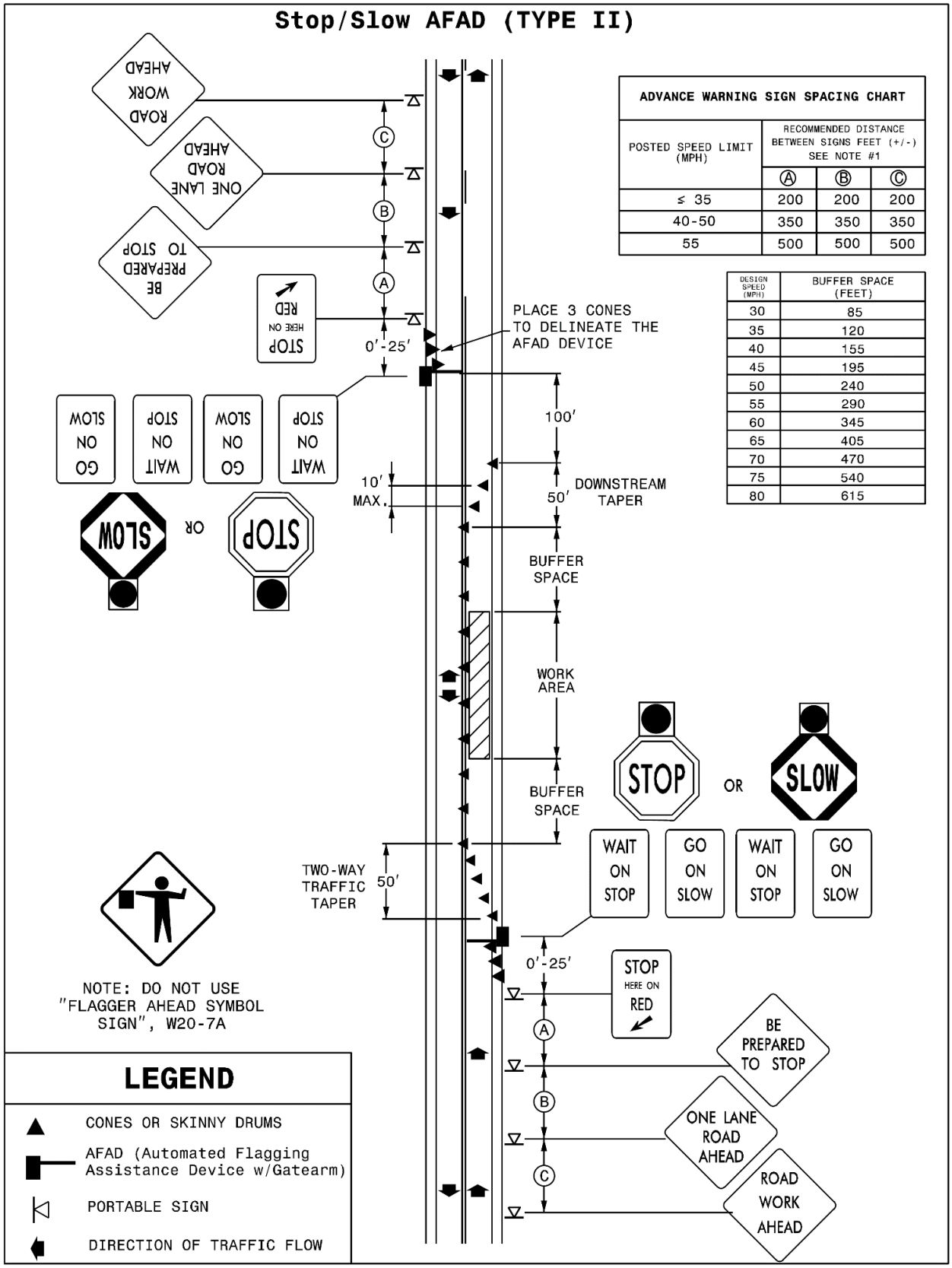
Red/Yellow Lens AFAD (TYPE I)



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

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

Stop/Slow AFAD (TYPE II)



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

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

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

Revise the *Standard Specifications* as follows:

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

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

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

Crash cushion to unanchored concrete requires a transition

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

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

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

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

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

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

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

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

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

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

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

PAVEMENT MARKINGS:

(5-19-26)(Rev. 10-20-26) 1087, 1205 SP12 R04

Revise the *Standard Specifications* as follows:

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

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

(C) Thermoplastic and Integrated Multipolymer (IMP) Composition

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

TABLE 1087-1A
PHYSICAL PROPERTIES
OF THERMOPLASTIC PAVEMENT MARKINGS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TABLE 1087-2
GLASS BEAD GRADATION REQUIREMENTS

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

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

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

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

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

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

(9) Tensile Elongation

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

(10) Abrasion Resistance

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

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

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

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

Integrated Multipolymer	Type 2 Material Certification and Type 3 Material Certification

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

Only apply markings to dry clean surfaces.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TABLE 1205-6
REFLECTOMETER REQUIREMENTS
FOR PAINT

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

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

In addition, *Paint Pavement Marking Lines* will be paid per linear foot for each 15 mil wet application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns and in accordance with Subarticle 1205-8(C) final paint pavement marking lines of 1 application of 30 mils wet will be measured and paid as 2 applications of 15 mils wet.

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

In addition, *Paint Pavement Marking Symbols* will be paid for each 15 mil wet application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns and in accordance with Subarticle 1205-8(C) final paint pavement marking symbols of 1 application of 30 mils wet will be measured and paid as 2 applications of 15 mils wet.

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

In addition, *Paint Pavement Marking Characters* will be paid for each 15 mil wet application placed in accordance with Subarticle 1205-8(C) for temporary pavement markings during temporary traffic patterns and in accordance with Subarticle 1205-8(C) final paint pavement marking characters of 1 application of 30 mils wet will be measured and paid as 2 applications of 15 mils wet.

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

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

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

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

SNOWPLOWABLE DELINEATION:

(10-15-24) 1253 SP12 R53

Description

Furnish, install and maintain snowplowable delineation.

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

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

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

Materials

Refer to Division 10 of the *Standard Specifications*.

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

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

Construction Methods

(A) General

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

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

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

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

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

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

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

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

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

(C) Reflector Replacement

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

In the event that a reflector is damaged, replace the damaged reflector by using adhesives and methods recommended by the manufacturer of the markers and approved by the Engineer. This work is considered incidental if damage occurs during the initial installation of the marker housings and maintenance of initial polycarbonate H-shaped markers or inlaid cradle markers specified in this section.

If during reflector replacement it is discovered that the housing is missing or broken this will be paid as *Polycarbonate H-shaped Markers* or *Inlaid Cradle Markers*. Missing housings shall be replaced. Broken housings shall be removed and replaced. In both cases the slot for the housings shall be properly prepared prior to installing the new housing; patch the existing marker slots as directed by the Engineer and install the new marker approximately one foot before or after the patch. Removal of broken housings and preparation of slots will be considered incidental to the work of replacing housings.

(D) Inlaid Raised Pavement Markers

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

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

(E) 10' Rumble Skips

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

(F) 10' Inlaid Pavement Markings

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

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

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

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

Maintenance

Maintain all installed snowplowable delineation before acceptance by the Engineer.

Measurement and Payment

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

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

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

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

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

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

Payment will be made under:

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

ROADWAY LIGHTING FOUNDATIONS:

(1-16-18)(Rev. 1-16-24) 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, *Roadway Standard Drawings* and accepted submittals. Define "high mount foundation" as a drilled pier including the conduit and anchor rod assembly that meets *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 *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 *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 *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 *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 *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 *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 *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)(Rev. 1-16-24) 1660 SP16 R02

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

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660 in the *Standard Specifications* and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as

an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

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

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

COIR FIBER MAT:

(9-16-25) 1629 SP16 R05

Revise the *Standard Specifications* as follows:

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

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

WATTLE DEVICES:

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

Revise the *Standard Specifications* as follows:

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

(B) Wattle and Wattle Barrier

Wattles shall meet Table 1642-1.

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

Coir Fiber Wattles shall meet Table 1642-2.

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

Wattle Barriers shall meet Table 1642-3.

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

Coir Fiber Wattle Barriers shall meet Table 1642-4.

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

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

Wattle will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattle*.

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of coir fiber wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattles*.

Wattle Barrier will be measured and paid as the actual number of linear feet of wattle barrier installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattle Barrier*.

Coir Fiber Wattle Barrier will be measured and paid as the actual number of linear feet of coir fiber wattle barrier installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattle Barrier*.

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

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

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

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

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08)(Rev. 1-16-24) Z-2

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

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

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

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

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

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

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

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

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

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

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

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

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet – Strain R
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass
Crownvetch
Pensacola Bahiagrass
Creeping Red Fescue
Japanese Millet
Reed Canary Grass
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

STANDARD SPECIAL PROVISION
ERRATA

(1-16-24)(Rev. 6-16-26) Z-4

Revise the *2024 Standard Specifications* as follows:

Division 1

Page 1-1, Article 101-2 ABBREVIATIONS, line 25, replace "American Wood-Preservers' Association" with "American Wood Protection Association".

Page 1-18, Article 102-10 BID BOND OR BID DEPOSIT, line 26, replace " Subarticle 102-8(A)(8)(b)" with "Subarticle 102-8(A)(12)(b)".

Page 1-20, Subarticle 102-14(A) State Funded Projects, line 3, replace "$30,000" with "$40,000".

Page 1-20, Subarticle 102-14(B) Federal Aid Projects, line 7, replace "$30,000" with "$40,000".

Page 1-36, Subarticle 104-12(B) Evaluation of Proposals, line 21, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-36, Subarticle 104-12(D) Preliminary Review, line 37, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-37, Subarticle 104-12(E) Final Proposal, line 3, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-37, Subarticle 104-12(F) Design-Build VEPs, line 36, replace "Design-Build Unit" with "Alternative Delivery Unit".

Page 1-38, Subarticle 104-12(G) Modifications, line 1, replace "Design-Build Unit" with "Alternative Delivery Unit".

Division 3

Page 3-5, Article 305-2 MATERIALS, after line 16, replace " 1032-3(A)(7)" with "1032-3" and add the item "Galvanized Corrugated Steel Pipe" with Section "1032-3".

Page 3-6, Article 310-2 MATERIALS, after line 9, add the item "Galvanized Corrugated Steel Pipe" with Section "1032-3".

Division 6

Page 6-15, Article 610-1 DESCRIPTION, line 20, replace "The work includes" with "The work includes, but is not limited to,".

Page 6-15, Article 610-1 DESCRIPTION, line 22, replace “applying the tack coat as specified.” with “applying the tack coat in accordance with Section 605.”.

Page 6-30, Article 610-14 DENSITY ACCEPTANCE, line 39, replace “QC process.” with “QC process in accordance with Section 609.”.

Page 6-31, Article 610-16 MEASUREMENT AND PAYMENT, line 13, replace "*Hot Mix Asphalt Pavement*” with “*Asphalt Concrete _____ Course, Type _____*”.

Page 6-50, Subarticle 661-4(A) Equipment, lines 4-7, replace the first two sentences of the seventh paragraph with the following:

When an erected fixed stringline is utilized for longitudinal profile and cross slope control furnish and erect the necessary guide line for the equipment.

Division 7

Page 7-18, Subarticle 710-10(A) General, lines 7-8, delete “for *Surface Testing Concrete Pavement*” from the last paragraph.

Division 8

Page 8-27, Article 846-1 DESCRIPTION, line 8, delete “4 inch” from the first paragraph.

Division 9

Page 9-17, Article 904-4 MEASUREMENT AND PAYMENT, prior to line 1, replace " Sign Erection, Relocate Type (Ground Mounted)” with “Sign Erection, Relocate Type ___ (Ground Mounted)”.

Division 10

Page 10-51, Article 1024-4 WATER, prior to line 1, delete the “unpopulated blank row” in Table 1024-2 between “Time of set, deviation from control” and “Chloride Ion Content, Max.”.

Page 10-170, Subarticle 1081-1(C) Requirements, line 4, replace "maximum” with “minimum”.

Division 11

Page 11-15, Article 1160-4 MEASUREMENT AND PAYMENT, line 24, replace “Where barrier units are moved more than one” with “Where barrier units are moved more than once”.

Division 15

Page 15-10, Article 1515-4 MEASUREMENT AND PAYMENT, lines 11, replace " All piping” with “All labor, the manhole, other materials, excavation, backfilling, piping”.

Division 16

Page 16-14, Article 1633-5 MEASUREMENT AND PAYMENT, line 20-24 and prior to line 25, delete and replace with the following " *Flocculant* will be measured and paid in accordance with Article 1642-5 applied to the temporary rock silt checks."

Page 16-3, Article 1609-2 MATERIALS, after line 26, replace "Type 4" with "Type 4a".

Page 16-25, Article 1644-2 MATERIALS, after line 22, replace "Type 4" with "Type 4a".

Page 16-27, Article 1644-5 MEASUREMENT AND PAYMENT, line 31, replace "Article 1630-4" with "Article 1630-3".

Division 17

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, line 23, delete and replace "1.25" with "1-1/4".

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, line 24, delete and replace ")(1.25" with ", 1-1/4".

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES

(Imported Fire Ant, Guava Root Knot Nematode, Spongy Moth (formerly known as gypsy moth), Witchweed, Cogon Grass, And Any Other Regulated Noxious Weed or Plant Pest)

(3-18-03)(Rev. 3-18-25) Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-707-3730, or *https://www.ncagr.gov/divisions/plant-industry/plant-protection/plant-industry-plant-pest-quarantines* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance of any character, if determined by an inspector present a hazard of spreading imported fire ant, guava root knot nematode, spongy moth (formerly known as gypsy moth), witchweed, cogon grass, or other regulated noxious weed or plant pest.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

TITLE VI AND NONDISCRIMINATION:

(6-28-77)(Rev 1/16/2024) Z-6

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) **Title VI Assurances (USDOT Order 1050.2A, Appendix A)**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(a) Compliance with Regulations

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) Nondiscrimination

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its

books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:

In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:

(i) Withholding payments to the contractor under the contract until the contractor complies; and/or

(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions

The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**

The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:

1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.

2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.

3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:

   "The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 US.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award."

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.

5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.

6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.

(b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))

(c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))

(d) The Contractor is responsible for notifying subcontractors of NCDOT's External Discrimination Complaints Process.

1. Applicability

   Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.

2. Eligibility

   Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.

3. Time Limits and Filing Options

   Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:

   (i) The date of the alleged act of discrimination; or

   (ii) The date when the person(s) became aware of the alleged discrimination; or

   (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

   Title VI and related discrimination complaints may be submitted to the following entities:

   - North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
   - Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
   - US Department of Transportation, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070

4. Format for Complaints

   Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.

5. Discrimination Complaint Form

   Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.

6. Complaint Basis

   Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

TABLE 103-1
COMPLAINT BASIS

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990
Religion (in the context of employment) *(Religion/ Creed in all aspects of any aviation or transit-related construction)*	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. ***Note:*** Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(3) **Pertinent Nondiscrimination Authorities**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

(a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.

(b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

(c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

(d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;

(e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

(f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

(g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

(h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

(i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

(j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

(k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

(l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).

(4) **Additional Title VI Assurances**

***The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*

(a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:

   (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. *

3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non¬ discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. *
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

(10-16-07) (Rev. 6-16-26) Z-10

Description

The North Carolina Department of Transportation administers a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternative OJT Program. All Contractors will be automatically placed in the Alternative OJT Program.

The Alternate OJT Program will allow a Contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this special provision and the NCDOT On-the-Job Training Program Manual.

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Unit, will assign annual training goals based on the Contractor's activity over the past three years' on federal projects with the Department. At the beginning of each year, all eligible Contractors will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time, the Contractor shall enter into an agreement with the Department to implement a self-imposed on-the-job training program for the calendar year. This agreement will specify the annual training goals agreed upon by both parties. The number of training assignments may range from 1 to 15 per Contractor per calendar year, unless a higher number is agreed to by the Contractor. The Contractor shall sign an agreement committing to fulfill their annual goal for the year.

Training Classifications

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions.

The Department has established common training classifications and their respective training requirements that may be used by the Contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new

classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this special provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of trainees in each occupation shall be in their first year of training. The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

All trainees enrolled in the program will receive at minimum an initial and Trainee/Post graduate interview conducted by the OJT program staff.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a Contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

Measurement and Payment

No compensation will be made for providing required training in accordance with these contract documents.

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Project Special Provisions
Geotechnical

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NORTH CAROLINA PROFESSIONAL SEAL 029869 ENGINEER SHANE C CLARK

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MECHANICALLY STABILIZED EARTH RETAINING WALLS (SPECIAL)

1.0 GENERAL

This provision allows for different backfill materials to be used. When variations are applicable, it will be specified in the notes on plans.

Construct mechanically stabilized earth (MSE) retaining walls consisting of steel or geosynthetic reinforcement in the reinforced zone connected to vertical facing elements. Use precast concrete panels for vertical facing elements and coarse aggregate in the reinforced zone unless noted otherwise in the plans. Provide reinforced concrete coping and pile sleeves as required. Design and construct MSE retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified MSE Wall Installer to construct MSE retaining walls.

Define MSE wall terms as follows:
Geosynthetic Reinforcement – Polyester Type (PET), HDPE or Polypropylene (PP) geosynthetic grids, i.e., geogrid reinforcement or polymer straps, i.e., geostrip reinforcement,
Geogrid – PET, HDPE or PP geogrid,
Reinforcement – Steel or geosynthetic reinforcement,
Aggregate – Coarse or fine aggregate,
Panel – Precast concrete panel,
Coping – Precast or CIP concrete coping,
Design Height (H) – Wall height + wall embedment as shown in the plans,
MSE Wall – Mechanically stabilized earth retaining wall,
MSE Wall Vendor – Vendor supplying the chosen MSE wall system,
MSE Panel Wall – MSE wall with panels,
MSE Segmental Wall – MSE wall with segmental retaining wall (SRW) units and
Abutment Wall – MSE wall with bridge foundations in any portion of the reinforced zone or an MSE wall connected to an abutment wall (even if bridge foundations only penetrate a small part of the reinforced zone, the entire MSE wall is considered an abutment wall).

For bridge approach fills behind end bents with MSE abutment walls, design reinforcement connected to end bent caps in accordance with the plans and this provision.

Use an approved MSE wall system in accordance with the plans and any NCDOT restrictions or exceptions for the chosen system. Value engineering proposals for other MSE wall systems will not be considered. Do not use MSE wall systems with an "approved for provisional use" status for MSE walls with design heights greater than 35 ft or walls supporting or adjacent to railroads or interstate highways. The list of approved MSE wall systems with approval status is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

2.0 MATERIALS

Refer to the *Standard Specifications*.

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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
Lightweight Aggregate	SP
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*

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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* or

(a) Lightweight Aggregate in accordance with the Lightweight Aggregate Special Provision and as specified in the plans

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

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Standard Specifications or provide aluminized steel strip reinforcement that meet ASTM A463, Type 2-100.

2. Geosynthetic Reinforcement

Provide Type 1 material certifications and identify geosynthetic reinforcement in accordance with Article 1056-3 of the *Standard Specifications*. Define machine direction (MD) and cross-machine direction (CD) for geogrids per Article 1056-3 of the *Standard Specifications*.

Use HDPE or PP geogrid for geogrid reinforcement cast into backwalls of end bent caps. Use PET or HDPE geogrid for geogrid reinforcement connected directly to SRW units and only HDPE geogrid for geogrid reinforcement cast into panels.

Provide extruded geogrids produced in the United States and manufactured from punched and drawn polypropylene sheets for PP geogrids that meet the following:

PP GEOGRID REQUIREMENTS		
Property	**Requirement[1]**	**Test Method**
Aperture Dimensions[2]	1" x 1.2"	N/A
Minimum Rib Thickness[2]	0.07" x 0.07"	N/A
Tensile Strength @ 2% Strain[2]	580 lb/ft x 690 lb/ft	ASTM D6637, Method B
Tensile Strength @ 5% Strain[2]	1,200 lb/ft x 1,370 lb/ft	
Ultimate Tensile Strength[2]	1,850 lb/ft x 2,050 lb/ft	
Junction Efficiency[3] (MD)	93%	ASTM D7737
Flexural Rigidity[4]	2,000,000 mg–cm	ASTM D7748
Aperture Stability Modulus[5]	0.55 lb–ft/degrees	ASTM D7864
UV Stability (Retained Strength)	100% (after 500 hr of exposure)	ASTM D4355

1. MARV per Article 1056-3 of the *Standard Specifications* except dimensions and thickness are nominal.
2. Requirement for MD x CD.
3. Junction Efficiency (%) = (Average Junction Strength (Xj_{ave}) / Ultimate Tensile Strength in the MD from ASTM D6637, Method A) × 100.
4. Test specimens two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and sufficiently long to enable measurement of the overhang dimension.
5. Applied moment of 17.7 lb–inch (torque increment).

C. Bearing Pads

For MSE panel walls, use preformed ethylene propylene diene monomer rubber bearing pads that meet ASTM D2000 Grade 2, Type A, Class A with a durometer hardness of 60 or 80 ± 5. Provide bearing pads with thicknesses that meet the following:

BEARING PAD THICKNESS

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Facing Area per Panel (A)	Minimum Pad Thickness After Compression (based on 2 times panel weight above pads)
A ≤ 30 sf	1/2"
30 sf < A ≤ 75 sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip panel anchors and connectors. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide miscellaneous components approved for the chosen MSE wall system. The list of approved miscellaneous components for each MSE wall system is available from the website shown elsewhere in this provision.

3.0 PRECONSTRUCTION REQUIREMENTS

A. MSE Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each MSE wall. Before beginning MSE wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of MSE wall locations as needed. For proposed slopes above or below MSE walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual MSE wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. MSE Wall Designs

For MSE wall designs, submit PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Segmental Wall Design Consultant to design MSE segmental walls. Provide MSE segmental wall designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Segmental Wall Design Consultant. Provide MSE panel wall designs sealed by a Design Engineer licensed in the state of North Carolina and employed or contracted by the MSE Wall Vendor.

Design MSE walls in accordance with the plans, *AASHTO LRFD Bridge Design Specifications* and any NCDOT restrictions for the chosen MSE wall system unless otherwise required. For abutment walls only, design MSE walls for seismic if wall sites meet either or both of the following:

- Wall site is in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*,

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- 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

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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

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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

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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

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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

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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

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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 2 Bridge Approach Fills.

Where it is necessary to provide backfill material behind the reinforced zone from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications.* Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

Payment will be made under:

Pay Item	**Pay Unit**
MSE Retaining Wall No. __	Square Foot

NORTH CAROLINA PROFESSIONAL SEAL 018979 ENGINEER Mohammad A. Mulla Signed by: Mohammad A. Mulla, PE 4EFECE6AF... 7/22/2026	NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C. CROCKETT Signed by: Stephen C. Crockett, PE C5CA5FED4... 7/22/2026	NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ABNER F. RIGGS, JR. DocuSigned by: Abner Riggs, Jr. C2F6ACA8... 7/23/2026
Seal Applies to: MSE Retaining Wall No. 1 MSE Retaining Wall No. 2 MSE Retaining Wall No. 3 MSE Retaining Wall No. 4 MSE Retaining Wall No. 5 MSE Retaining Wall No. 6 MSE Retaining Wall No. 12 MSE Retaining Wall No. 18	Seal Applies to: MSE Retaining Wall No. 8 MSE Retaining Wall No. 9 MSE Retaining Wall No. 28	Seal Applies to: MSE Retaining Wall No. 7

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CIP MECHANICALLY STABILIZED EARTH RETAINING WALLS (SPECIAL)

1.0 GENERAL

This special provision applies to mechanically stabilized earth retaining walls at walls 22, 23, 24, and 25 only.

Construct CIP mechanically stabilized earth (MSE) retaining walls consisting of steel reinforcement in the reinforced zone connected to a CIP reinforced concrete face. Use coarse aggregate in the reinforced zone of CIP MSE retaining walls. Provide pile sleeves as required. Complete MSE retaining wall construction with welded wire facing before constructing the CIP face. Design and construct CIP 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 CIP MSE retaining walls.

Define CIP MSE wall terms as follows:
Reinforcement – Steel reinforcement,
Aggregate – Coarse aggregate,
Concrete Facing – CIP reinforced concrete face,
MSE Wall – CIP mechanically stabilized earth retaining wall,
MSE Wall Vendor – Vendor supplying the chosen MSE wall system 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.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Coarse Aggregate	1014-2
Corrugated Steel Pipe	1032-3
Geotextiles, Type 2	1056
Joint Materials	1028
Portland Cement Concrete, Class A	1000
Reinforcing Steel	1070
Shoulder Drain Materials	816-2
Welded Wire Reinforcement	1070-3

Use galvanized corrugated steel pipe with a zinc coating weight of 2 oz/sf (G200) for pile sleeves. Provide Type 2 geotextile for retention and separation geotextiles. Use Class A concrete for concrete facing and welded wire reinforcement for welded wire facing, struts and wires as required by the MSE Wall Vendor for the chosen MSE wall system. Provide

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steel strip connectors embedded in concrete facing fabricated from structural steel that meets the requirements for steel strip reinforcement.

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 geotextiles 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. Coarse Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate. Provide aggregate with electrochemical properties that meet the following requirements:

COARASE AGGREGATE pH & CHEMICAL REQUIREMENTS			
pH	**Resistivity**	**Chlorides**	**Sulfates**
5 – 10	≥ 5,000 Ω · cm	≤ 100 ppm	≤ 200 ppm

Use aggregate from sources participating in the Department's Aggregate QC/QA Program as described in Section 1006 of the *Standard Specifications*. Electrochemical testing is only required for coarse aggregate from sources in the Coastal Plain as defined by Subarticle 1018-2(B)(1). When required, sample and test aggregate in accordance with the *Mechanically Stabilized Earth Wall Aggregate Sampling and Testing Procedures*.

B. Steel Reinforcement

Provide steel reinforcement supplied by the MSE Wall Vendor or a manufacturer approved or licensed by the vendor. 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.

C. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide miscellaneous components required by the MSE Wall Vendor for the chosen MSE wall system.

3.0 PRECONSTRUCTION REQUIREMENTS

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A. MSE Wall System

Submit documentation that the chosen MSE wall system has been successfully used on at least 6 state Department of Transportation projects in the U.S. with design heights exceeding 20 ft within the last 5 years. Documentation should include the General Contractor and Owner's name and current contact information with descriptions of each past project including design heights and wall face areas.

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. Do not begin MSE wall construction until a design submittal is accepted. Provide MSE 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 and *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Design MSE walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*. Use a uniform reinforcement length throughout the wall height of at least 0.7H with H as shown in the plans or 6 ft, whichever is longer, unless noted otherwise in the plans. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate drains or the reinforced zone outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads and default values for reinforcement in accordance with the AASHTO LRFD specifications. Design steel components including reinforcement and connectors for the design life noted in the plans and "loss of galvanizing" metal loss rates for nonaggressive backfill in accordance with the AASHTO LRFD specifications for galvanized and aluminized steel. After coating depletion, use "carbon steel" metal loss rates for nonaggressive backfill in accordance with the AASHTO LRFD specifications for galvanized and aluminized steel.

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 the *FHWA Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I* (Publication No. FHWA-NHI-10-024).

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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.

Use coarse aggregate for aggregate leveling pads. Use 6" thick leveling pads beneath welded wire and concrete facing. Unless required otherwise in the plans, embed top of leveling pads in accordance with the following requirements:

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. Define “H” as the maximum design height plus embedment per wall with the design height and embedment as shown in the plans.

Retain coarse aggregate at welded wire facing with retention geotextiles and extend geotextiles at least 3 ft back behind facing into aggregate. Separation geotextiles are required between the aggregate and overlying fill or pavement sections except when concrete pavement, full depth asphalt or cement treated base is placed directly on aggregate. When noted in the plans, separation geotextiles are also required at the back of the reinforced zone between the aggregate and backfill or natural ground.

Locate a continuous aggregate shoulder drain along the base of the concrete facing in front of the leveling pads. Provide wall drainage systems consisting of drains and outlet components in accordance with Standard Drawing No. 816.02 of the *Roadway Standard Drawings*.

Design concrete facing in accordance with the plans and Section 5 of the *AASHTO LRFD Bridge Design Specifications*. Provide reinforcing steel of sufficient density to satisfy Article 5.7.3.4 of the AASHTO LRFD specifications. Use concrete facing with the dimensions shown in the plans. 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, coarse aggregate and geotextile locations and details of leveling pads,

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welded wire and concrete facing, bin walls, pile sleeves, etc. If necessary, include details on working drawings for concrete barrier rail with moment slab, reinforcement connected to end bent caps and obstructions extending through walls or interfering with reinforcement, leveling pads, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. At least one analysis is required for each wall section with different reinforcement lengths. When designing MSE walls with computer software other than MSEW, use MSEW, version 3.0 with update 14.96 or later, manufactured by ADAMA Engineering, Inc. to verify the design. At least one MSEW analysis is required per 100 ft of wall length with at least one analysis for the wall section with the longest reinforcement. Submit electronic MSEW input files and PDF output files with design calculations.

C. Preconstruction Meeting

Before starting MSE wall construction, hold a preconstruction meeting to discuss the construction and inspection of the MSE walls. If this meeting occurs before all MSE wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of MSE walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and MSE Wall Installer Superintendent will attend preconstruction meetings.

4.0 CORROSION MONITORING

Corrosion monitoring of steel reinforcement is required for MSE walls. 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 welded wire facing 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.

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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 aggregate or reinforcement until excavation dimensions and foundation material are approved.

Construct aggregate leveling pads at elevations and with dimensions shown in the accepted submittals. Compact leveling pads with a vibratory compactor to the satisfaction of the Engineer.

Erect welded wire facing so the wall position is as shown in the accepted submittals. Set welded wire facing adjacent to each other in the horizontal and vertical direction to completely cover the wall face with facing. Stagger welded wire facing to create a running bond by centering facing over joints in the row below. Construct MSE walls with the following tolerances:

A. Wall face is within 3/4" of horizontal and vertical alignment shown in the accepted submittals when measured along a 10 ft straightedge and

B. Wall plumbness (batter) is not negative (wall face leaning forward) and within 0.5° of vertical.

Wrap retention geotextiles behind welded wire facing as shown in the accepted submittals and cover geotextiles with at least 3" of aggregate. Overlap adjacent retention geotextiles at least 18" with seams oriented perpendicular to the wall face. Hold retention geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement at locations and elevations shown in the accepted submittals and within 3" of corresponding connection elevations. Locate reinforcement and connectors to allow for minimum required concrete cover for concrete facing. Do not splice reinforcement. 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. Use only hand operated compaction equipment to compact coarse aggregate within 3 ft of welded wire facing. At a distance greater than 3 ft, compact coarse 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. 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.

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Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. 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.

Construct concrete facing in accordance with the accepted submittals and Section 420 of the *Standard Specifications*. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi. Unless required otherwise in the plans, provide a Class 2 surface finish for concrete facing that meets Subarticle 420-17(F) of the *Standard Specifications*. Construct concrete facing joints at a spacing of 10 ft to 12 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction or sawed joints that meet Subarticle 825-10(B) or 825-10(E) respectively for the remaining joints. Stop reinforcing steel for concrete facing 2" on either side of expansion joints.

Install reinforcement connected to end bent caps in accordance with the accepted submittals. When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed. Seal joints above and behind MSE walls between concrete facing and slope protection with silicone sealant.

7.0 MEASUREMENT AND PAYMENT

CIP 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 concrete facing.

The contract unit price for *CIP MSE Retaining Wall No. __* will be full compensation for providing designs, submittals, labor, tools, equipment and MSE wall materials, excavating, backfilling, hauling and removing excavated materials and supplying site assistance, leveling pads, welded wire facing, reinforcement, coarse aggregate, wall drainage systems, geotextiles, concrete facing, miscellaneous components and any incidentals necessary to construct MSE walls. The contract unit price for *CIP 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 and joints sealed with silicone sealant.

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 *CIP MSE Retaining Wall No. __*.

The contract unit price for *CIP MSE Retaining Wall No. __* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind the reinforced zone from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work

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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**
CIP MSE Retaining Wall No. __	Square Foot

NORTH CAROLINA PROFESSIONAL SEAL 018979 ENGINEER Mohammed A. Mirza

Signed by: Mohammed A. Mirza, PE
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7/22/2026

Seal Applies to:
CIP MSE Retaining Wall No. 22
CIP MSE Retaining Wall No. 23

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by: Abner Riggs, Jr.
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7/23/2026

Seal Applies to:
CIP MSE Retaining Wall No. 24
CIP MSE Retaining Wall No. 25

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SOIL NAIL RETAINING WALLS (1-16-24)

1.0 GENERAL

Construct soil nail retaining walls consisting of soil nails spaced at a regular pattern and connected to a CIP reinforced concrete face. A soil nail consists of a solid steel bar grouted in a drilled hole inclined at an angle below horizontal. Use shotcrete for temporary support of excavations during construction. Design and construct soil nail retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Anchored Wall Contractor to construct soil nail retaining walls. Define "soil nail wall" as a soil nail retaining wall and "Soil Nail Wall Contractor" as the Anchored Wall Contractor installing soil nails and applying shotcrete. Define "nail" as a soil nail and "concrete facing" as a CIP reinforced concrete face. An abutment wall is defined as a soil nail wall with nails that extend under a bridge end bent or a soil nail wall connected to an abutment wall. Even if only one nail extends under a bridge end bent, the entire soil nail wall is considered an abutment wall.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Geosynthetics	1056
Joint Materials	1028
Masonry	1040
Portland Cement	1024-1
Portland Cement Concrete, Class A	1000
Reinforcing Steel	1070
Select Material, Class VI	1016
Shotcrete	1002
Shoulder Drain Materials	816-2
Steel Plates	1072-2
Water	1024-4
Welded Stud Shear Connectors	1072-6

Provide Class VI select material (standard size No. 57 stone) for leveling pads. Use Type 5 grout for soil nails.

Provide soil nails consisting of grouted steel bars and nail head assemblies. Use deformed solid steel bars that meet AASHTO M 275 or M 31, Grade 60, 75 or 80. Splice bars in accordance with Article 1070-9 of the *Standard Specifications*.

Provide epoxy coated bars that meet Article 1070-7 of the *Standard Specifications*. Provide Class A corrosion protection (encapsulated bar) or Class B corrosion protection (epoxy coated bar only, no galvanized bar) for soil nails in accordance with Article 34.3.3 of the *AASHTO LRFD Bridge Construction Specifications.* Use centralizers that meet Article 34.3.4 of the AASHTO LRFD specifications.

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Provide nail head assemblies consisting of nuts, washers and bearing plates with welded stud shear connectors. Use steel plates for bearing plates and steel washers and hex nuts recommended by the Soil Nail Manufacturer.

Provide Type 3 material certifications for soil nail materials in accordance with Article 106-3 of the *Standard Specifications*. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store soil nail wall materials so materials are kept clean and free of damage. Do not crack, fracture or otherwise damage grout inside sheaths of encapsulated nails. Bent, damaged or defective materials will be rejected.

3.0 PRECONSTRUCTION REQUIREMENTS

A. Soil Nail Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each soil nail wall. Before beginning soil nail wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of soil nail wall locations as needed. For proposed slopes above or below soil nail walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual soil nail wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. Soil Nail Wall Designs

For soil nail wall designs, submit PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Do not begin soil nail wall construction until a design submittal is accepted.

Use a prequalified Anchored Wall Design Consultant to design soil nail walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Anchored Wall Design Consultant.

Design soil nail walls in accordance with the plans and the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. For abutment walls only, design soil nail walls for seismic if wall sites meet either or both of the following:

- Wall site is in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*,
- Wall site is classified as AASHTO Site Class E, as noted in the plans, and is in or west of Pender, Duplin, Wayne, Johnston, Wake, Durham or Person County.

Design soil nails that meet the following unless otherwise approved:

1. Horizontal and vertical spacing of at least 3 ft,
2. Inclination of at least 12° below horizontal,

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3. Clearance between ends of bars and drill holes of at least 6",
4. Grout cover between epoxy coated bars and drill hole walls of at least 1" or in accordance with Article 11.12.8 of the AASHTO LRFD specifications for encapsulated bars and
5. Diameter of 6" to 10".

Four inch diameter soil nails may be approved for nails in rock at the discretion of the Engineer. Do not extend nails beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with nails, maintain a clearance of at least 6" between obstructions and nails.

When noted in the plans, design soil nail walls for a live load (traffic) surcharge of 250 psf. For steel beam guardrail with 8 ft posts above soil nail walls, analyze facing and top row of nails for a nominal horizontal load (P_{H1}) of 300 lb/ft of wall in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications. For concrete barrier rail above soil nail walls, analyze facing and top row of nails for a nominal P_{H1} of 500 lb/ft of wall in accordance with Figure 3.11.6.3-2(a).

Provide wall drainage systems consisting of geocomposite sheet drains, an aggregate shoulder drain and outlet components. Place sheet drains with a horizontal spacing of no more than 10 ft and center drains between adjacent nails. Attach sheet drains to excavation faces and connect drains to aggregate leveling pads. Locate a continuous aggregate shoulder drain along the base of concrete facing in front of leveling pads. Provide aggregate shoulder drains and outlet components in accordance with Roadway Standard Drawing No. 816.02.

Use No. 57 stone for aggregate leveling pads. Use 6" thick leveling pads beneath concrete facing. Unless required otherwise in the plans, embed top of leveling pads at least 12" below bottom of walls shown in the plans.

Design shotcrete and concrete facing in accordance with the plans and Article 11.12.6.2 of the *AASHTO LRFD Bridge Design Specifications*. Use shotcrete and concrete facing with the dimensions shown in the plans and attach facing to nail heads with welded stud shear connectors. When concrete barrier rail is required above soil nail walls, use concrete barrier rail with moment slab as shown in the plans.

Submit working drawings and design calculations including unit grout/ground bond strengths for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with nail locations including known test nail locations, typical sections and details of nails, drainage, shotcrete, leveling pads and concrete facing. If necessary, include details on working drawings for concrete barrier rail with moment slab and obstructions extending through walls or interfering with nails, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. Include analysis of temporary conditions in design calculations. At least one analysis is required for each

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wall section with different nail lengths. Analyze internal and compound stability with a computer software program that uses limit equilibrium methods and submit all PDF output files from the program with the design calculations. See Article C11.12.2 of the AASHTO LRFD specifications for determining the maximum soil nail force, T_{maxsn}. Once T_{maxsn} and pullout length behind slip surface, L_P, are determined from limit equilibrium methods at the target soil failure resistance factor (1 over factor of safety output from computer software), use these values for soil nail (pullout and tensile resistance) and wall facing (flexure, punching shear and headed-stud tensile resistance) design in accordance with Articles 11.12.5.2, 11.12.6.1 and 11.12.6.2 of the AASHTO LRFD specifications.

When designing soil nail walls with computer software Snail manufactured by the California Department of Transportation (CALTRANS), use Snail, version 2.2.0 or later, to calculate factors of safety and T_{maxsn} and L_P values in accordance with the following:

1. Allowable Stress Design for Analysis Method with no load factors applied except those applied to factored surcharge loads from structures or traffic,

2. Perform Below Toe Search option selected when any soil layer has a friction angle less than 30° and

3. Default value of 0.33 for Interface Friction Reduction Factor.

When designing soil nail walls with computer software other than Snail, use bi-linear (or tri-linear, as applicable) search surfaces intended to reproduce Snail results. Factors of safety and T_{maxsn} and L_P values are acceptable if they are within 5% of the factors of safety and T_{maxsn} and L_P values calculated by the Engineer using the computer software Slide2 manufactured by Rocscience, Inc.

C. Soil Nail Wall Construction Plan

Submit a PDF file of a soil nail wall construction plan at least 30 days before the preconstruction meeting. Do not begin soil nail wall construction until the construction plan submittal is accepted. Provide detailed project specific information in the soil nail wall construction plan that includes the following:

1. Overall description and sequence of soil nail wall construction;
2. List and sizes of excavation equipment, drill rigs and tools, tremies and grouting equipment;
3. Procedures for excavations, drilling and grouting, soil nail and wall drainage system installation and facing construction;
4. Details of shotcrete equipment and application including mix process, test panels, thickness gauges and shooting methods;
5. Shotcrete nozzleman with certification in accordance with Article 1002-1 of the *Standard Specifications*;
6. Plan and methods for nail testing with calibration certificates dated within 90 days of

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the submittal date;

7. Examples of construction records to be provided that meet Section 4.0(F) and test nail records to be used in accordance with Section 5.0(D) of this provision;
8. Grout mix design with acceptable ranges for grout flow and density;
9. Shotcrete mix design that meets Section 1002 of the *Standard Specifications*; and
10. Other information shown in the plans or requested by the Engineer.

If alternate construction procedures are proposed or necessary, a revised soil nail wall construction plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend soil nail wall construction until a revised plan is accepted.

D. Preconstruction Meeting

Before starting soil nail wall construction, hold a preconstruction meeting to discuss the construction, inspection and testing of the soil nail walls. If this meeting occurs before all soil nail wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of soil nail walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Soil Nail Wall Contractor Superintendent will attend preconstruction meetings.

4.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of soil nail walls. Direct run off away from soil nail walls and areas above and behind walls.

Notify the Engineer before blasting in the vicinity of soil nail walls. Perform blasting in accordance with the contract. Unless required otherwise in the plans, install foundations located behind soil nail walls before beginning wall construction.

Install soil nail walls in accordance with the accepted submittals and as directed. Do not excavate behind soil nail walls. If overexcavation occurs, repair walls with an approved method and a revised soil nail wall design or construction plan may be required.

A. Excavation

Excavate for soil nail walls from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with no negative batter (excavation face leaning forward). Excavate lifts in accordance with the following:

1. Heights not to exceed vertical nail spacing,
2. Bottom of lifts no more than 3 ft below nail locations for current lift and
3. Horizontal and vertical alignment within 2" of location shown in the accepted submittals.

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Remove any cobbles, boulders, rubble or debris that will protrude more than 2" into the required shotcrete thickness. Rocky ground such as colluvium, boulder fills and weathered rock may be difficult to excavate without leaving voids.

Apply shotcrete to excavation faces within 24 hours of excavating each lift unless otherwise approved. Shotcreting may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.

If an excavation becomes unstable at any time, suspend soil nail wall construction and temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soil nail wall design or construction plan may be required.

Do not excavate the next lift until nail installations and testing and shotcrete application for the current lift are accepted and grout and shotcrete for the current lift have cured at least 3 days and 1 day, respectively.

B. Soil Nails

Install soil nails in the same way as acceptable test nails. Drill and grout nails the same day and do not leave drill holes open overnight.

Control drilling and grouting to prevent excessive ground movements, damaging structures and pavements or fracturing rock and soil formations. If ground heave or subsidence occurs, suspend soil nail wall construction and take corrective action to minimize movement. If property damage occurs, make repairs with an approved method and a revised soil nail wall design or construction plan may be required.

1. Drilling

Use drill rigs of the sizes necessary to install soil nails and with sufficient capacity to drill through whatever materials are encountered. Drill straight and clean holes with the dimensions and inclination shown in the accepted submittals. Drill holes within 6" of locations and 2° of inclination shown in the accepted submittals unless otherwise approved.

Stabilize drill holes with temporary casings if unstable, caving or sloughing material is anticipated or encountered. Do not use drilling fluids to stabilize drill holes or remove cuttings.

2. Steel Bars

Center steel bars in drill holes with centralizers. Securely attach centralizers along bars at no more than 8 ft centers. Attach uppermost and lowermost centralizers 18" from excavation faces and ends of holes.

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Do not insert steel bars into drill holes until hole locations, dimensions, inclination and cleanliness are approved. Do not vibrate, drive or otherwise force bars into holes. If a steel bar cannot be completely and easily inserted into a drill hole, remove the bar and clean or redrill the hole.

3. Grouting

Mix and place grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *Standard Specifications*. Remove oil, rust inhibitors, residual drilling fluids and similar foreign materials from holding tanks/hoppers, stirring devices, pumps, lines, tremie pipes and any other equipment in contact with grout before use. Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute/American Petroleum Institute Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

Inject grout at the lowest point of drill holes through tremies, e.g., grout tubes, casings, hollow-stem augers or drill rods, in one continuous operation. Fill drill holes progressively from ends of holes to excavation faces and withdraw tremies at a slow even rate as holes are filled to prevent voids in grout. Extend tremies into grout at least 5 ft at all times except when grout is initially placed in holes.

Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing). Cold joints in grout are not allowed except for test nails. Remove any temporary casings as grout is placed and record grout volume for each drill hole.

4. Nail Heads

Weld stud shear connectors to bearing plates of nails in accordance with Article 1072-6 of the *Standard Specifications*. Install nail head assemblies after shotcreting. Before shotcrete reaches initial set, seat bearing plates and tighten nuts so plates contact shotcrete uniformly. If uniform contact is not possible, install nail head assemblies on mortar pads so nail heads are evenly loaded.

C. Wall Drainage Systems

Install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. Before installing shotcrete reinforcement, place geocomposite sheet drains with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, sheet drains may be placed after shotcreting over weep holes through the shotcrete. Hold sheet drains in place with anchor pins so drains are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous sheet drains are not allowed. If splices are needed, overlap sheet drains at least 12" so flow is not impeded. Connect sheet drains to aggregate leveling pads by embedding drain ends at least 4" into No. 57 stone.

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D. Shotcrete

Clean ungrouted zones of drill holes and excavation faces of loose materials, mud, rebound and other foreign material. Moisten surfaces to receive shotcrete. Install shotcrete reinforcement in accordance with the contract and accepted submittals. Secure reinforcing steel so shooting does not displace or vibrate reinforcement. Install approved thickness gauges on 5 ft centers in the horizontal and vertical directions to measure shotcrete thickness.

Apply shotcrete in accordance with the contract, accepted submittals and Subarticle 1002-3(F) of the *Standard Specifications*. Use approved shotcrete nozzlemen who made satisfactory preconstruction test panels to apply shotcrete. Direct shotcrete at right angles to excavation faces except when shooting around reinforcing steel. Rotate nozzle steadily in small circular patterns and apply shotcrete from bottom of lifts up.

Make shotcrete surfaces uniform and free of sloughing or sagging. Completely fill ungrouted zones of drill holes and any other voids with shotcrete. Taper construction joints to a thin edge over a horizontal distance of at least the shotcrete thickness. Wet joint surfaces before shooting adjacent sections.

Repair surface defects as soon as possible after shooting. Remove any shotcrete which lacks uniformity, exhibits segregation, honeycombing or lamination or contains any voids or sand pockets and replace with fresh shotcrete to the satisfaction of the Engineer. Protect shotcrete from freezing and rain until shotcrete reaches initial set.

E. Leveling Pads and Concrete Facing

Construct aggregate leveling pads at elevations and with dimensions shown in the accepted submittals. Compact leveling pads with a vibratory compactor to the satisfaction of the Engineer.

Construct concrete facing in accordance with the accepted submittals and Section 420 of the *Standard Specifications*. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi. Unless required otherwise in the plans, provide a Class 2 surface finish for concrete facing that meets Subarticle 420-17(F) of the *Standard Specifications*. Construct concrete facing joints at a spacing of 10 ft to 12 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction or sawed joints that meet Subarticle 825-10(B) or 825-10(E) respectively for the remaining joints. Stop reinforcing steel for concrete facing 2" on either side of expansion joints.

If a brick veneer is required, construct brick masonry in accordance with Section 830 of the *Standard Specifications*. Anchor brick veneers to soil nail walls in accordance with Subarticle 453-4 of the *Standard Specifications*. Seal joints above and behind soil nail walls between concrete facing and slope protection with silicone sealant.

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F. Construction Records

Provide 2 copies of soil nail wall construction records within 24 hours of completing each lift. Include the following in construction records:

1. Names of Soil Nail Wall Contractor, Superintendent, Nozzleman, Drill Rig Operator, Project Manager and Design Engineer;
2. Wall description, county, Department's contract, TIP and WBS element number;
3. Wall station and number and lift location, dimensions, elevations and description;
4. Nail locations, dimensions and inclinations, bar types, sizes and grades, corrosion protection and temporary casing information;
5. Date and time drilling begins and ends, steel bars are inserted into drill holes, grout and shotcrete are mixed and arrives on-site and grout placement and shotcrete application begins and ends;
6. Grout volume, temperature, flow and density records;
7. Ground and surface water conditions and elevations if applicable;
8. Weather conditions including air temperature at time of grout placement and shotcrete application; and
9. All other pertinent details related to soil nail wall construction.

After completing each soil nail wall or stage of a wall, provide a PDF file of all corresponding construction records.

5.0 NAIL TESTING

Test soil nails in accordance with the contract and as directed. "Verification tests" are performed on nails not incorporated into soil nail walls, i.e., sacrificial nails and "proof tests" are performed on nails incorporated into walls, i.e., production nails. Define "verification test nail" and "proof test nail" as a nail tested with either a verification or proof test, respectively. Define "test nails" as verification or proof test nails.

Verification tests are typically required for at least one nail per soil type per soil nail wall or 2 nails per wall, whichever is greater. Proof tests are typically required for at least one nail per nail row per soil nail wall or at least 5% of production nails, whichever is greater. More or less test nails may be required depending on subsurface conditions encountered. The Engineer will determine the number and locations of verification and proof tests required. The approximate known test nail locations may be shown in the plans.

Do not test nails until grout and shotcrete attain the required 3-day compressive strength. Do not install any production nails until verification tests are accepted.

A. Test Equipment

Use the following equipment to test nails:

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1. Two dial gauges with rigid supports,
2. Hydraulic jack and pressure gauge,
3. Jacking block or reaction frame and
4. Electrical resistance load cell (verification tests only).

Provide dial gauges with enough range and precision to measure the maximum test nail movement to 0.001". Use pressure gauges graduated in 100 psi increments or less. Submit identification numbers and calibration records for load cells, jacks and pressure gauges with the soil nail wall construction plan. Calibrate each jack and pressure gauge as a unit.

Align test equipment to uniformly and evenly load test nails. Use a jacking block or reaction frame that does not damage or contact shotcrete within 3 ft of nail heads. Place dial gauges opposite each other on either side of test nails and align gauges within 5° of bar inclinations. Set up test equipment so resetting or repositioning equipment during nail testing is not needed.

B. Test Nails

Test nails include both unbonded and bond lengths. Grout only bond lengths before nail testing. Provide unbonded and bond lengths of at least 3 ft and 10 ft, respectively.

Steel bars for production nails may be overstressed under higher test nail loads. If necessary, use larger size or higher grade bars with more capacity for test nails instead of shortening bond lengths to less than the minimum required.

C. Nail Tests

Install verification test nails with the same equipment, installation methods and drill hole diameter and inclination as production nails. Test verification and proof test nails in accordance with the accepted submittals and Articles 34.5.5.2 and 34.5.5.3, respectively of the *AASHTO LRFD Bridge Construction Specifications* except correct Eq. 34.5.5.2-2 to $VTL = L_{BVT} \times r_{po}$ (kips/ft).

D. Test Nail Acceptance

Submit 2 copies of test nail records including load versus movement and time versus creep movement plots within 24 hours of completing each verification or proof test. The Engineer will review the test nail records to determine if test nails are acceptable. Test nail acceptance is based in part on the acceptance criteria in Article 34.5.5.4 of the *AASHTO LRFD Bridge Construction Specifications.*

For proof test nails, maintain stability of unbonded lengths for subsequent grouting. If a proof test nail is accepted but the unbonded length cannot be satisfactorily grouted, do not incorporate the proof test nail into the soil nail wall and add another production nail to replace the test nail.

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If the Engineer determines a verification test nail is unacceptable, revise the soil nail design or installation methods. Submit a revised soil nail wall design or construction plan for acceptance and provide acceptable verification test nails with the revised design or installation methods.

If the Engineer determines a proof test nail is unacceptable, either perform additional proof tests on adjacent production nails or revise the soil nail design or installation methods for the production nails represented by the unacceptable proof test nail as determined by the Engineer. Submit a revised soil nail wall design or construction plan for acceptance, provide an acceptable proof test nail with the revised design or installation methods and install additional production nails for the nails represented by the unacceptable proof test nail.

After completing nail testing for each soil nail wall or stage of a wall, provide a PDF file of all corresponding test nail records.

6.0 MEASUREMENT AND PAYMENT

Soil Nail Retaining Walls will be measured and paid in square feet. Soil nail walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of leveling pad elevations. Define "top of wall" as top of concrete facing.

The contract unit price for *Soil Nail Retaining Walls* will be full compensation for providing designs, submittals, labor, tools, equipment and soil nail wall materials, excavating, hauling and removing excavated materials, installing soil nails, grouting, shotcreting and supplying wall drainage systems, leveling pads, concrete facing and any incidentals necessary to construct soil nail walls. The contract unit price for *Soil Nail Retaining Walls* will also be full compensation for brick veneers, if required. No additional payment will be made and no extension of completion date or time will be allowed for repairing property damage, overexcavations or unstable excavations, unacceptable test nails or thicker shotcrete or concrete facing.

The contract unit price for *Soil Nail Retaining Walls* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with soil nail walls as these items will be paid for elsewhere in the contract.

Soil Nail Verification Tests and *Soil Nail Proof Tests* will be measured and paid in units of each. Soil nail testing will be measured as the number of initial verification or proof tests performed. The contract unit prices for *Soil Nail Verification Tests* and *Soil Nail Proof Tests* will be full compensation for initial nail testing. No payment will be made for subsequent nail testing performed on the same or replacement test nails.

Payment will be made under:

Pay Item	**Pay Unit**
Soil Nail Retaining Walls	Square Foot
Soil Nail Verification Tests	Each

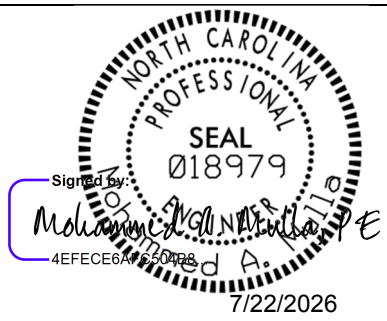
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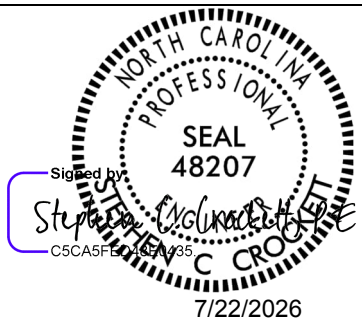
Soil Nail Proof Tests



7/22/2026

Seal Applies to:
Soil Nail Retaining Walls,
Soil Nail Verification Tests,
Soil Nai Proof Tests
at Retaining Wall Nos. 11, 13, 14, 15, 16

Each



7/22/2026

Seal Applies to:
Soil Nail Retaining Walls,
Soil Nail Verification Tests,
Soil Nai Proof Tests
at Retaining Wall No. 10

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SOLDIER PILE RETAINING WALLS (1-16-24)

1.0 GENERAL

Construct soldier pile retaining walls consisting of driven or drilled-in steel H-piles with either precast concrete panels in between piles or a CIP reinforced concrete face attached to front of piles unless required otherwise in the plans. Timber lagging is typically used for temporary support of excavations during construction. Provide CIP reinforced concrete coping as required. Design and construct soldier pile retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Cantilever Wall Contractor to construct soldier pile retaining walls. Define "soldier pile wall" as a soldier pile retaining wall. Define "panel" as a precast concrete panel and "concrete facing" as a CIP reinforced concrete face. Define "pile" as a steel H-pile and "coping" as CIP concrete coping.

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Asphalt Concrete Base Course, Type B25.0C	620
Flowable Fill, Excavatable	1000-7
Geosynthetics	1056
Grout, Type 1	1003
Joint Materials	1028
Masonry	1040
Portland Cement Concrete	1000
Reinforcing Steel	1070
Retaining Wall Panels	1077
Select Materials	1016
Shoulder Drain Materials	816-2
Steel H-Piles	1084-1
Untreated Timber	1082-2
Welded Stud Shear Connectors	1072-6

Provide Type 2 geotextile for separation geotextiles and Class VI select material (standard size No. 57 stone) for leveling pads and backfilling. Use Class A concrete for concrete facing and coping and Class A concrete that meets Article 450-2 of the *Standard Specifications* or grout for drilled-in piles. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging.

Unless required otherwise in the contract, produce panels with a smooth flat final finish that meets Article 1077-11 of the *Standard Specifications*. When noted in the plans, produce panels with an exposed aggregate finish that meets Article 1077-12 of the *Standard Specifications*. Produce panels within 1/4" of the panel dimensions shown in the accepted submittals. Damaged panels with excessive discoloration, chips or cracks as determined by the Engineer will be rejected.

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For soldier pile walls with panels, galvanize piles in accordance with Section 1076 of the *Standard Specifications*. When noted in the plans, paint galvanized piles in accordance with Article 442-13 of the *Standard Specifications*. Apply the following system to paint galvanized piles gray with waterborne paints that meet Article 1080-9 of the *Standard Specifications*. For painting galvanized piles other colors, contact the Materials and Tests (M&T) Unit for an appropriate paint system.

GRAY PAINT SYSTEM FOR GALVANIZED PILES			
Coat	**Color**	**Dry/Wet Film Thickness (Mils)**	
		Min.	**Max.**
Intermediate	Brown	3.0 DFT	5.0 DFT
Stripe	White	4.0 WFT	7.0 WFT
Topcoat	Gray	2.0 DFT	4.0 DFT
Total		**5.0 DFT**	**9.0 DFT**

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 soldier pile wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

3.0 PRECONSTRUCTION REQUIREMENTS

A. Soldier Pile Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each soldier pile wall. Before beginning soldier pile wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of soldier pile wall locations as needed. For proposed slopes above or below soldier pile walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual soldier pile wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. Soldier Pile Wall Designs

For soldier pile wall designs, submit PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Do not begin soldier pile wall construction until a design submittal is accepted.

Use a prequalified Cantilever Wall Design Consultant to design soldier pile walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Cantilever Wall Design Consultant.

Design soldier pile walls in accordance with the plans and Article 11.8 of the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Design soldier pile walls

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for a maximum deflection of 2" or 1.5% of H, whichever is less, with H as shown in the plans.

When noted in the plans, design soldier pile walls for a live load (traffic) surcharge of 250 psf in accordance with Article 11.5.6 of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts above soldier pile walls, analyze walls for a nominal horizontal load (P_{H1}) of 300 lb/ft of wall in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications. For concrete barrier rail above soldier pile walls, analyze walls for a nominal P_{H1} of 500 lb/ft of wall in accordance with Figure 3.11.6.3-2(a).

When a rock mass shear strength (S_m) is noted in the plans, analyze piles using the equation shown in Figure 3.11.5.6-2 of the AASHTO LRFD specifications to calculate the passive resistance of the rock ($\overline{P_p}$). Use a maximum H-pile spacing of 10 ft. At the Contractor's option, use driven or drilled-in piles for soldier pile walls with concrete facing unless otherwise required. For soldier pile walls with panels, use drilled-in piles unless noted otherwise in the plans. Use concrete or grout for embedded portions of drilled-in piles. Install drilled-in piles by excavating holes with diameters that will result in at least 3" of clearance all around piles.

Provide temporary support of excavations for excavations more than 4 ft deep and timber lagging in accordance with the *AASHTO Guide Design Specifications for Bridge Temporary Works*. At the Contractor's option and when noted in the plans, provide temporary slopes instead of temporary support of excavations. Do not extend temporary slopes outside right-of-way or easement limits. Except for fill sections or when using temporary slopes, backfill voids behind panels, lagging and piles with No. 57 stone. Separation geotextiles are required between No. 57 stone and overlying fill sections. When placing pavement sections directly on No. 57 stone, cap stone with 4" of asphalt concrete base course.

At the Contractor's option, use panels or concrete facing unless required otherwise in the plans. Design panels and concrete facing in accordance with the plans and Section 5 of the *AASHTO LRFD Bridge Design Specifications*. Provide reinforcing steel of sufficient density to satisfy Article 5.7.3.4 of the AASHTO LRFD specifications. Use panels or concrete facing with the dimensions shown in the plans and attach facing to front of H-piles with welded stud shear connectors.

Use No. 57 stone for aggregate leveling pads. Use 6" thick leveling pads beneath panels and concrete facing. Unless required otherwise in the plans, embed top of leveling pads at least 12" below bottom of walls shown in the plans.

Provide wall drainage systems consisting of geocomposite sheet drains, an aggregate shoulder drain and outlet components. Place sheet drains with a horizontal spacing of no more than 10 ft and center drains between adjacent piles. Attach sheet drains to front of timber lagging or back of panels or concrete facing and connect drains to aggregate leveling pads. Locate a continuous aggregate shoulder drain along the base of panels or concrete facing in front of piles and leveling pads. Provide aggregate shoulder drains

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and outlet components in accordance with Roadway Standard Drawing No. 816.02.

Unless required otherwise in the plans, use CIP reinforced concrete coping at top of soldier pile walls with panels. Use coping dimensions shown in the plans and at the Contractor's option, connect coping to panels with dowels or extend coping down back of panels. When concrete barrier rail is required above soldier pile 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 pile locations, typical sections and details of piles, drainage, temporary support, leveling pads, panels and concrete facing. If necessary, include details on working drawings for coping, concrete barrier rail with moment slab and obstructions extending through walls or interfering with piles, barriers or moment slabs. Submit design calculations including deflection calculations for each wall section with different surcharge loads, geometry or material parameters. Include analysis of temporary conditions in design calculations. When designing soldier pile walls with computer software, a hand calculation is required for the tallest wall section.

C. Soldier Pile Wall Construction Plan

Submit a PDF file of a soldier pile wall construction plan at least 30 days before the preconstruction meeting. Do not begin soldier pile wall construction until the construction plan submittal is accepted. Provide project specific information in the soldier pile wall construction plan including a detailed construction sequence. For driven piles, submit proposed pile driving methods and equipment in accordance with Subarticle 450-3(D)(2) of the *Standard Specifications*. For drilled-in piles, submit installation details including drilling equipment and methods for stabilizing and filling holes. Provide details in the construction plan of excavations including temporary support and any other information shown in the plans or requested by the Engineer.

If alternate construction procedures are proposed or necessary, a revised soldier pile wall construction plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend soldier pile wall construction until a revised plan is accepted.

D. Preconstruction Meeting

Before starting soldier pile wall construction, hold a preconstruction meeting to discuss the construction and inspection of the soldier pile walls. If this meeting occurs before all soldier pile wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of soldier pile walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Cantilever Wall Contractor Superintendent will attend preconstruction meetings.

4.0 CONSTRUCTION METHODS

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Control drainage during construction in the vicinity of soldier pile walls. Direct run off away from soldier pile walls and areas above and behind walls. Contain and maintain No. 57 stone and backfill and protect material from erosion.

Notify the Engineer before blasting in the vicinity of soldier pile walls. Perform blasting in accordance with the contract. Unless required otherwise in the plans, install foundations located behind soldier pile walls before beginning wall construction if the horizontal distance to the closest foundation is less than the height of the tallest wall section.

Install soldier pile walls in accordance with the accepted submittals and as directed. Do not excavate behind soldier pile walls unless a temporary slope is shown in the accepted submittals. If overexcavation occurs and is not approved, repair walls with an approved method and a revised soldier pile wall design or construction plan may be required.

A. Piles

If a temporary slope is shown in the accepted submittals, excavate the slope before installing piles. Otherwise, install piles before excavating for soldier pile walls. Weld stud shear connectors to piles in accordance with Article 1072-6 of the *Standard Specifications.*

Install piles within 1" of horizontal and vertical alignment shown in the accepted submittals and with no negative batter (piles leaning forward). Minimize alignment variations between piles for soldier pile walls with concrete facing since variations can result in thicker concrete facing in some locations in order to provide the minimum required facing thickness elsewhere. Locate piles so the minimum required concrete facing thickness, if applicable, and roadway clearances are maintained for variable pile alignments.

Install piles to the required elevations in accordance with Subarticles 450-3(D) and 450-3(E) of the *Standard Specifications*. Piles may be installed with a vibratory hammer as approved by the Engineer. Do not splice piles. If necessary, cut off piles at elevations shown in the accepted submittals along a plane normal to the pile axis.

Use pile excavation to install drilled-in piles. If overexcavation occurs, fill to required elevations with No. 57 stone before setting piles. After filling holes with concrete or grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least 7 days before excavating.

Notify the Engineer if refusal is reached before pile excavation or driven piles attain the required penetration. When this occurs, a revised soldier pile wall design or construction plan submittal may be required. When a minimum pile penetration into rock is noted in the plans, rock is as determined by the Engineer.

B. Excavation

If a temporary slope is shown in the accepted submittals, excavate the slope as shown.

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Otherwise, excavate in front of piles from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with a maximum height of 5 ft. Use timber lagging or an alternate approved method for temporary support of excavations in accordance with the accepted submittals.

Install temporary support within 24 hours of excavating each lift unless otherwise approved. The installation may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.

If an excavation becomes unstable at any time, suspend soldier pile wall construction and temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soldier pile wall design or construction plan may be required.

Remove flowable fill and material in between piles as necessary to install timber lagging. Position lagging with at least 3" of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until temporary support for the current lift is accepted.

C. Wall Drainage Systems

Install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. Place geocomposite sheet drains with the geotextile side facing away from wall faces. Secure sheet drains so drains are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soldier pile walls. Discontinuous sheet drains are not allowed. If splices are needed, overlap sheet drains at least 12" so flow is not impeded. Connect sheet drains to aggregate leveling pads by embedding drain ends at least 4" into No. 57 stone.

D. Leveling Pads, Panels, Coping and Concrete Facing

Construct aggregate leveling pads at elevations and with dimensions shown in the accepted submittals. Compact leveling pads with a vibratory compactor to the satisfaction of the Engineer.

Set panels against pile flanges as shown in the accepted submittals. Position panels with at least 2" of contact in the horizontal direction between the panels and pile flanges. If contact cannot be maintained, remove panels, fill gaps with joint filler and reset panels. Securely support panels until enough No. 57 stone or backfill is placed to hold panels in place.

Construct coping as shown in the accepted submittals and Subarticle 452-4(B) of the *Standard Specifications*. When single faced precast concrete barrier is required in front of and against soldier pile 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

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No. 78M stone). Otherwise, fill gap with backer rod and seal joint between barrier and soldier pile wall with silicone sealant.

Construct concrete facing in accordance with the accepted submittals and Section 420 of the *Standard Specifications*. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi. Unless required otherwise in the plans, provide a Class 2 surface finish for concrete facing that meets Subarticle 420-17(F) of the *Standard Specifications*. Construct concrete facing joints at a spacing of 10 ft to 12 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction or sawed joints that meet Subarticle 825-10(B) or 825-10(E) respectively for the remaining joints. Stop reinforcing steel for concrete facing 2" on either side of expansion joints.

If a brick veneer is required, construct brick masonry in accordance with Section 830 of the *Standard Specifications*. Anchor brick veneers to soldier pile walls in accordance with Subarticle 453-4 of the *Standard Specifications*. Seal joints above and behind soldier pile walls between coping or concrete facing and concrete slope protection with silicone sealant.

E. Backfill

For fill sections or if a temporary slope is shown in the accepted submittals, backfill behind piles, panels and concrete facing in accordance with Article 410-8 of the *Standard Specifications*. Backfill voids behind panels, lagging and piles with No. 57 stone as shown in the accepted submittals. Ensure all voids between panels and lagging and between piles, lagging and excavation faces are filled with No. 57 stone. Compact stone to the satisfaction of the Engineer. When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed.

F. Pile Coatings

For soldier pile walls with panels, clean exposed galvanized or painted surfaces of piles with a 2,500 psi pressure washer after wall construction is complete. Repair galvanized surfaces that are exposed and damaged in accordance with Article 1076-7 of the *Standard Specifications*. Repair painted surfaces that are exposed and damaged by applying 4.0 to 7.0 mils wet film thickness of a topcoat to damaged areas with brushes or rollers. Use the same paint for damaged areas that was used for the topcoat when painting piles initially. Feather or taper topcoats in damaged areas to be level with surrounding areas.

5.0 MEASUREMENT AND PAYMENT

Soldier Pile Retaining Walls will be measured and paid in square feet. Soldier pile 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 concrete facing for soldier pile walls without coping.

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The contract unit price for *Soldier Pile Retaining Walls* will be full compensation for providing designs, submittals, labor, tools, equipment and soldier pile wall materials, installing piles, excavating, hauling and removing excavated materials, placing and compacting No. 57 stone and backfill material and supplying temporary support of excavations, wall drainage systems, leveling pads, panels, concrete facing, No. 57 stone, geotextiles, aggregate concrete base course and any incidentals necessary to construct soldier pile walls. The contract unit price for *Soldier Pile Retaining Walls* will also be full compensation for coping, pile coatings, backer rod and silicone sealant, No. 78M stone and brick veneers, if required. No additional payment will be made and no extension of completion date or time will be allowed for repairing overexcavations or unstable excavations or thicker concrete facing.

The contract unit price for *Soldier Pile Retaining Walls* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with soldier pile walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind soldier pile walls 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**
Soldier Pile Retaining Walls	Square Foot

NORTH CAROLINA PROFESSIONAL SEAL 018979 ENGINEER Mohammed A. Mulla PE

Signed by: Mohammed A. Mulla PE
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7/22/2026

Seal Applies to:
Soldier Pile Retaining Walls at
Retaining Wall Nos. 6, 21

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ARCHITECTURAL CONCRETE SURFACE TREATMENT (SPECIAL)

1.0 GENERAL

The work covered by this special provision consists of constructing textured surfaces on formed reinforced concrete surfaces as indicated on the Plans and in this Special Provision. The wall faces will be textured and the copings will be smooth, natural concrete, or as directed by the Engineer. The Contractor shall furnish all materials, labor, equipment, and incidentals necessary for the construction of architectural concrete surface treatment using simulated stone masonry form liners (molds) and a compatible concrete coloring system.

The architectural concrete surface treatment should match the appearance (stone size and shape, stone color, and stone texture, pattern, and relief) of natural stone and rock, in the project vicinity, or as directed by the Engineer. Grout pattern joints (mortar joints) and bed thickness should re-create the appearance and color of natural stone on the cast-in-place and/or precast concrete panels for the wall project walls except for Walls 27, 28, 30-32 as indicated in the Plans, this Special Provision, or as directed by the Engineer.

2.0 SUBMITTALS

Shop Drawings – The Contractor shall submit for review and acceptance, plan and elevation views and details showing overall simulated stone pattern, joint locations, form tie locations, and end, edge or other special conditions. The drawings should include typical cross sections of applicable surfaces, joints, corners, stone relief, stone size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the shop drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Shop drawings should be of sufficient scale to show the detail of all stone and joints patterns. The size of the sheets used for the shop drawings shall be 22" x 34".

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. Special attention should be given to details for wrapping form liners around corners.

Shop drawings shall be reviewed and accepted prior to fabrication of form liners.

Sample Panels – After the shop drawings have been reviewed and accepted by the Engineer, the Contractor shall construct 24” x 24” transportable sample panel(s) at the project site. The materials used in construction of the sample panel(s) shall comply with section 420 of the Standard Specifications. The sample panel(s) shall be constructed using approved form liners. Sample panels will be required for each different form liner pattern that is to be used on the project. Any sample panel that is not accepted by the Engineer is to be removed from the project site and a new sample panel produced at no additional expense to the Department.

Architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the accepted sample panel(s). Upon acceptance by the Engineer, the sample panel(s) shall be used as the quality standard for the project. After the acceptance of the completed structure, the Contractor shall dispose of the sample panels as

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directed by the Engineer.

3.0 MATERIAL REQUIREMENTS

Form Liner – The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼" when concrete is poured at a rate of 10 vertical feet (3 vertical meters) per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The Contractor is required to use the same source of form liner for all required elements, including precast fascia panels on bridges 7-10. The architectural concrete surface treatment should match the appearance (stone size and shape, stone texture, pattern and relief) of cut and mortared natural stone to resemble a pattern similar to the #439 Sierra Drystack by Sika Corporation, as shown below.



All texture is to be in addition to the nominal thickness of each element within tolerances. Maximum relief of the textured surface shall be 1 1/2 inch or less.

The form liners are to be patterned as referenced above and as directed by the Engineer. The Contractor may choose one of the following manufactures to supply the stone-textured surface treatment as specified above. One form liner pattern will be used on this project.

- Sika Corporation http://www.sika.com/
- Architectural Polymers http://www.apformliner.com/
- Custom Rock http://www.customrock.com/
- Fitzgerald http://www.formliners.com/
- Scott System http://www.scottsystem.com/
- Spec Formliners http://www.specformliners.com/

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- U.S. Formliner http://www.usformliner.com/
- American Formliners http://www.americanformliners.com/

At Walls 22-25, the contractor's attention is brought to the fact that the wall and bridge aesthetics must work together. Additional requirements for these walls include:

- Architectural Concrete Surface Treatment is applied to the cast-in-place wall finish. The wall finish is cast in a single stage for the entire wall, even if the wall is built in stages. See MSE Wall plans and special provisions. Formliner shall be continuous through the pour, except where pour joints and crack control joints are required by design. Simulated stone patterns shall be match-cast across crack control and pour joints to create a continuous, unbroken visible appearance.
- The coping of the MSE walls at the tops and corners must be constructed to match with the bridge end bent components. The dimensions of the vertical corner coping shall be matched to the end bent wing wall length to create a visually continuous vertical smooth concrete element. The coping may be cast in place or precast. The corner copings shall be jointed at 2' spacing in accordance with details on the structure plan end bent sheets.
- No additional payment will be made for the coordination of aesthetic details and finishes between wall and bridge.

Form Release Agent – Form release agent shall be a nonstaining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product. Form release agents shall be compatible with the color system applied and any special surface finish.

Form Ties - Form ties shall be set back a minimum of 2" from the finished concrete surface. The ties shall be designed so that all material in the device to a depth of at least 2" back of the concrete face (bottom of simulated mortar groove) can be disengaged and removed without spalling or damaging the concrete. The Contractor shall submit the type of form ties to the Engineer for approval.

Concrete Color – The final coloration of the project walls (with the exception of walls 22-25, see below, and walls 27, 28 and 30-32 which do not have architectural concrete surface treatment) is to consist of a single color (either Federal Colors #33522 or 30372) and shall be placed in such a way as to appear as natural stone. The wall coping for these walls will have the same selected color. Stain the sample panels using both proposed colors and once approved by the Engineer, the selected color can be used on the wall.

Walls 22 through 25 shall be treated with a four-color mix of Federal Colors #33522 (40%), 30372 (35%), 20095 (15%) and 24064 (10%) and shall be placed in such a way as to appear as natural stone. The wall coping for these walls shall be Federal Color #33522. Stain the sample panel using the proposed colors and once approved by the Engineer they can be used on the wall.

Color stains shall be a special penetrating stain mix as provided by the manufacturer and shall be in multiple colors of gray, brown, white, and black to achieve a full, natural color variation in the finished surface. The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali,

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fungi, sunlight, or weathering. Stain mix shall meet the requirements for mildew resistance of Federal Test Method Standard 144, Method 6271, and requirements for weathering resistance of 1.000 hours accelerated exposure measures by Weatherometer in accordance with ASTM G 26. Color samples must be submitted for approval. Concrete stains shall be supplied by one of the following or as approved by the Engineer.

Sherwin Williams
H&C Shield Plus
101 Prospect Ave., NW
Cleveland, OH 44115

Canyon Tone Stain
United Coatings
E 1901 Cataldo
Green Acres, Washington 90016

Cementrate Acrylic Stain
Fosroc, Inc.
55 Skyline Drive
Plainview, New York 11803

Hydroshield Stain
Robson-Downes Associates, Inc.
Oxford, Maryland 21654

Anti-Graffiti Coating Application – The coating shall be applied after full cure of the color coating. Apply the anti-graffiti coating by brush, roller or airless spray when ambient temperature is between 45 and 90 degrees F, and the surface temperature is between 50 and 100 degrees F. Ensure the surface is clean and dry before applying the anti-graffiti coating. The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

Quality Standards - Manufacturer of simulated stone masonry form liners and custom coloring system shall have at least five years experience making stone masonry molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors. The Contractor shall schedule a pre-installation conference with manufacturer representative and the Engineer to assure understanding of simulated stone masonry 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 simulated stone masonry manufacturer and final coloration contractor at the Preconstruction Conference.

4.0 CONSTRUCTION

Simulated Stone Form Liner System and Surface Finish

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The Contractor shall demonstrate his workmanship by first constructing a sample panel of the simulated stone masonry form liner pattern and coloration. The sample panel shall be constructed on site a minimum of six weeks prior to the construction of the walls. The sample panel shall measure 3' height by 5' length by 8" thick and shall be unreinforced, vertically cast, and of concrete construction to determine the surface texture resulting from the use of form liners. Sample panels shall be cast, finished, and stained until approved by the Engineer. The approved sample panel shall remain on site as the basis for comparison for work constructed on the project. The architectural surface treatment and pattern of the finished work shall achieve the same final effect as demonstrated on the approved sample panel. Upon completion of all work, the panel shall be removed from the site.

The simulated stone form liners are to be capable of withstanding anticipated concrete pour pressures without leakage or without causing physical or visual defects. The simulated stone form liners are to be removable without causing concrete surface deterioration or weakness in the substrate. Form release agents, form stripping methods, patching materials, as well as related construction are to be in accordance with the manufacturer's recommendations or as directed by the Engineer.

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.

The Contractor shall submit the type of form ties to be used in this construction to the Engineer for approval prior to use. Form tie holes shall be finished in accordance with standard concreting practices and shall be acceptable to the Engineer. All patching material shall exactly match the color and appearance of the poured concrete surface.

Concrete surfaces shall be clean, free of laitance, dirt, dust, grease, efflorescence, paint, or other foreign material, following manufacturer's specifications for surface preparation prior to application of color stain. The surface area shall also be free of blemishes, discolorations, surface voids, and unnatural form marks. The Contractor is advised that sandblasting will not be allowed for cleaning concrete surfaces. Pressure washing for removal of laitance shall be used.

If required on the plans, the Contractor shall provide a Color Application Artist who is trained in the special techniques to achieve realistic surface appearances, if requested by the Engineer. To avoid contaminating or damaging the wall surfaces, color stain application shall be scheduled when all concrete work is completed, the concrete has cured a minimum of 28 days, the surface has been determined to be acceptable for coloring, and after adjacent earthwork is complete. The Contractor is to coordinate coloring applications without interference from other work. The Contractor is required to apply coloring to an appropriate test area of 50 square feet and as designated by the Engineer, which will serve as a quality standard for the remaining surface to be colored. Upon approval of the test area by the Engineer, the remaining surfaces may be colored. Stains shall be applied when ambient air temperatures are in accordance with manufacturer's specifications or as directed by the Engineer. The number of coats of stain applied shall be in accordance with manufacturer's specifications or as directed by the Engineer. Treated surfaces located adjacent to exposed

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soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

Experience and Qualifications - The Contractor shall have a minimum of three consecutive years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 5 references who were responsible for supervision of similar projects and will testify to the successful completion of these projects. Include name, address, telephone number, and specific type of application.

5.0 MEASUREMENT AND PAYMENT

Architectural concrete surface treatment as described in this Special Provision will be paid for at the contract unit price bid for "Architectural Concrete Surface Treatment". The payment quantity will be equal to the final installed wall face quantity. Payment will include the furnishing and use of all form liners, the construction, finishing, staining, anti-graffiti coating and removal of all sample panels, and all equipment, materials, labor, and incidentals necessary to complete the work in conformance with the Contract Documents.

Payment will be made under:

Pay Item	**Pay Unit**
Architectural Concrete Surface Treatment	Square Feet

NORTH CAROLINA PROFESSIONAL SEAL 018979 ENGINEER Mohammed H. Mulla Signed by: Mohammed H. Mulla, PE 4EFECE6AFC504D8... 7/22/2026	NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN E. CROCKETT Signed by: Stephen E. Crockett, PE C5CA5FED48E0... 7/22/2026	NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ALBERT E. RIGGS, JR. DocuSigned by: Albert Riggs, Jr. C2F6AC...D274B1... 7/23/2026
Seal Applies to: *Architectural Concrete Surface Treatment* at Retaining Wall Nos. 1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 21, 22, 23	Seal Applies to: *Architectural Concrete Surface Treatment* at Retaining Wall Nos. 8, 9, 10	Seal Applies to: *Architectural Concrete Surface Treatment* at Retaining Wall Nos. 7, 24, 25

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THERMAL PROFILE LOGGING:

(11-17-26)

Description

Perform integrity testing using Thermal Profile Logging (TPL) by measuring the heat generated by curing cement (hydration energy) to evaluate the integrity of drilled piers in accordance with ASTM D7949. Use a prequalified Crosshole Sonic Logging (CSL) Consultant to perform TPL testing and provide TPL reports. Use a TPL Operator approved as a Field Engineer (key person) for the CSL Consultant. Provide TPL reports sealed by an engineer licensed in the State of North Carolina approved as a Project Engineer (key person) for the same CSL Consultant.

Materials

Supply all materials and equipment required to perform TPL testing in accordance with the ASTM D7949, Method B. Attach embedded thermal sensors to the reinforcing cage before drilled pier construction in accordance with ASTM D7949, Method B.

Testing

Perform TPL testing in accordance with ASTM D7949, Method B. Begin recording temperature data to the nearest one-degree Fahrenheit immediately after completing concrete placement. Record temperatures using an hour or smaller interval of time.

Reports

Submit each TPL report within 7 working days of completing TPL testing to the Engineer for review and approval. If both TPL testing and CSL testing are conducted on the same drilled pier, provide one report for both tests with a comparison of the results. Include all items required for CSL reports in accordance with Subarticle 411-5(A)(2) of the *Standard Specification* that are applicable to TPL testing and the following TPL testing specific items in the TPL reports:

(A) TPL Results

(i) Graphical displays of all temperatures versus depth including date and time for all readings

(B) Summary/Conclusions

(i) The overall average temperature

(ii) Summary of observed effective radius reduction and local cover

(iii) List of suspected anomalies with corresponding locations (thermal sensor(s) and depth range)

(C) Attachments

(i) Embedded sensor locations, elevations, lengths and identifications

(ii) Description of the data recording unit and software version

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information

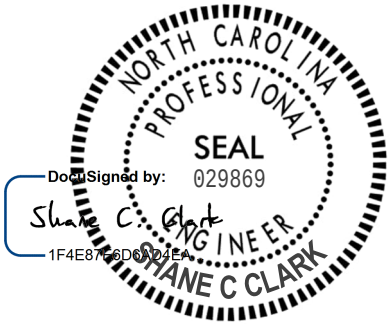
(iii) PDF copy of all TPL data

Measurement and Payment

TPL Testing will be measured and paid in units of each. *TPL Testing* will be measured as one per drilled pier. The contract unit price for *TPL Testing* will be full compensation for performing TPL testing and providing TPL reports. TPL thermal sensors and data loggers associated with TPL testing will be incidental to the contract unit price for *TPL Testing*.

Payment will be made under:

Pay Item	**Pay Unit**
TPL Testing	Each



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DRILLED PIER PILOT BORING (SPECIAL)

1.0 GENERAL

The Contractor is responsible for creating access to all interior Bent locations with pilot hole borings. This access will be used by an approved subcontractor to drill pilot borings to be used in the final drilled pier design for all piers at interior Bent locations.

2.0 MATERIALS

The Contractor can use any means that has been included in the permitted project to provide access to the drilled pier locations.

3.0 PREDRILLING REQUIREMENTS

A. Survey Pier Locations

Prior to drilling the Contractor will have the center of each pier location surveyed and clearly marked.

Predrilling Meeting

Before beginning drilling, hold a predrilling meeting to discuss the needs of the pilot hole borings. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Drilling Subcontractor will attend preconstruction meetings.

4.0 PILOT BORING REQUIREMENTS

The Drilling Subcontractor will drill a pilot boring within 3” of center for each drilled shaft. Each boring will be advanced to the elevations as noted in the Notes on Plans.

A. Work Experience

The Drilling Subcontractor is to be selected from the Approved Firms List, located here:

https://www.ebs.nc.gov/VendorDirectory/search.html?s=pc&a=new

The Subcontractor will have to be currently on the list and approved to perform “Structure Foundation Investigation and Design”, Code 295

B. Final Product

Using the NCDOT Geotechnical Investigation Manual as a guide, the Subcontractor is to drill each pilot hole using all means necessary to collect representative samples from each hole. The field logs should note all variances

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in drill behavior on the logs. All coring products should be clearly labelled and boxed in approved core boxes.

The field logs along with the core boxes should be delivered to the Geotechnical Field Office located at:

11 Old Charlotte Highway

Asheville, NC 28802

Coordinate with Shane Clark, PE at (828-250-3390) prior to delivery to work out any final instructions or directions.

5.0 UPDATED DRILLED PIER LENGTHS

Within 10 working days of the receiving the Drilled Pier Pilot Boring data, the NCDOT Geotechnical Engineering Unit will provide "Tip No-Higher-Than Elevation" and other drilled pier requirements for each Drilled Pier to the Resident Engineer and Contractor.

6.0 MEASUREMENT AND PAYMENT

Drilling footage for Drilled Pier Pilot Borings will not be measured.

The contract unit price for Drilled Pier Pilot Borings will be full compensation for providing labor, per diem, tools, equipment, excavating, packaging, delivery and any miscellaneous components or incidentals necessary to complete the task.

Surveying, providing access, backfilling, hauling and regrading excavated materials and any miscellaneous components or incidentals necessary to complete the task by the Contractor will be considered incidental, with no additional compensation from the Department.

Payment will be made under:

Pay Item	**Pay Unit**
Drilled Pier Pilot Boring	Each



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CONCRETE BARRIER RAIL WITH MOMENT SLAB AND LIGHT SUPPORT (SPECIAL)

DESCRIPTION

Construct concrete barrier rail connected to moment slabs and light support to resist traffic impact above retaining walls. Construct concrete barrier rail with moment slab in accordance with the contract and accepted submittals.

MATERIALS

Refer to Division 10 of the Standard Specifications

Item:	Section
Barrier Delineators	1088-2
Portland Cement Concrete	1000
Reinforcing Steel	1070

Concrete for the concrete barrier shall meet the requirements for Class AA concrete.

Class A concrete shall be used for moment slabs and light Support.

Provide epoxy coated reinforcing steel that meets Article 1070-7 of the Standard *Specifications* for vertical concrete barrier rail.

METHOD OF CONSTRUCTION

Construct concrete barrier rail with moment slab and light support in accordance with the plans and accepted submittals. Construct cast-in-place reinforced concrete moment slabs and Light Support in accordance with Section 420 of the Standard Specifications. Unless otherwise noted, construct concrete barrier rail and light support detailed in the plans using conventional forms or by slip-forming using an approved self-propelled extrusion machine. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi.

All exposed surfaces of the concrete barrier rail and light support which are not satisfactory to the Engineer as to uniformity of color and texture or because of excessive patching shall be corrected as required by the Engineer. Give the exposed faces of the concrete barrier rail and light support constructed using forms a Class 2 surface finish in accordance with Section 420-17(F) of the Standard Specifications. Use a broom finish on exposed faces of slip-formed concrete barrier rail being performed. The light post installation shall not begin until the concrete in the light support has reached a minimum compressive strength of 3,000 psi.

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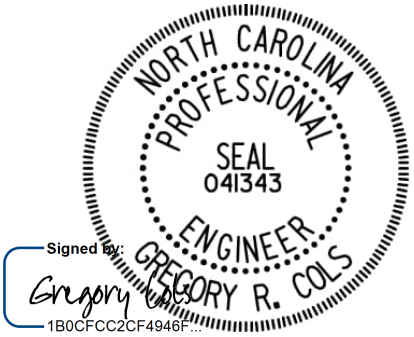
MEASUREMENT AND PAYMENT

Concrete Barrier Rail with Moment Slab and Light Support will be measured and paid in linear feet. Concrete Barrier Rail with Moment Slab and Light Support will be measured as the length of concrete barrier rail installed and accepted. The contract unit price for Concrete Barrier Rail with Moment Slab and Light Support will be full compensation for submittals, labor, tools, equipment and concrete barrier with moment slab and light support materials, excavating, backfilling, hauling and removing excavated materials and supplying any incidentals necessary to construct the concrete parapet with moment slab.

There will be no direct payment for barrier rail delineators as they are incidental to the work being performed.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Barrier Rail with Moment Slab and Light Support	Linear Foot



7/22/2026

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LIGHTWEIGHT AGGREGATE (SPECIAL)

1.0 GENERAL

Furnish and place lightweight aggregate as shown on the plans, according to this provision, and as directed by the engineer. Use ESCS (Expanded Shale Clay Slate) produced by the rotary kiln method conforming to ASTM C330 (latest edition).

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Geotextiles, Type 2	1056

Provide Type 2 geotextile for filtration and separation.

A. Lightweight Aggregate

Lightweight aggregate must have a proven record of durability, and be non-corrosive, with the following properties:

- Contains a maximum organic content of 0.1%.
- Soundness Loss (AASHTO T104): Have a maximum soundness loss of less than 30% when subjected to four cycles of Magnesium Sulfate.
- Abrasion Resistance (ASTM C131): Have a maximum percentage of abrasion loss of less than 40%.
- Chloride Content (AASHTO T291): Have a chloride content less than 100 ppm.
- Gradation (ASTM 136): Use an aggregate gradation from 3/4" to #4. Other gradations may be acceptable with approval by the Engineer.
- Aggregate loose unit weight (ASTM C29): Have a loose unit weight less than 55 lbs/ft^3.
- In-place unit weight: (ASTM D4253, D4254): Have an in-place compacted dry unit weight between 55 and 60 lbs/ft^3. Material must be compacted to a minimum 65% relative density as determined by ASTM D4253 and D4254. Use a vibratory table when determining the maximum index density and unit weight in accordance with ASTM D4253. Determine the minimum index density and unit weight in accordance with ASTM D4254.
- Angle of Internal Friction (ASTM D3080): Minimum angle of internal friction of 40 degrees. Test a saturated representative sample (with particles larger than larger than 0.75 inch removed) in a round or square shear box that is a minimum of 12 inches across.
- Resistivity (ASTM D1125): Have a resistivity greater than 3000 ohm-cm.
- pH (ASTM D1293): Have a pH greater than five but less than 10.

Before placing any backfill, furnish a Type IV certification in accordance with Article 106-3 of the Standard Specifications. Include a copy of all test results conducted in accordance with the above requirements in the certification. The Engineer determines how often

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NCDOT samples backfill material to assure compliance with gradation and other material properties.

3.0 METHOD OF CONSTRUCTION

Install separation and filtration geotextile along interface between the lightweight aggregate and underlying fill, overlying fill, or pavement sections. When noted in the plans, the geotextiles are also required along the backside of the lightweight aggregate reinforced zone and backfill or natural ground. Unroll geotextile perpendicular to the roadway centerline. Overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed. For sloping or vertical interfaces between lightweight aggregate and different materials unroll geotextiles down slope. If geotextile roll length is too short, overlap end of geotextile rolls along sloping ground at least 5 feet with the upper geotextile laid over the lower one. Place geotextiles in slight tension free of kinks, folds, wrinkles or creases. Do not displace or damage geotextiles while placing aggregate. Do not leave geotextiles exposed for more than 7 days before covering with aggregate. Place geotextiles on surfaces free of obstructions, debris and soft pockets.

Place lightweight aggregate in uniform layers with loose lift thickness no more than 8” to 10” thick lifts. Compact the lightweight aggregate in accordance with Subarticle 235-3(C) of the Standard Specifications. Use only hand operated compaction equipment to compact aggregate within 3 feet of the wall face. At a distance greater than 3 feet, compact lightweight aggregate with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face, or as directed by the Engineer. In confined areas, use vibratory plate compaction equipment (5 hp to 20 hp) with a minimum of two passes in 6” lifts for a 5 hp plate and 10” lifts for a 20 hp plate. Sheeps foot or grid type rollers shall not be used. Take all necessary precautions when working adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for placement and compaction, must not operate on the exposed lightweight fill.

4.0 MEASUREMENT AND PAYMENT

Lightweight Aggregate will be measured and paid for per cubic yard of “Lightweight Aggregate” that has been acceptably placed and compacted. Such price and payment will be full compensation for furnishing, hauling, placing and compacting the fill and all incidentals necessary to complete the work.

Geotextile for Lightweight Aggregate will be measured and paid in square yards. Geotextiles will be measured along the ground surface or interfaces as the square yards of exposed geotextiles before placing backfill material. No measurement will be made for overlapping geotextiles or sewing seams. The contract unit price for Geotextile will be full compensation for providing, transporting and placing geotextiles, wire staples and anchor pin and sewing geotextiles.

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Payment will be made under:

Pay Item	**Pay Unit**
Lightweight Aggregate	Cubic Yard
Geotextile for Lightweight Aggregate	Square Yard



STANDARD SHORING: **(1-16-24)**

Description

Standard shoring includes standard temporary shoring and standard temporary mechanically stabilized earth (MSE) walls. At the Contractor's option, use standard shoring as noted in the plans or as directed. When using standard shoring, a temporary shoring design submittal is not required. Construct standard shoring based on actual elevations and shoring dimensions in accordance with the contract and Geotechnical Standard Detail No. 1801.01 or 1801.02.

Define "standard temporary shoring" as cantilever shoring that meets the standard temporary shoring detail (Geotechnical Standard Detail No. 1801.01). Define "standard temporary wall" as a temporary MSE wall with geotextile or geogrid reinforcement that meets the standard temporary wall detail (Geotechnical Standard Detail No. 1801.02). Define "standard temporary geotextile wall" as a standard temporary wall with geotextile reinforcement and "standard temporary geogrid wall" as a standard temporary wall with geogrid reinforcement.

Provide positive protection for standard shoring at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to the *Standard Specifications*.

Item	Section
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-7
Geosynthetics	1056
Grout, Type 1	1003
Portland Cement Concrete, Class A	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3

Provide Type 6 material certifications for shoring materials. Use Class IV select material for temporary guardrail. Use Class A concrete that meets Article 450-2 of the *Standard Specifications* or Type 1 grout for drilled-in piles.

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, use sheet piles with the minimum required section modulus or H-piles with the sizes shown in Geotechnical Standard Detail No. 1801.01. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use the following:

(1) A-2-4 soil for backfill around culverts,

(2) A-2-4 soil in the reinforced zone of standard temporary walls with a back slope and

(3) Class VI select material in the reinforced zone of standard temporary geotextile walls.

(B) Standard Temporary Walls

Use welded wire reinforcement for welded wire facing, struts and wires with the dimensions and minimum wire sizes shown in Geotechnical Standard Detail No. 1801.02. Provide Type 2 geotextile for separation and retention geotextiles. Do not use more than 4 different reinforcement strengths for each standard temporary wall.

(1) Geotextile Reinforcement

Provide Type 4a geotextile for geotextile reinforcement except for the ultimate tensile strength. Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geotextile wall location, provide geotextiles with ultimate tensile strengths as shown in Geotechnical Standard Detail No. 1801.02.

(2) Geogrid Reinforcement

Use geogrids for geogrid reinforcement with a roll width of at least 4 ft and an "approved" status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Based on actual wall height, groundwater or flood elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geogrid wall location, provide geogrids for geogrid reinforcement with short-term design strengths as shown in Geotechnical Standard Detail No. 1801.02. Geogrids are approved for short-term design strengths (3-year design life) in the machine direction (MD) and cross-machine direction (CD) based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of standard shoring except for barrier above standard temporary walls. Concrete barrier with the minimum required clear distance is required above standard temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and standard shoring. At the Contractor's option or if clear distance for standard temporary shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above standard temporary walls.

(C) Standard Shoring Selection Forms

Before beginning standard shoring construction, survey existing ground elevations in the vicinity of standard shoring locations to determine actual shoring or wall heights (H). Submit a standard shoring selection form for each location at least 7 days before starting standard shoring construction. Standard shoring selection forms are available from: connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx

Construction Methods

Construct standard shoring in accordance with the *Temporary Shoring* provision.

(A) Standard Temporary Shoring Installation

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, install piles with the minimum required embedment and extension for each shoring section in accordance with Geotechnical Standard Detail No. 1801.01. For concrete barrier above and next to standard temporary shoring and temporary guardrail above and attached to standard temporary shoring, use "surcharge case with traffic impact" in accordance with Geotechnical Standard Detail No. 1801.01. Otherwise, use "slope or surcharge case with no traffic impact" in accordance with Geotechnical Standard Detail No. 1801.01. If refusal is reached before driven piles attain the minimum required embedment, use drilled-in H-piles with timber lagging for standard temporary shoring.

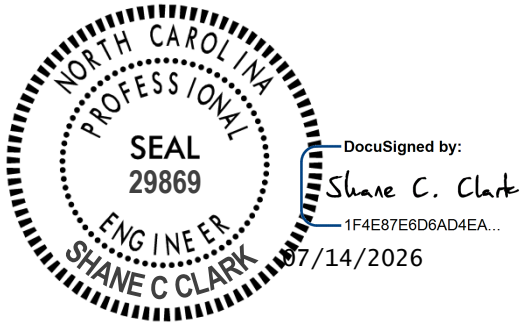
(B) Standard Temporary Walls Installation

Based on actual wall height, groundwater elevation, slope or surcharge case, geotextile or geogrid reinforcement and shoring backfill in the reinforced zone at each standard temporary wall location, construct walls with the minimum required reinforcement length and number of reinforcement layers for each wall section in accordance with Geotechnical Standard Detail No. 1801.02. For standard temporary walls with pile foundations in the reinforced zone, drive piles through reinforcement after constructing temporary walls.

For standard temporary walls with interior angles less than 90°, wrap geosynthetics at acute corners as directed by the Engineer. Place geosynthetics as shown in Geotechnical Standard Detail No. 1801.02. Place separation geotextiles between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, place separation geotextiles between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Measurement and Payment

Standard shoring will be measured and paid in accordance with the *Temporary Shoring* provision.



DRILLED PIERS:

(11-17-26)

Revise the *Standard Specifications* as follows:

Replace Section 411 with the following:

SECTION 411
DRILLED PIERS

411-1 DESCRIPTION

Construct drilled piers consisting of CIP reinforced concrete cylindrical sections in excavated holes typically stabilized with casings or slurry. Provide permanent casings, standard penetration tests, integrity testing and assistance with the shaft inspection device as noted in the plans. Construct drilled piers with the required resistances and dimensions in accordance with the contract and accepted submittals. Use a prequalified Drilled Pier Contractor to construct drilled piers.

Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier. Define "permanent casing" as a casing that remains in the excavation and acts as a form for Drilled Pier concrete and "temporary casing" as any casing that is not permanent. Define "rock" as a continuous intact natural material with a standard penetration resistance of 0.1 foot or less per 60 blows or a rock auger penetration rate of less than 2 inches per 5 minutes of drilling at full crowd force or as determined by the Engineer when rock is not encountered as expected based on these criteria. This definition excludes discontinuous loose natural materials such as boulders and man-made materials such as concrete, steel, timber, etc. and is not for measurement and payment purposes. See Article 411-7 for measurement and payment of drilled piers.

411-2 MATERIALS

Refer to Division 10.

Item	Section
Grout, Type 2	1003
Portland Cement Concrete, Class Drilled Pier	1000
Reinforcing Steel	1070

Provide Type 3 material certifications in accordance with Article 106-3 for permanent casings and roller, chair, steel pipe and cap materials. Store steel materials on blocking at least 12 inches above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store drilled pier materials so materials are kept clean and free of damage.

(A) Steel Casing

Define "casing" as a temporary or permanent casing. If permanent casing is required for an excavation, the largest diameter casing in the hole is the permanent casing. This does not apply to working casings around permanent casings as approved by the Engineer.

Use smooth non-corrugated clean watertight steel casings of ample strength to withstand handling and installation stresses and pressures imposed by concrete, earth, backfill and fluids.

(1) Temporary Casings

Provide temporary casings with a nominal wall thickness of at least 0.375 inch and an outside diameter equal to or larger than the design pier diameter for which temporary casing is used.

(2) Permanent Casings

Use permanent casings with a yield strength of at least 36 ksi and a nominal wall thickness that meets Table 411-1.

TABLE 411-1
MINIMUM PERMANENT CASING WALL THICKNESS

Casing Diameter	Nominal Wall Thickness
< 48"	0.375"
48" - 78"	0.500"
> 78"	0.625"

Provide permanent casings with an outside diameter equal to the design pier diameter for which permanent casing is used unless larger diameter permanent casings are approved by the Engineer.

(B) Slurry

Define "slurry" as bentonite or polymer slurry. Mix bentonite clay or synthetic polymer with water to make bentonite or polymer slurry.

(1) Bentonite Slurry

Provide bentonite slurry that meets Table 411-2.

TABLE 411-2
BENTONITE SLURRY REQUIREMENTS[A]

Property	ANSI/API RP[B] 13B-1	Requirement
Density[C] (Mud Weight)	Section 4 Mud Balance	64.3 - 72.0 pcf
Viscosity	Section 6.2 Marsh Funnel	28 - 50 sec/qt
Sand Content	Section 9	≤ 4 %[D]
		≤ 2 %[E]
pH	Section 11 Glass Electrode pH Meter[F]	8 - 11

A. Slurry temperature of at least 40°F required
B. American National Standards Institute/American Petroleum Institute Recommended Practice
C. Increase density requirements by 2 pcf in saltwater
D. In tanks before pumping slurry into excavations

E. In excavations immediately before placing concrete
F. pH paper is also acceptable for measuring pH

(2) Polymer Slurry

Use polymer slurry products qualified by the Department. Provide polymer slurry with density, viscosity, sand content and pH properties that meet the product requirements. The polymer slurry QPL with the property requirements for each qualified polymer slurry product is available on the Geotechnical Engineering Unit's website.

(C) Rollers and Chairs

Use rollers and chairs that are non-metallic and resistant to corrosion and degradation. Provide rollers with the necessary dimensions to maintain the minimum required concrete cover shown in the plans and center rebar cages within excavations. Use chairs of sufficient strength to support rebar cages in excavations and of the size necessary to raise cages off bottom of holes to maintain the minimum required distance shown in the plans.

(D) Steel Pipes and Caps

Use Schedule 40 black steel pipes for access tubes for crosshole sonic logging (CSL). Provide CSL tubes with an inside diameter of at least 1.5 inches. Use CSL tubes with a round, regular inside diameter free of defects and obstructions, including any pipe joints, in order to permit free, unobstructed passage of probes for CSL testing. Provide watertight CSL tubes free of corrosion with clean internal and external faces to ensure a good bond between concrete and tubes. Fit CSL tubes with watertight plastic caps on the bottom and removable caps on top.

(E) Drilled Pier Concrete

Use drilled pier concrete material meeting the requirements of Section 1000, except as modified below:

(1) Supplementary Cementitious Materials (SCMs)

Add SCMs to reduce peak concrete hydration temperature, improve thermal performance, and mitigate risk of thermal cracking in Drilled Pier Concrete in accordance with Table 411-3. Use any one or combination of the SCMs that satisfies the required minimum dosages below:

(a) ≥ 25% Class F fly ash that meets ASTM C618
(b) ≥ 35% Class C fly ash that meets ASTM C618
(c) ≥ 35% slag cement that meets ASTM C989/C989M
(d) ≥ 5% silica fume that meets ASTM C1240 with ≥ 25% slag cement
(e) ≥ 5% silica fume that meets ASTM C1240 with ≥ 20% Class F fly ash that meets ASTM C618

Use SCMs found on the Department's approved producer/supplier list. Concrete mixtures containing high alkali cements must also utilize the appropriate SCMs and minimum substitution rates provided in Article 1024-1.

(2) Equivalent Cement Content (ECC)

Determine the ECC on a per cubic yard basis with the following formula:

ECC= 1.0(PC) + 0.5(FAF) + 0.8(FAC) + 1.2(SF) + 1.0(SC)

Where:

PC = Portland cement
FAF = Class F fly ash
FAC = Class C fly ash
SF = Silica fume
SC = Slag cement

All units are in pounds per cubic yard.

ECC shall meet the requirements of Table 411-3 unless otherwise supported by a temperature prediction model in accordance with Subarticle 411-2(E)(3)(b).

(3) Thermal Control

(a) Use appropriate thermal control measures to reduce the peak concrete hydration temperature in Drilled Pier Concrete. Methods for controlling concrete temperature may include, but are not limited to, the following:

(i) Selecting constituent materials that minimize the heat generated by concrete hydration.

(ii) Cooling constituent materials to reduce the temperature of concrete in its plastic state.

(iii) Controlling the rate of concrete placement.

(iv) Other methods proposed by the Contractor and approved by the Engineer.

At a minimum, provide thermal control for Drilled Pier Concrete in accordance with Table 411-3.

TABLE 411-3
THERMAL CONTROL REQUIREMENTS FOR DRILLED PIER CONCRETE

D **Drilled Pier Diameter[A] (ft)**	**SCMs Required? (Yes/No)**	**Max ECC (lb/cy)**	**Max Temp with SCMs[C] (°F)**	**Max Temp without SCMs (°F)**	**Temp Prediction Required? (Yes/No)**	**Temp Monitoring Required? (Yes/No)**
$D < 5$	No	N/A	185	158	No	No
$5 \leq D < 6$	Yes	625		N/A	No	Yes
$D \geq 6$	Yes	B		N/A	Yes	Yes

A. Drilled pier diameter is the largest constructed diameter for any portion of a pier.

B. As determined by temperature prediction model

C. For a list of SCM's allowed see Subarticle 411-2(E)(1)

(b) Temperature Prediction

Use the Schmidt Method or numerical thermal modeling as described in *Concrete: Microstructure, Properties, and Materials* by Mehta and Monteiro (2014) or other method approved by the Engineer to predict concrete hydration temperature. Temperature predictions are required for each Drilled Pier Concrete mix design with a different drilled pier condition. Variations in constructed drilled pier diameter or drilled piers with permanent steel casing are considered different drilled pier conditions. Submit temperature prediction results and any planned thermal control measures at least 30 days before beginning Drilled Pier Concrete placement.

(c) Temperature Monitoring

Monitor concrete hydration temperature for the first drilled pier constructed with each Drilled Pier Concrete mix with a different drilled pier condition as described in Subarticle 411-2(E)(3)(b). Measure temperature at the center of the drilled pier diameter using two redundant thermal sensors inserted at least 1.5 × pier diameters below the top of pier and in accordance with ASTM D7949, Method B. Begin recording temperature data to the nearest one-degree Fahrenheit immediately after completing concrete placement. Record temperatures using an hour or smaller interval of time. Continue recording temperatures until at least 24 hours after the peak temperature has passed. If a temperature limit is exceeded, continue monitoring until all temperature values fall below the specified limit, even if the 24-hour requirement has been met. Submit temperature monitoring data within 24 hours after completing monitoring and before placing another drilled pier under the same conditions.

If temperature limits are exceeded during monitoring, submit a revised thermal control plan including but not limited to revised concrete mix designs, lower concrete placement temperature, or other modifications proposed by the contractor for review by the Engineer. Do not place additional drilled piers under the same conditions until the revised thermal control plan has been reviewed by the Engineer. Drilled piers that exceed the temperature limits established in Table 411-3 are considered unacceptable unless the Contractor demonstrates through an engineering analysis that the drilled pier is acceptable to the Engineer.

(d) Concrete Placement Temperature

For drilled piers with constructed diameters of 5 feet or greater, maintain concrete temperature at time of placement between 40°F and 75°F. Placement temperatures up to 85°F may be permitted when supported by temperature prediction or monitoring as specified in Subarticle 411-2(E)(3)(b) and (c). When placement temperatures above 75°F are permitted based on temperature monitoring, continue monitoring subsequent drilled piers until monitoring demonstrates that the maximum temperature specified in Table 411-3 will not be exceeded at the higher placement temperature.

(4) Concrete Slump Loss

Place concrete within the slump requirements listed in Table 1000-1 and maintain a minimum slump of 5 inches throughout the elapsed time. The elapsed time for placing drilled shaft concrete includes the concrete mixing and transit time, the concrete placement time, and the time required to remove any tremies, temporary casings, etc. Include the estimated elapsed time for concrete placement in the drilled shaft installation plan.

For drilled piers with a theoretical concrete volume of 75 cubic yards or more and an estimated elapsed time greater than 2 hours, perform a field slump loss test. Perform the slump loss test in accordance with the procedure posted on the NCDOT Materials and Tests Unit website and demonstrate to the Engineer, before drilled pier concrete placement, that the concrete will maintain a slump of 5 inches or greater for the estimated elapsed time. Place concrete if it's temperature at the time of placement into the drilled pier is no more than 10°F higher than the slump loss test temperature. Use ice or other concrete-cooling ingredients to lower concrete temperature or run additional slump loss tests at the higher temperatures.

411-3 PRECONSTRUCTION REQUIREMENTS

(A) Drilled Pier Construction Plan

Submit the proposed drilled pier construction plan for all drilled piers for acceptance by the Engineer. Provide an electronic copy of this plan at least 30 days before starting drilled pier construction. Do not begin drilled pier construction until a construction plan is accepted by the Engineer. Provide detailed project specific information in the drilled pier construction plan that includes the following:

(1) Overall description and sequence of drilled pier construction;

(2) List and sizes of equipment including cranes, drill rigs, vibratory and downhole hammers, Kelly bars, augers, core barrels, casings (diameters, thicknesses and lengths), cleanout buckets, air lifts, pumps, slurry equipment, tremies, pump pipes and other equipment;

(3) Procedures for casing installation and temporary casing removal including how telescoping temporary casings will be removed;

(4) If applicable, details of slurry testing and use including intended purpose, product information and additives, manufacturer's recommendations for use, name and contact information for slurry manufacturer's technical representative, mixing and handling procedures and how slurry level will be maintained above the highest piezometric head;

(5) Methods for drilling and cleaning holes including how cores will be removed and drilling spoils and slurry will be handled and disposed of;

(6) Details of CSL tubes, caps and joints including pipe size and how tubes will be attached to reinforcing steel;

(7) Procedures for lifting and setting reinforcing steel including how rebar cages will be supported and centralized;

(8) Procedures for placing concrete including how tremies and pump pipes will be controlled and contaminated concrete will be contained;

(9) Concrete mix design that meets Section 1000;

(10) Approved packaged grout or grout mix design that meets Section 1003;

(11) CSL Consultant including Field and Project Engineer; and

(12) Other information shown in the plans or requested by the Engineer.

If alternate construction procedures are proposed or necessary, a revised drilled pier construction plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend drilled pier construction until a revised plan is accepted by the Engineer.

(B) Preconstruction Meeting

Before starting drilled pier construction, hold a drilled pier preconstruction meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this drilled pier preconstruction meeting with the Engineer after the Drilled Pier Contractor mobilizes to the site. If this meeting occurs before all drilled pier submittals have been accepted by the Engineer, additional drilled pier preconstruction meetings may be required before beginning construction of drilled piers without accepted submittals. The Prime Contractor and Drilled Pier Contractor Superintendent shall attend the drilled pier preconstruction meetings.

411-4 CONSTRUCTION METHODS

Do not excavate holes, install piles or allow equipment loads or vibrations within 20 feet of completed piers until 16 hours after drilled pier concrete reaches initial set.

When drilling from a barge, use a fixed template that maintains hole position and alignment during drilled pier construction. Do not use floating templates or templates attached to barges.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of Kelly bars before beginning and frequently during drilling.

For drilled piers constructed with slurry or permanent casings, the pier diameter may be 2 inches less than the design pier diameter shown in the plans. For all other drilled piers, construct piers with the minimum required diameters shown in the plans except for portions of drilled piers in rock which may be 2 inches less than the design pier diameter.

Install drilled piers with tip elevations no higher than shown in the plans or approved by the Engineer. Provide piers with the minimum required tip resistance and, when noted in the plans, penetration into rock.

(A) Excavation

Excavate holes with equipment of the sizes required to construct drilled piers. Use equipment and methods accepted in the drilled pier construction plan or approved by the Engineer. Inform the Engineer of any deviations from the accepted plan.

Use drill rigs with sufficient capacity to drill through soil, rock, boulders, timbers, man-made objects and any other materials encountered and drill 20 feet deeper or 20% longer than the maximum drilled pier length shown in the plans, whichever is greater. Drilling below pier tip elevations shown in the plans may be required to attain sufficient resistance.

Do not use blasting to advance drilled pier excavations. Blasting for core removal is only permitted when approved by the Engineer. See Articles 107-11 and 107-12 for protection of public and private property and control of siltation, dust and air and water pollution from blasting, drilling and excavating with down-the-hole hammers. Contain and dispose of drilling spoils and waste concrete in accordance with Section 802 or as directed by the Engineer. Drilling spoils consist of all materials and fluids removed from excavations.

Stabilize excavations with only casings or slurry and casings except, as approved by the Engineer, portions of excavations in rock. Use casings or slurry in rock if unstable material is anticipated or encountered. Stabilize excavations from beginning of drilling through concrete placement. If excavations become unstable, the Engineer may suspend drilling and require a revised drilled pier construction plan. If it becomes necessary to replace a casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with slurry before removing the casing.

When noted in the plans, do not dewater drilled pier excavations. Otherwise, if excavations are in rock, dewater excavations to the satisfaction of the Engineer.

(B) Casings

Provide temporary casings to stabilize holes and protect personnel entering excavations. Permanent casings may be required as noted in the plans. Install permanent casings with tip elevations no deeper than shown in the plans or approved by the Engineer. Additional drilled pier length and reinforcing steel may be required if permanent casings are installed below elevations noted in the plans.

Install casings in continuous sections. Overlap telescoping casings at least 24 inches. Remove portions of permanent casings above the ground line or top of piers, whichever is higher, after placing concrete. Do not cut off permanent casings until Drilled Pier concrete attains a compressive strength of at least 3,000 psi.

When using slurry construction without permanent casings, temporary casings at least 10 feet long are required at top of excavations. Maintain top of casings at least 12 inches above the ground line.

(C) Slurry Construction

Unless noted otherwise in the plans, slurry construction or polymer slurry is at the Contractor’s option.

Use slurry and additives to stabilize holes in accordance with the manufacturer’s recommendations. Provide a technical representative employed by the slurry

manufacturer to assist and guide the Drilled Pier Contractor onsite during the construction of the first drilled pier. If problems are encountered during drilled pier construction, the Engineer may require the technical representative to return to the site.

Provide documentation that mixing water is suitable for slurry. Use slurry equipment that is sufficient for mixing, agitating, circulating and storing slurry. Thoroughly premix slurry with water in tanks before pumping into excavations. Allow bentonite slurry to hydrate at least 24 hours in tanks before use.

Pump slurry into excavations before encountering water. Maintain slurry level at least 5 feet or one pier diameter, whichever is greater, above the highest piezometric head along the drilled pier length. The highest piezometric head is anticipated to be the static water or groundwater elevation. However, the Drilled Pier Contractor is responsible for determining the highest piezometric head for each pier.

Maintain the required slurry properties at all times. Desand or replace slurry as needed to meet the required sand content in tanks before pumping slurry into excavations and in excavations immediately before placing concrete.

(1) Time

Agitate bentonite slurry in holes at least every 4 hours. If this 4-hour time limit is exceeded, the Engineer may require holes to be overreamed at least 1 inch and no more than 3 inches below casings. Overream holes with grooving tools, overreaming buckets or other approved methods.

Construct drilled piers so the maximum time slurry is in contact with uncased portions of holes from drilling through concrete placement does not exceed 36 hours. If this 36 hour time limit is exceeded, the Engineer may require the hole diameter to be enlarged at least 6 inches. If the enlarged hole diameter is greater than the permanent casing diameter, replace casing with a larger permanent casing with an outside diameter equal to the diameter of the enlarged hole.

(2) Slurry Testing

Define a “sample set” as slurry samples collected from mid-height and within 2 feet of the bottom of slurry tanks or holes. Take a sample set from slurry tanks to test slurry before beginning drilling. Do not pump slurry into excavations until both slurry samples from tanks meet the required slurry properties. Take sample sets from excavations to test slurry at least every 4 hours and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Sign, date and submit slurry test reports upon completion of each pier. The Department reserves the right to perform comparison slurry tests at any time.

(3) Disposal

Comply with all Federal, State and local regulations, as well as the project permits and commitments, when disposing of slurry and drilling spoils mixed with slurry.

Contain slurry and drilling spoils and keep out of water at all times.

(D) Cleaning and Inspection

Provide clean holes with level bottoms so elevations within bottom of holes do not vary by more than 12 inches. Remove soft and loose material from bottom of holes using methods accepted in the drilled pier construction plan or approved by the Engineer. When bottom of holes are not hand cleaned, remove sediment from holes with cleanout buckets, air lifts or pumps.

After cleaning is complete, provide all equipment, personnel and assistance required for the Engineer to visually inspect holes from above or by entering excavations. Remove all cleaning and drilling equipment from holes during inspections and do not interfere with inspections.

(1) Tip Resistance

If the Engineer determines that the material below an excavation does not provide the minimum required tip resistance, increase the drilled pier length and lengthen reinforcing steel as directed by the Engineer. One of the following methods may be required to check the conditions and continuity of material below excavations.

(a) Test Hole

If excavations are in rock, drill a 1.5 inch diameter test hole at least 6 feet below bottom of holes to determine the continuity of rock below holes.

(b) Standard Penetration Test

Standard penetration tests (SPT) may be required as noted in the plans. When required, drive a split-barrel sampler 18 inches below bottom of holes or to refusal in accordance with ASTM D1586. Perform SPT in holes at least 12 inches away from casing walls and support drill rods so rods remain vertical and straight. Report the number of blows applied in each 6 inch increment and provide recovered samples to the Engineer. The Engineer will determine the standard penetration resistance required.

(2) Bottom Cleanliness

Holes are clean if at least 50% of bottom of holes has less than 0.5 inch of sediment and no portions of bottom of holes have more than 1.5 inches of sediment. If bottom of holes does not meet this cleanliness criteria, remove sediment from holes until the Engineer determines holes are clean. One or more of the following methods may be required to inspect the bottom cleanliness of holes.

(a) Steel Probe

If drilled pier excavations are not dewatered or as directed by the Engineer, provide a #10 rebar steel probe that is 24 inches long with a flat tip on one end and a non-stretch cable connected to the other end. Provide a cable long enough to lower the steel probe to the bottom of holes for the Engineer to determine the amount of sediment in holes.

(b) Shaft Inspection Device

The Engineer may use the shaft inspection device (SID) as noted in the plans. The Engineer provides the SID and personnel to operate it. Notify the Engineer at least 2 days before finishing holes that will be inspected with the SID.

Assist the Engineer in handling the SID and associated equipment and supporting the SID during inspections. Provide working areas large enough for the SID, associated equipment and SID personnel within reach of the SID cables and clear view of holes being inspected. If necessary, provide a secure location to store the SID and associated equipment onsite overnight.

Approximately one hour is required to inspect a hole with the SID after the SID and associated equipment are set up. The Engineer will use the SID to measure the amount of sediment at 5 locations around the bottom of holes.

(E) Reinforcing Steel and Concrete

Assemble rebar cages consisting of bar and spiral reinforcing steel shown in the plans. Securely cross tie reinforcing steel at each intersection with double wire. Attach a chair under each reinforcing bar and rollers near the top and bottom of rebar cages and every 10 feet along cages in between. The number of rollers required at each location along rebar cages is one roller per foot of design pier diameter with at least 4 rollers per location. Space rollers equally around rebar cages at each location. Attach rollers so rollers are supported across 2 adjacent reinforcing bars and will freely rotate when rebar cages are lowered into excavations.

If CSL tubes are required, securely attach CSL tubes to spiral reinforcing steel on the inside of rebar cages with at least 3 inches of clearance to vertical reinforcing bars. Extend CSL tubes from 6 inches above pier tip elevations to at least 2 feet above the ground line or top of permanent casings, whichever is greater. The number of CSL tubes required for each drilled pier is one tube per foot of design pier diameter with at least 4 tubes per pier. Space CSL tubes equally around rebar cages so distances between tubes measured around spiral reinforcing steel are uniform. Install CSL tubes as straight and parallel to each other as possible. Fit caps on top and bottom of CSL tubes.

After the Engineer determines that the material below excavations provides the minimum required tip resistance and holes are clean, place rebar cages and then concrete in excavations. Do not rack or distort rebar cages and CSL tubes when lifting and handling cages. Set rebar cages directly on bottom of holes or, as approved by the Engineer, hang cages from permanent casings. When hanging rebar cages, leave devices supporting cages in place until Drilled Pier concrete attains a compressive strength of at least 3,000 psi.

Do not delay placing cages or concrete unless excavations are cased to rock or otherwise approved. If delays occur, the Engineer may require removal of rebar cages to reinspect bottom cleanliness of holes. If bottom of holes does not meet the cleanliness criteria in

Subarticle 411-4(D)(2), remove sediment from holes until the Engineer determines holes are clean before resetting rebar cages.

After placing rebar cages with CSL tubes, remove top caps, fill tubes with clean water and reinstall caps before placing concrete. Check for correct cage position before placing concrete and keep rebar cages plumb during concrete placement. Maintain cage position so rebar cages do not move vertically more than 6 inches and columns or footings have the minimum required concrete cover shown in the plans.

Remove all temporary casings during concrete placement. Do not twist, move or otherwise disturb temporary casings until the concrete depth inside casings is at least 10 feet or half the head, whichever is greater, above the bottom of casing being disturbed. Define "head" as the difference between the highest piezometric head along the drilled pier length and the static water elevation inside the excavation.

When removing temporary casings, maintain the required concrete depth above the bottom of casing being removed except when the concrete level is at or above top of piers. Sustain sufficient concrete depths to overcome pressures imposed by earth, backfill and fluids. As temporary casings are withdrawn, ensure fluids trapped behind casings is displaced upward and discharged out of excavations without contaminating or displacing concrete.

Pour concrete in excavations to form uniform jointless monolithic drilled piers. Do not trap soil, air, fluids or other contaminants in concrete. Remove contaminated concrete from top of piers at time of concrete placement.

Inform the Engineer of the volume of concrete placed for each pier. For piers constructed with slurry or as directed by the Engineer, record a graphical plot of depth versus theoretical and actual concrete volumes.

Dry or wet placement of concrete is at the Contractor's option for piers constructed with only casings if the water inflow rate into excavations is less than 6 inches per half hour after removing any pumps from holes. Wet placement of concrete is required for all other drilled pier construction.

(1) Dry Placement

If holes are filling with water for dry placement of concrete, dewater excavations as much as possible before placing concrete. For drilled piers less than 80 feet long, pour concrete down the center of excavations so concrete does not hit reinforcing steel or excavation sidewalls. For piers longer than 80 feet, place concrete with a tremie or pump pipe down the center of excavations so length of free fall is less than 80 feet.

(2) Wet Placement

For wet placement of concrete, maintain static water or slurry levels in holes before placing concrete. Place concrete through steel tremies or pump pipes. Use tremies with watertight joints and a diameter of at least 10 inches. Pump concrete in accordance with Article 420-5. Use approved devices to prevent contaminating concrete when tremies or pump pipes are initially placed in excavations. Keep

tremies or pump pipes embedded into concrete at least 5 feet at all times except when the concrete is initially placed.

When the concrete level reaches the static water elevation inside the excavation, dry placement of concrete is permitted. Before changing to dry placement, pump water or slurry out of holes and remove contaminated concrete from the exposed concrete surface.

411-5 INTEGRITY TESTING

Define "integrity testing" as crosshole sonic logging (CSL) and thermal profile logging (TPL). Integrity testing shall be performed as noted in the plans or as required by the Engineer. Perform TPL testing if required in the contract. The Engineer will determine how many and which drilled piers require integrity testing. For CSL testing, do not test piers until Drilled Pier concrete cures for at least 7 days and attains a compressive strength of at least 3,000 psi.

(A) Crosshole Sonic Logging

If CSL testing is required, use a prequalified CSL Consultant to perform CSL testing and provide CSL reports. Use a CSL Operator approved as a Field Engineer (key person) for the CSL Consultant. Provide CSL reports sealed by an engineer licensed in the State of North Carolina approved as a Project Engineer (key person) for the same CSL Consultant.

(1) CSL Testing

Perform CSL testing in accordance with ASTM D6760. If probes for CSL testing will not pass through to the bottom of CSL tubes, the Engineer may require coring to replace inaccessible tubes. Do not begin coring until core hole size and locations are approved by the Engineer. Core at least 1.5 inches diameter holes the full length of piers. Upon completion of coring, fill holes with clean water and cover to keep out debris. Perform CSL testing in core holes instead of inaccessible tubes.

For piers with 4 or 5 CSL tubes, test all tube pairs. For piers with 6 or more CSL tubes, test all adjacent tube pairs around spiral reinforcing steel and at least 50% of remaining tube pairs selected by the Engineer. Record CSL data at depth intervals of 2.5 inches or less from the bottom of CSL tubes to top of piers.

(2) CSL Testing

Submit each CSL report within 7 days of completing CSL testing. Include the following in CSL reports:

(a) Title Sheet

(i) Department's TIP number and WBS element number

(ii) Project description

(iii) County

(iv) Bridge station number

(v) Pier location

(vi) Personnel

(vii) Report date

(b) Introduction

(c) Site and Subsurface Conditions (including water table elevation)

(d) Pier Details

(i) Pier and casing diameters, lengths and elevations

(ii) Drilled Pier concrete compressive strength

(iii) Installation methods including use of casings, slurry, pumps, tremies, dry or wet placement of concrete, etc.

(e) CSL Results

(i) Logs with plots of signal arrival times and energy vs. depth for all tube pairs tested

(f) Summary/Conclusions

(i) Table of first arrival time (FAT) increases greater than 30% of the local average FAT value with corresponding locations (tube pair(s) and depth ranges) for all tube pairs tested

(ii) Table of relative energy reductions 9 dB greater than the local average relative energy value with corresponding locations (tube pair(s) and depth ranges) for all tube pairs tested

(iii) List of suspected anomalies with corresponding locations (tube pair(s) and depth ranges)

(g) Attachments

(i) Boring log(s)

(ii) Field inspection forms and concrete curves (from Engineer)

(iii) CSL tube locations, elevations, lengths and identifications

(iv) CSL hardware model and software version information

(v) PDF copy of all CSL data

(B) Drilled Pier Evaluation

Define “drilled pier evaluation” as any additional testing, excavation or coring following integrity testing. Based on concrete placement and CSL results, the Engineer will determine if drilled piers require evaluation within 7 days of receiving CSL reports, in accordance with Table 411-4.

TABLE 411-4
DRILLED PIER EVALUATION CRITERIA

FAT Increase	Relative Energy Reduction	Evaluation Required?
≤ 30%	≤ 9 dB	No
> 30%	≤ 9 dB	Yes
≤ 30%	> 9 dB	Yes
> 30%	> 9 dB	Yes

If drilled pier evaluation is necessary, use one or more of the following methods, or any other methods approved by the Engineer to investigate the pier.

(1) CSL Testing

Use CSL testing as described in Subarticle 511-5(A) and perform testing with probes vertically offset in CSL tubes. CSL offset data will typically be required for all locations (tube pair and depth) where first arrival time increases are greater than 30% and relative energy reduction exceeds 9 dB. Record offset data at depths, intervals and angles needed to completely delineate anomalies.

Provide CSL reports that meet Subarticle 411-5(A)(2). When CSL offset data is required, perform tomographic analysis and provide 3 dimensional color coded tomographic images of piers showing locations and sizes of anomalies.

(2) Excavation

Excavate around piers and remove permanent casing as needed to expose Drilled Pier concrete. Do not damage piers when excavating or removing casings. The Engineer will determine the portions of piers to expose.

(3) Coring

Core piers and provide PQ size cores that meet ASTM D2113. The Engineer will determine the number, location and depth of core holes required based on CSL and Tomographic Analysis. Handle, log and store concrete cores with methods acceptable to the Engineer. Use a consultant with an engineer licensed in the State of North Carolina to log cores and use a qualified NCDOT laboratory to test strength of the selected core specimens.

Submit to the Engineer the investigation results in a drilled pier evaluation report sealed by an engineer licensed in the State of North Carolina for review and approval.

(C) Drilled Pier Remediation

If the Engineer determines a drilled pier is unacceptable, remediation is required. Remediation may include, but is not limited to hydroblasting and pressure grouting, utilizing micropiles within the drilled pier to transfer load above and below a defect, removing part or all of unacceptable drilled piers, modifying drilled pier design or providing replacement or additional drilled piers, micropiles, and/or driven piles within a pier footing or bent cap. Submit a drilled pier remediation report including the working drawings and design calculations for acceptance in accordance with Article 105-2. Ensure the drilled pier remediation report is designed, detailed and sealed by an engineer licensed in the State of North Carolina. Do not begin remediation work until remediation

plans are approved by the Engineer. When repairing unacceptable piers, perform post repair verification testing to gauge success of the repair.

411-6 DRILLED PIER ACCEPTANCE

Drilled pier acceptance is based in part on the following criteria:

(A) Temporary casings and drilling tools are removed from the drilled pier excavation or the Engineer determines that a temporary casing may remain in the excavation.

(B) Drilled Pier concrete is properly placed and does not have any evidence of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing) and meets compressive strength required in Table 1000-1.

(C) Center of pier is within 3 inches of plan location and 2% of plumb. Top of pier is within 1 inch above and 3 inches below the elevation shown in the plans or approved by the Engineer.

(D) Rebar cage is properly placed and top and center of cage is within tolerances for center of pier. Tip of permanent casing does not extend below the elevation noted in the plans or approved by the Engineer.

(E) CSL report meeting Subarticle 411-5(A)(2).

(F) Drilled pier evaluation report meeting Subarticle 411-5(B).

(G) Drilled pier remediation report meeting Subarticle 411-5(C).

Do not grout CSL tubes or core holes, backfill around a pier or perform any work on a drilled pier until the Engineer accepts the pier. If the drilled pier is accepted by the Engineer, dewater and grout CSL tubes and core holes, and backfill around the pier with approved material to finished grade. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

411-7 MEASUREMENT AND PAYMENT

____ *Dia. Drilled Piers in Soil*, ____ *Dia. Drilled Piers Not in Soil* and ____ *Dia. Drill Piers* will be measured and paid in linear feet. Acceptable drilled piers will be measured as the difference between the specified top of pier and pier tip elevations or revised elevations approved by the Engineer.

For bents with a not in soil pay item shown in the plans, drilled piers will be paid as ____ *Dia. Drilled Piers in Soil* and ____ *Dia. Drilled Piers Not in Soil*. Define "not in soil" as material with a rock auger penetration rate of less than 2 inches per 5 minutes of drilling at full crowd force. When not in soil is encountered, seams, voids and weathered rock less than 3 feet thick with a rock auger penetration rate of greater than 2 inches per 5 minutes of drilling at full crowd force will be paid at the contract unit price for ____ *Dia. Drilled Piers Not in Soil*. Seams, voids and weathered rock greater than 3 feet thick will be paid at the contract unit price for ____ *Dia. Drilled Piers in Soil* where not in soil is no longer encountered. For bents with a not in soil pay item shown in the plans, drilled piers through air or water will be paid at the contract unit price for ____ *Dia. Drilled Piers in Soil*.

For bents without a not in soil pay item shown in the plans, drilled piers will be paid as ____ *Dia. Drill Piers*. The contract unit price for ____ *Dia. Drilled Piers* will be full compensation for drilling through any materials encountered.

The contract unit prices for ____ *Dia. Drilled Piers in Soil*, ____ *Dia. Drilled Piers Not in Soil* and ____ *Dia. Drill Piers* will also be full compensation for spoils and slurry containment and disposal, supplying and placing Drilled Pier concrete, material and testing requirements in Subarticle 411-2(E), temporary casing and slurry construction including a slurry manufacturer representative and overreaming and enlarging piers and any concrete removal, miscellaneous grading and excavation. No additional payment will be made for excess Drilled Pier concrete due to caving or sloughing holes or telescoping casings.

Reinforcing steel will be measured and paid in accordance with Article 425-6.

Permanent Steel Casing for ____ Dia. Drilled Pier will be measured and paid in linear feet. Permanent casings will only be paid for when required by the Engineer or shown in the plans. Permanent casings will be measured as the difference between the ground line or specified top of pier elevation, whichever is higher, and the specified permanent casing tip elevation or revised elevation approved by the Engineer. If a permanent casing cannot be installed to the casing tip elevation shown in the plans, up to 3 feet of casing cut-off will be paid at the contract unit price for *Permanent Steel Casing for ____ Dia. Drilled Pier*.

SID Inspections will be measured and paid in units of each. *SID Inspections* will be measured as one per pier. The contract unit price for *SID Inspections* will be full compensation for inspecting holes with the SID the first time. No additional payment will be made for subsequent inspections of the same hole.

The Contractor is responsible for any damage to the SID equipment due to the Contractor's fault or negligence. Replace any damaged equipment at no additional cost to the Department.

SPT Testing will be measured and paid in units of each. *SPT Testing* will be measured as the number of standard penetration tests performed except no payment will be made for *SPT Testing* to determine if temporary casing is necessary.

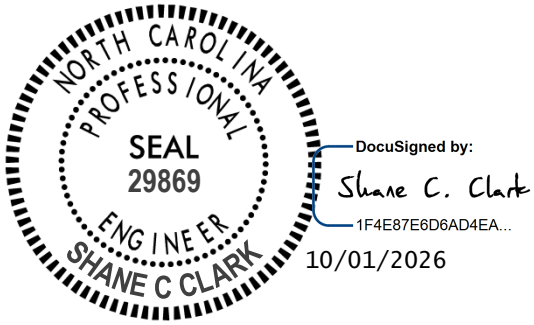
CSL Testing will be measured and paid in units of each. *CSL Testing* will be measured as one per pier. The contract unit price for *CSL Testing* will be full compensation for performing initial CSL testing and providing CSL reports. Subsequent CSL testing of and CSL reports for the same pier will be considered further investigation. No separate payment will be made for CSL tubes. CSL tubes including coring for inaccessible tubes and grouting will be incidental to the contract unit prices for drilled piers.

No payment will be made for stuck temporary casings that cannot be removed from drilled pier excavations or additional drilled pier length and reinforcing steel required due to temporary casings that remain in excavations. Drilled pier evaluations of piers that are acceptable based on drilled pier evaluation reports will be paid as extra work in accordance with Article 104-7. No payment will be made for drilled pier evaluations of unacceptable drilled piers, drilled pier

remediation or post repair testing.

Payment will be made under:

Pay Item	**Pay Unit**
____ Dia. Drilled Piers in Soil	Linear Foot
____ Dia. Drilled Piers Not in Soil	Linear Foot
____ Dia. Drilled Piers	Linear Foot
Permanent Steel Casing for ____ Dia. Drilled Piers	Linear Foot
SID Inspections	Each
SPT Testing	Each
CSL Testing	Each



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NEXT GENERATION CONCRETE SURFACE (NGCS) GRINDING:

(05/10/2024)

Description

This standard specifies the procedures for project level construction of the Next Generation Concrete Surface (NGCS) Grinding on existing or newly constructed roadways using diamond grinding and grooving techniques. This standard does not apply to any other diamond grinding or grooving processes.

Equipment

Grinding shall be accomplished using diamond blades mounted on a self-propelled machine designed specifically for diamond grinding and texturing pavement. The equipment shall weigh a minimum of 35,000 pounds including the grinding head and be of a size that will grind a strip at least 4 feet wide in a single pass, and can produce overlapping match lines out of the wheel path. The effective wheel base of the machine shall be no less than 12 feet. The effective wheel base is defined as the distance from the front wheel assembly transverse pivot point to the transverse pivot point of the profile/depth control/ ground drive wheels.

Grinding equipment that causes raveling, aggregate fractures, spalls, or disturbance to the transverse or longitudinal joints shall not be permitted. The equipment shall have a positive means of vacuuming the grinding residue from the pavement surface leaving the surface in a clean, near-dry condition.

The equipment shall be maintained to ensure it is in proper working order, with attention paid to the "roundness" of the match and depth control wheels. Any wheels found to be out of round shall be replaced immediately.

Method of Construction

The construction operation shall be scheduled and proceed in a manner that produces a neat, uniform finished surface. Shoulder, auxiliary or ramp lane grinding shall transition from the edge of the mainline as required to provide drainage, leaving no more than a 3/16 inch ridge and an acceptable riding surface. When conditions require a feather pass into the shoulder, auxiliary or ramp lanes, conventional diamond grinding shall be used. Full- and partial-depth concrete repairs, slab stabilization and dowel bar retrofit shall be completed prior to any grinding. Joint sealing shall be completed subsequent to the diamond grinding operations and shall be installed in a recessed condition.

Grinding shall be accomplished in a manner that eliminates joint or crack faults so there is no more than a 1/16 inch differential between the adjacent sides of the joints and cracks. Grinding shall also substantially remove pavement conditions such as warp and curl to provide an acceptable ride.
Lateral drainage shall be achieved by maintaining a constant cross slope between grinding extremities in each lane. The finished cross slope shall mirror the pre-grind cross slope and shall have no depressions or misalignment of slope greater than 1/8 inch in 12 feet when measured with a 12 foot straightedge placed perpendicular to the centerline. Straightedge requirements will not apply across longitudinal joints or outside the ground area.

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Grinding shall begin and end at lines normal to the pavement centerline at the project limits. Passes of the grinding head shall not overlap more than 1-2 inches. No unground surface area between passes will be permitted.

Two-Pass NGCS Operation – This construction operation will allow for two separate operations to construct the NGCS section. The first operation will create the flush ground surface. The flush grind blades shall be mounted on a minimum 4 foot grinding head, stacked with 0.125 inch wide blades separated by 0.035 +/-0.005 inch wide spacers resulting in 92 to 100 blades per foot. The blades used to produce the flush ground surface shall be flat across their contact surface and in the same plane with other flush grind blades when mounted. The complete head, when stacked with all blades, shall be straight across its length without bowing when mounted on the diamond grinding machine. No unground surface area between passes will be permitted. The smoothness levels stated within this standard must be attained and measured to the satisfaction of the Engineer prior to constructing the second operation. The second operation will provide the longitudinal grooves. The longitudinal grooving blades shall be 0.095 +/- 0.05 inches wide and will produce grooves 1/8 inch to 3/16 inch in depth. The longitudinal grooves will be spaced on 1/2 inch to 5/8 inch centers. The grooves shall be constructed parallel to the centerline. The contractor shall use a guide to ensure proper alignment of the grooves to centerline.

Final Surface Finish

The NGCS grinding process shall produce a pavement surface that is true to grade and uniform in appearance with a longitudinal grooved texture. The flush ground surface shall appear smooth and shall contain no ridges that exceed 1/32 inch. The longitudinal grooves shall be constructed parallel to the centerline. At a minimum, 98% of the pavement surface shall be textured utilizing the NGCS. Depressed pavement areas due to subsidence, edge slump or other localized causes will be excluded from this requirement when approved by the Engineer.

Smoothness Requirements

Final surface testing is required on this project in accordance with Article 710-7 of the *2024 Standard Specifications.* All corrective actions must be approved by the Engineer.

Disposal of Residual Slurry

Diamond grinding slurry management and disposal shall be in accordance with the latest Permit No. WQ0035749. The contractor shall dispose of the slurry at a permitted facility No direct discharge or land application of diamond grinding slurry is permitted. 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. The Engineer shall review the slurry disposal plan. The plan must be accepted prior to beginning the diamond grinding operation.

> To prevent the migration of any accidental discharge from the diamond grinding machine entering a drainage inlet or structure, the contractor shall install wattles and silt fence at the direction of the Engineer. Silt Fence shall be installed in accordance with Section 1605 of the NCDOT *2024 Standard Specifications*.

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For more detailed information, see the Environmental Permits and Guidelines section under Environmental resources on the NC Connect website for the DG permit and guidelines at the following link. (NCID access required.)

https://connect.ncdot.gov/resources/Environmental/Environmental%20Permits%20and%20Guidelines/Forms/AllItems.aspx

Measurement and Payment

NGCS construction will be measured by the square yard. The measurement will be the final textured surface area regardless of the number of passes required to achieve acceptable results.
Minor areas of unground pavement within the designated areas to be ground will be included in the measurement. When conditions require a feather pass into the shoulder, auxiliary or ramp lanes, conventional diamond grinding shall be used. Payment will be by the square yard based on a width of 2 feet times the length of the required feather pass. The minimum length of feather pass will be 100 feet.

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.

Temporary Silt Fence will be measured and paid in linear feet, accepted in place, along the ground line of the fence.

Wattle will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattle*.

Payment will be made under:

Pay Item	**Pay Unit**
Next Generation Concrete Surface (NGCS) Grinding	Square Yard
Temporary Silt Fence	Linear Foot
Wattle	Linear Foot



9/1/2026

Docusign Envelope ID: 6B545A9E-F27A-8CE0-8218-AEEF8C969FDC

RELOCATE EXISTING WAY FINDING ASSEMBLY:

(A) DESCRIPTION

Remove and reinstall existing way finding assemblies in locations shown on the signing plans and in accordance with the contract.

(B) MATERIALS

Furnish and install attachment hardware and foundation (if applicable) per manufacturer specifications. Original manufacturer to be provided by the Engineer if available.

(C) CONSTRUCTION METHODS

For an existing way finding assembly noted on the signing plans for relocation, notify the Engineer in writing two (2) weeks prior to commencement of construction activities in the block in which the existing way finding sign assembly is located.

Prior to removal of the way finding assembly, document the sign condition using photography or video. Remove the existing way finding assembly and transport to a location specified by the Engineer for temporary stockpiling. Upon stockpiling the way finding sign, document the condition of the sign. Dispose of any non-reusable hardware and footing(s) per NCDOT Standard Specification 907 (if applicable). Provide all sign condition documentation to the Engineer.

Reinstall the existing way finding assembly in its final location as noted on the proposed signing plans, obtaining approval to reinstall from the Engineer prior to reinstallation. Furnish and install attachment hardware and foundation (if applicable) per manufacturer specifications. After the wayfinding sign has been reinstalled, document the condition of the way finding sign using photography or video and provide that documentation to the Engineer.

Repair any areas or materials within the project limits disturbed or damaged in the performance of the work required under this section as directed by the Engineer.

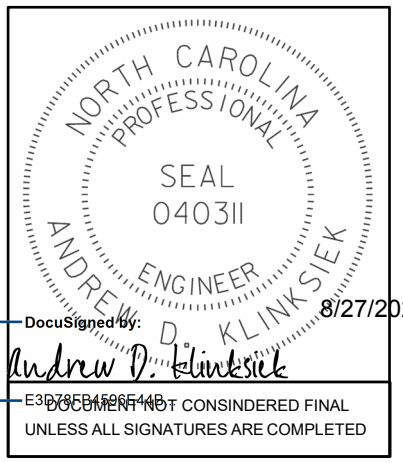
(D) MEASUREMENT AND PAYMENT

Relocate Existing Way Finding Assembly will be measured and paid as the actual number of way finding assemblies satisfactorily removed, temporarily stockpiled, reinstalled and accepted by the Engineer.

The Engineer shall not be liable for any damage in the removal, transit, or reinstallation of relocated way finding signs.

Replacement of existing supports, regardless of type, and any required footings is incidental to the work performed for *Relocate Existing Way Finding Assembly.*

Payment will be made under:



Pay Item	Pay Unit
Relocate Existing Way Finding Assembly	Each

Docusign Envelope ID: 6B545A9E-F27A-8CE0-8218-AEEF8C969FDC

STOCKPILE EXISTING WAY FINDING ASSEMBLY:

(A) DESCRIPTION

Properly stockpile existing way finding assemblies in accordance with the contract.

(B) CONSTRUCTION METHODS

For an existing way finding assembly noted on the signing plans for stockpiling, notify the Engineer in writing two (2) weeks prior to commencement of construction activities in the block in which the existing way finding sign assembly is located.

Prior to removal of the way finding assembly, document the sign condition using photography or video. Remove the existing way finding assembly and transport to a location specified by the Engineer for stockpiling. Upon stockpiling the way finding sign, document the condition of the sign. Dispose of any non-reusable hardware and footing(s) per NCDOT Standard Specification 907 (if applicable). Provide all sign condition documentation to the Engineer.

Repair any areas or materials within the project limits disturbed or damaged in the performance of the work required under this section as directed by the Engineer.

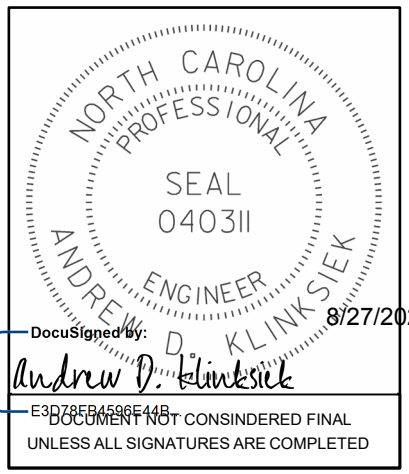
(C) MEASUREMENT AND PAYMENT

Stockpile Existing Way Finding Assembly will be measured and paid as the actual number of way finding assemblies satisfactorily removed, stockpiled and accepted by the Engineer.

The Engineer shall not be liable for any damage in the removal or transit of the stockpiled way finding signs.

Payment will be made under:

Pay Item	**Pay Unit**
Stockpile Existing Way Finding Assembly	Each



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STOCKPILE OF SIGN, LOGO BUSINESS PANEL:

(A) DESCRIPTION

Properly stockpile Logo Business Panels.

(B) CONSTRUCTION METHODS

Repair any areas or materials within the project limits disturbed or damaged in the performance of the work required under this section as directed by the Engineer.

Do not stockpile Logo Business Panel until directed by the Engineer or North Carolina Signing Program.

Before stockpiling, remove Logo Business Panel from existing logo panel. The North Carolina Signing Program maintains ownership of all materials to be stockpiled. Transport and stockpile Logo Business Panel to a location directed by the Engineer or North Carolina Signing Program. Sort and stockpile all materials neatly in stacks or storage bins. Repair or replace materials damaged in the removal or while in storage.

(C) MEASUREMENT AND PAYMENT

Stockpile of Sign, Logo Business Panel will be measured and paid for as the actual number of unique Logo Business Panels acceptably stockpiled. Removal is incidental to stockpiling.

Repair or replacement of any materials or areas within the project limits disturbed or damaged in the performance of the work required under this section will be at no cost to the Department.

Payment will be made under:

Pay Item	**Pay Unit**
Stockpile of Sign, Logo Business Panel	Each

NORTH CAROLINA PROFESSIONAL SEAL 040311 ENGINEER ANDREW D. KLINKSIEK

8/27/2026

DocuSigned by:
Andrew D. Klinksiek
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DOCUMENT NOT CONSINDERED FINAL UNLESS ALL SIGNATURES ARE COMPLETED



Signed by:
Matthew V. Springer
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06/17/2025

YIELD LINES PAVEMENT MARKING:
(1-15-24)(Rev. 6-17-25)

Description

Install yield lines in accordance with this special provision, Section 1205 of the *Standard Specifications* and as directed by the Engineer.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	**Section**
Pavement Markings	1087

The material for yield line pavement markings shall be thermoplastic, integrated multipolymer, polyurea, type III cold applied plastic, or heated-in-place thermoplastic. Paint may be used for temporary yield line pavement markings.

Application

Refer to Section 1205 of the *Standard Specifications* and refer to Division 12 of the *Roadway Standard Drawings* on application of products used for yield lines. Refer to the integrated multipolymer (IMP) pavement marking special provision found elsewhere in this contract as applicable. Yield lines shall be a row of solid white isosceles triangles with 3 to 12 inches between each one, 12 to 24 inches in width, with a height 1.5 times the width. Yield lines shall point towards traffic, and they shall be placed at least 4 feet before the nearest controlled crosswalk. For unsignalized midblock crosswalks, yield lines shall be placed with the Yield Here to Pedestrians sign located 20 to 50 feet in advance of the crosswalk. Yield lines are not symbols or characters.

Measurement and Payment

Yield Line _____ Pavement Marking, __", __mils (for thermoplastic, integrated multipolymer, polyurea and heated-in-place thermoplastic material), *Yield Line Pavement Marking, Type III (__")* (for Type 3 cold applied plastic material), or *Yield Line Pavement Marking, __"* (for paint material) will be measured and paid as the actual number of linear feet of pavement marking lines satisfactorily placed and accepted by the Engineer. The quantity of lines will be the summation of the linear feet of solid line measured end-to-end of the line.

Payment will be made under:

Pay Item	**Pay Unit**
Yield Line _____ Pavement Marking, __", __mils	Linear Feet
Yield Line Cold Applied Plastic Pavement Marking, Type III (__")	Linear Feet
Yield Line Paint Pavement Marking, __"	Linear Feet

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September 02, 2026

WORK ZONE TRAFFIC CONTROL
Project Special Provisions
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Covering of Signs	TC-40

Signed by:
J.W. Woolard, Jr.
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NORTH CAROLINA PROFESSIONAL SEAL 19862 ENGINEER J. W. WOOLARD, JR.

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I-2513AC Buncombe County
September 02, 2026

ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES

(10/31/2017) (Rev. 6/3/2022)

Description

Furnish, install, and maintain all ADA compliant pedestrian traffic control devices for existing pedestrian facilities that are disrupted, closed, or relocated by planned work activities.

The ADA compliant pedestrian traffic control devices used to either close, redirect, divert or detour pedestrian traffic are Pedestrian Channelizing Devices.

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.

lations. All detectable warning features are to be included with these installations.

Measurement and Payment

Pedestrian Channelizing Devices will be measured and paid as the maximum number of linear feet of *Pedestrian Channelizing Devices* furnished, acceptably placed, and in use at any one time during the life of the project.

No direct payment will be made for any sign affixed to a pedestrian channelizing device. Signs mounted to pedestrian channelizing devices will be considered incidental to the device.

Payment will be made under:

Pay Item	Pay Unit
Pedestrian Channelizing Devices	Linear Foot

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CONNECTED LANE CLOSURE SYSTEM
(10/29/2018) (Rev. 2/17/2026)

Description

Furnish, install, operate, maintain, relocate, and remove Connected Lane Closure Systems (CLCS) for lane closures on multi-lane roadways with posted speed limits of 55 mph and greater. The purpose of CLCS is to transmit real-time information of active lane closures for use by the State Transportation Operations Center (STOC), Regional Transportation Management Centers (TMCs), and traveler information systems; and for third party vendors (Mapping, Navigation, Connected Vehicles, etc.) to identify and provide advanced notification of active lane closures to approaching motorists.

Materials

The CLCS shall be designed and built to transmit the real-time location and direction of the lane closure. The information transmitted shall conform to the current version of the USDOT's Work Zone Data Exchange (WZDx) specification and be made available to NCDOT approved consumers of this data. More information about the WZDx specification can be found at (https://www.transportation.gov/av/data/wzdx

The connected lane closure devices shall be capable of wireless communication.

The initial connected device representing the START location 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. The connected device shall no longer transmit location information when the flashing arrow board is turned off or changed to caution mode. The device shall have a visual indicator (e.g. an illuminated light, either steady burn or flash) to allow clear, visual proof the device is powered on, has established communication and is transmitting. The visual indicator shall not be located such that it potentially creates confusion for the motorists.

A second connected device representing the END location 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 the device has established communication and is transmitting. The light may be either steady burn or flashing and shall not exceed one (1)

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inch in diameter. This second connected device representing the END location may be created virtually by a connected flashing arrow board.

The devices shall have sufficient battery life to maintain operation for the duration of the lane closure or can be recharged without deactivating the device or impacting the lane closure information transmitted to the external parties. All costs associated with charging are incidental and shall be included in the cost of the system.

Construction Methods

CLCS shall be used on all lane closures on multi-lane roadways with posted speed limits of 55 mph and greater throughout the duration of the project.

A START and END location shall be established by the installed system 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. The other at the last traffic control device at the end of the lane closure(s) if the END location cannot be created virtually. 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 transmit location information if equipped with connected devices. Subsequent lane closures occurring downstream of where all lanes have been reopened or 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 or virtually created 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.

When the lane closure is removed, the flashing arrow board shall be turned off or changed to caution mode, and the connected device shall automatically turn off simultaneously and shall no longer transmit location information. Turning the device away from traffic or moving the device to a staging area with the arrow board in arrow mode is not acceptable.

The CLCS shall run continuously during any active lane closure for the duration of the contract. 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.

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Technical Requirements

The GPS within the connected devices shall have a horizontal accuracy of 10 feet, 95% of the time.

The system shall send real-time alerts to designated NCDOT personnel when the flashing arrow mode or direction is changed. The alert shall be within 5 minutes of the actual change.

The connected device shall transmit a Connected Work Zone (CWZ) Device Feed in compliance with the Work Zone Data Exchange (WZDx) specification (WZDx Specification (Field Device) / Connected Work Zone Specification (CWZ)). The feed shall be transmitted within five (5) minutes of initiation and updated every fifteen (15) minutes to the central server.

All required properties shall be transmitted. In addition, the following properties are also require:

- Road Direction
- Road Name
- Status Messages
- Is in Transport Position

More information about the WZDx specification can be found at https://www.transportation.gov/av/data/wzdx.

The Contractor shall provide multiple logins to a secured server (e.g. vendor dashboard) that provides real-time and historic status. The status must be exportable, within 24 hours, in .csv or .xls/.xlsx format and include data for date, device name, flashing arrow mode, communication status, road name, road direction, battery voltage, time on, time off, and GPS coordinates. The historic logged information shall be available to CLCS users 24/7/365 during the length of the entire construction phase. All logged information from the project shall be retained by the Contractor and be available to the NCDOT for at least three (3) years after the contract ends.

The battery voltage shall be collected at least once an hour. The information shall be stored and available for troubleshooting. To prevent communication loss, the system shall transmit an alert via E-mail or SMS to designated personnel if the battery voltage of a device is under a specified threshold.

The CLCS shall provide an immediate electronic alert (e.g. via E-mail or SMS) to the Traffic Control Supervisor or other designated individual if a device is not transmitting its position for a period of 30 minutes or more.

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The outputs from the connected device on the arrow board and the downstream connected (or virtual) device at the end of the lane closure shall be easily identifiable as a single system, 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 system.

Measurement and Payment

Connected Lane Closure System will be measured and paid as the maximum number of connected systems acceptably placed and in use at any one time during the life of the project. Each lane closure system may be satisfied by one of the following:

- 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.

- One (1) connected lane closure device connected to the flashing arrow board that can generate a virtual END location with 10’ accuracy.

All devices for each system must be functioning properly to receive payment for the system. No payment will be made for a system until all devices are satisfactorily installed and operational at the device and on the vendors dashboard. A copy of the device status reporting should be provided by the Contractor every 2 weeks.

The price for each connected lane closure system will cover all material, labor, maintenance, relocation, removal, and communication costs required for the duration of the project.

Flashing arrow boards and crashworthy devices (such as drums) used to mount the downstream connected lane closure device are paid separately elsewhere in this Contract.

Pay Item	**Pay Unit**
Connected Lane Closure System	Each

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September 02, 2026

HIGH VISIBILITY DEVICES
(10/25/2019) (Rev. 5/19/2026)

Description

Furnish and install high visibility devices on all roadways within the project limits with speed limits of 55 mph or higher.

Materials

(A) General

Use the following high visibility devices for work zone performance applications that are listed on the NCDOT APL.

(a) Drums
(b) Skinny Drums
(c) Work Zone Stationary Signs
(d) Work Zone Rigid Portable Signs (nighttime use)

All drums and skinny drums shall meet the requirements of Article 1089-5 of the *Standard Specifications* and shall have Grade B flexible, fluorescent orange sheeting that meets the retroreflective requirements of Article 1092-2 of the *Standard Specifications*.

All stationary work zone signs shall meet the requirements of Articles 1089-1 and 1089-2 of the *Standard Specifications*. Legend overlays are prohibited. Vertical sign post reflector strips shall be added to all stationary sign supports. Use Grade B fluorescent orange for work zone sign supports and Grade B fluorescent yellow for exit sign supports. Install sign post reflector strips a minimum of 2” wide, a minimum of 6’ long on sign supports with one sign mounted and a minimum of 4.5’ long for sign supports with two or more signs mounted vertically.

All portable work zone signs shall meet the requirements of Article 1089-1 and 1089-2 of the *Standard Specifications*. However, roll-up signs are prohibited for night work.

(B) Material Qualifications/Certifications

Provide a Type 3 Material Certification for all materials in accordance with Articles 106-3 and 1087-4 of the *Standard Specifications*.

Construction Methods

Install high visibility devices in accordance with this special provision and the applicable requirements of Section 1110, 1130 and 1180 of the *Standard Specifications*.

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Maintenance

Replace any sign or drum that prematurely fails due to any damage or defect that causes it to perform unsatisfactorily with a 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.

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 work zone high visibility stationary sign supports or portable sign stands. All work zone high visibility stationary sign supports or portable sign stands will be incidental to the work of providing *High Visibility Stationary Signs* or *High Visibility Portable Signs* respectively. Relocation, replacement, repair, disposal and maintenance of high visibility devices will be incidental to the work of this special provision. Relocation, replacement, repair, disposal or maintenance of ballasts or reflective sheeting will be incidental to the work of this special provision.

Payment will be made under:

Pay Item:	**Pay Unit**
High Visibility Drums	Each
High Visibility Skinny Drums	Each
High Visibility Stationary Signs	Square Foot
High Visibility Portable Signs	Square Foot

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TEMPORARY GLARE SCREEN:

(02/06/2013) (Rev. 10/13/2023)

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 pounds. Use galvanized mounting hardware in accordance with Section 1076 of the the NCDOT *Standard Specifications for Roads and Structures (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.

Anchor the modular units to the barrier using either a mechanical or adhesive system with a 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 NCDOT *Standard Specifications*.

Construction Methods

Section 1105-3 of the NCDOT *Standard Specifications* applies to this special provision.

Maintenance

Maintain Temporary Glare Screen in accordance with Section 1105-4 of the NCDOT *Standard Specifications*.

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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

TEMPORARY PORTABLE TRAFFIC SIGNAL SYSTEM:
(07/14/2015) (Rev. 12/19/2025)

Description

Furnish, install, place in operation, repair, maintain, relocate, and remove the temporary portable traffic / driveway signal system for traffic maintenance. The portable traffic / driveway signals will require a system that is coordinated to maintain safe and efficient traffic operations along -Y14- State Street during construction. The system will contain **(2)** trailer mounted traffic signal units along -**Y14- State Street** along with **(2)** additional trailer mounted traffic signal unit(s) at the intersection of **-Y14- State Street and -Y15- Hanover Street**. These units shall communicate and operate with the **5** driveway units.

Materials

Provide:

(4) Temporary Portable Traffic Signals (PTS) - Each shall be a trailer mounted unit with two 12” signal heads per trailer. One signal head shall be mounted on an overhead mast arm capable of extending over the travel lane. The other signal shall be mounted on a vertical upright. Each PTS unit shall be equipped with traffic detection equipment.

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(5) Residential Driveway Temporary Signals (DS) – Each shall be a trailer or cart mounted unit with 1 signal head per trailer per the specification contained herein. Each DS shall be equipped with traffic detection equipment.

All signal units must be on the NCDOT Qualified Products List (PTS) and Approved Products List (DS).

(DS) Trailer / Cart Requirements

Each DS trailer shall be equipped with batteries in a lockable, weatherproof compartment and shall be capable of a minimum of 21 days of continuous operation at temperatures at or above (50º F) without charging. The trailer shall also be equipped with a solar charging system to facilitate continuous operation for a minimum of 45 days based on temperatures of (50° F) or greater. The DS trailer shall be painted highway safety orange. Each trailer shall be clearly identified with the manufacturer, serial number and emergency phone number.

Signal Head / Display Requirements

The DS trailer shall be equipped with one three-section signal head in an inverted "T" configuration consisting of one 12" steady circular red LED indication on top and two adjacent 8" (minimum) or 12" (maximum) flashing arrow yellow LED indications on the bottom. Signal heads shall be mounted on a retractable vertical upright and equipped with a manual hand crank.

LED indications shall conform to the ITE performance specifications for Vehicle Traffic Control Signal Heads. Signal heads shall be equipped with visors which extend beyond the signal head a minimum of 8". The signal heads shall have the ability to accommodate back plates. The signal head shall be mounted to a vertical upright at a minimum height of 9' measured from the bottom of the green indication to the road surface.

Signage for Driveway Signal Unit

The trailer shall be able to accommodate a minimum of two rigid signs. The signs shall display NO TURN ON RED and TURN ONLY IN DIRECTION OF ARROW. Additional sign legends may be used, as directed by the engineer.

Communication Requirements

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All PTS and DS shall maintain communication at all times. Acceptable communication shall be either hardwire cable or wireless radio link communication. If the hardwire cable communication is utilized the communication cable shall be deployed in a manner that will not intrude in the direct work area of the project or obstruct vehicular and pedestrian traffic. If the wireless radio link communication option is utilized clear line of sight between signals within the signal setup shall be maintained. Radio communication shall utilize the 900MHz frequency band and have frequency hopping capability. The radio link communication system shall have a minimum range of (1 mile).

Fault Mode Requirements

The PTS and DS shall revert to a solid red mode upon system default. The default setting shall be solid red unless otherwise specified by the project engineer. The temporary portable traffic / driveway signal system repairs shall be the responsibility of the contactor and shall be rendered in a manner that will return the system to full operation in the most expeditious manner. The PTS shall be equipped with a remote monitoring system. Where cell communication availability exists, the remote monitoring system shall have capabilities as described in the Remote Monitoring System section of this specification.

Remote Monitoring System

The remote monitoring system (RMS) shall be capable of reporting signal location, battery voltage / battery history and system default. The RMS shall include a password protected web site viewable from any computer with internet capability. In the event of a system default the RMS shall provide specific information concerning the cause of the system default (i.e. red lamp on signal number 1). The RMS shall be equipped with a mechanism capable of immediately contacting a minimum of three previously designated individuals via text messaging and/or email upon a default.

The running program operating the PTS system shall be available and viewable through the RMS website at all times. The RMS shall maintain a history of the operating system in each signal including operating hours and events and the location of the PTS trailer. The RMS is not required as part of this bid proposal.

Implementation

Notify the Engineer at least thirty (30) calendar days prior to installation so that coordination can begin to provide public notification to all dwellings that will be utilizing the DS. This can be done with a flyer, mailer, or door hanger as described in **Attachment 1**.

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The signal system shall operate in a rest in red, first-come, first-served mode, unless specifically directed otherwise by the Engineer. When a DS unit detects a vehicle, it shall input a call to both mainline PTS units.

Deployment and installation of the system shall only be facilitated by personnel that have been factory trained and fully authorized by the manufacturers.

Measurement and Payment

The Temporary Portable Traffic Signal System will be measured as the **(4)** trailer mounted units (PTS) and the **(5)** driveway units (DS) furnished, installed, operated, removed and accepted.

No measurement will be made for operation, relocation, maintenance, removal, or use of flaggers during repair periods as these will be considered incidental to furnishing, installing, and operating the temporary portable traffic signal system.

No measurement will be made for signal controllers, communication, vehicle detection system, and traffic signal software as these will be considered incidental to furnishing, installing, and operating the temporary portable traffic signal system.

No payment will be made until signal timing and operation has been field verified and accepted by the Engineer.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Portable Traffic Signal System	Each

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Attachment 1:
Public Notice

Soon, the traffic pattern on State Street will change from a two-lane/two-way road into a single lane with drivers in each direction taking turns crossing the single lane. We implement this type of temporary traffic pattern for long-term lane closures needed for construction. As part of this change, temporary portable traffic signals will be placed on either end of State Street. To allow you safe access to State Street, a temporary signal device will be placed within sight of the end of your road or driveway. This signal will indicate via a flashing yellow arrow which direction the traffic is flowing through the single lane. The direction the arrow is flashing is the direction you may safely turn on to State Street. The signal will also include a red light, which instructs you to stop and not make any turns until you see the signal change to a flashing yellow arrow; then you should turn only in the direction of the flashing yellow arrow.

Thank you for your patience while the construction in your area is underway. Please enter the work zone safely and stay alert to the signs and signals as you proceed.

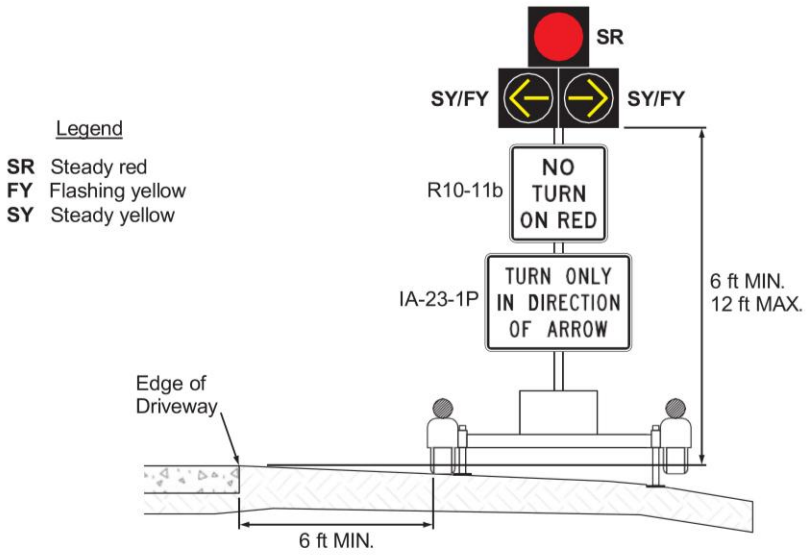
Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

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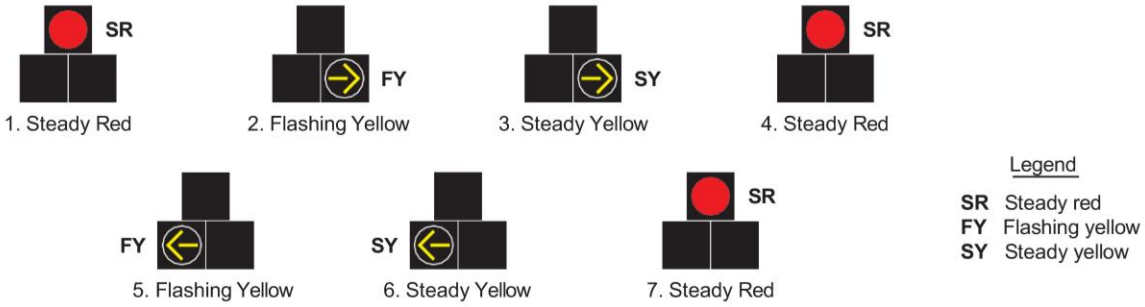
I-2513AC
September 02, 2026

Buncombe County

Residential Driveway Temporary Signal



Phasing Sequence

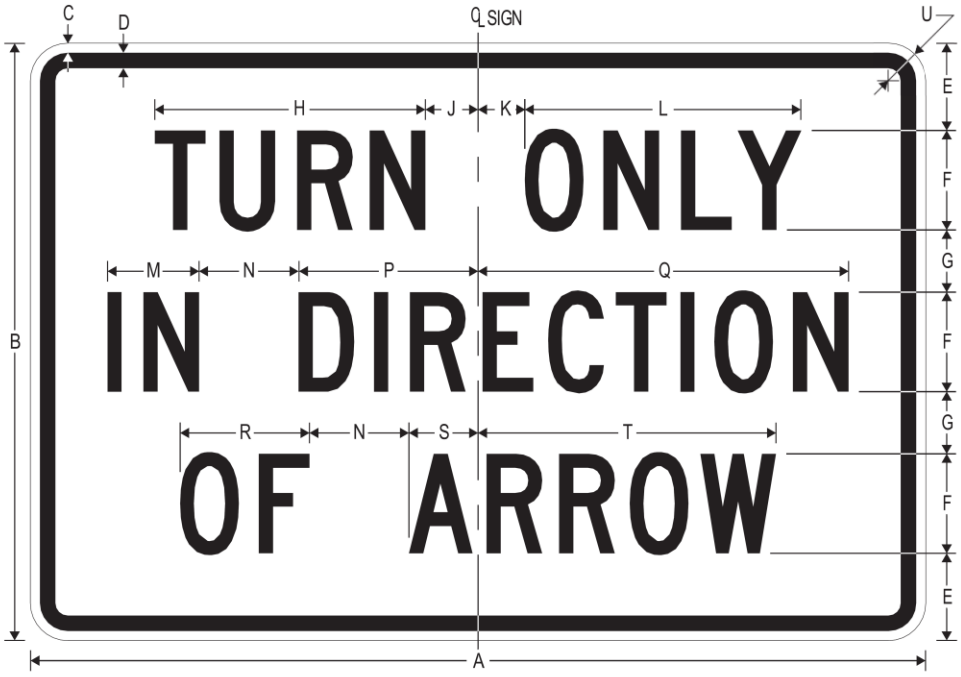


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Regulatory Plaque



IA-23-1P
TURN ONLY IN DIRECTION OF ARROW (PLAQUE)

A	B	C	D	E	F	G	H	J	K
36	24	0.375	0.625	3.5	4 C	2.5	10.844	2.120	1.880

L	M	N	P	Q	R	S	T	U
11.124	3.681	4	7.223	14.904	5.202	2.782	11.984	1.5

COLORS: LEGEND, BORDER — BLACK
BACKGROUND — WHITE (RETROREFLECTIVE)

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Dimension Descriptions

- A is the horizontal dimension of the plaque.
- B is the vertical dimension of the plaque.
- C is the inset from the edge of the plaque to the border.
- D is the border width.
- E is the distance from the top of the first line to the top of the sign and from the bottom of the last line to the bottom of the sign.
- F is the letter height and FHWA standard font for each line.
- G is the space between the lines.
- H is the width of the first word on the first line.
- J is the distance from the vertical center of the sign to the right edge of the first word on the first line.
- K is the distance from the vertical center of the sign the left edge of the second word on the first line.
- L is the width of the second word on the first line.
- M is the width of the first word on the second line.
- N is the space between the words on the second and third lines.
- P is the distance from the vertical center of the sign to the left edge of the second word on the second line.
- Q is the distance from the vertical center of the sign to the right edge of the second word on the second line.
- R is the width of the first word on the third line.
- S is the distance from the vertical center of the sign to the left edge of the second word on the third line.
- T is the distance from the vertical center of the sign to the right edge of the second word on the third line.
- U is the corner radius.

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

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September 02, 2026

WORK ZONE PERFORMANCE PAVEMENT MARKINGS:
(10/8/2016) (Rev. 4/21/2026)

Description

Furnish, install, and maintain Work Zone Performance pavement markings for traffic patterns in work zones during construction as specified in this special provision.

Materials

A) General

Use materials that comply with the manufacturer's recommendations, ensuring durability and minimum retroreflectivity as specified in this special provision for at least 12 months, unless noted otherwise.

Use the following approved materials for Work Zone Performance pavement markings:

(1) Polyurea
(2) Sprayed Thermoplastic
(3) Extruded Thermoplastic
(4) Epoxy
(5) Cold Applied Plastic (Type IV)
(6) Polymer (Single System) – Reapply Polymer (Single System) material every 180 days unless documentation from an independent Mobile Retroreflective Contractor confirming compliance with retroreflectivity requirements is submitted to the Engineer. All costs for retroreflectivity readings to avoid reapplication are the Contractor's responsibility.

Some Work Zone Performance pavement marking materials are not recommended on specific pavement surface types. The Contractor shall use Work Zone Performance pavement marking materials recommended by the manufacturer for use on the pavement type that the marking will be applied to.

B) Material Qualifications/Certifications

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Use Work Zone Performance pavement marking materials, as listed above, which are on the NCDOT APL at the time of installation or otherwise approved by the Engineer.

All Work Zone Performance pavement markings shall incorporate a high performance glass bead, or equivalent, listed on the NCDOT APL.

Submit material certifications in accordance with Articles 106-3 and 1087-8 of the *Standard Specifications*.

Construction Methods

A) Surface Preparation

Before installation, sweep and prepare all pavement surfaces receiving Work Zone Performance pavement markings as recommended by the manufacturer.

B) Weather Limitations and Seasonal Limitations

Apply Work Zone Performance pavement markings following the weather limitations and seasonal limitations in accordance with Subarticle 1205-3(C) of the *Standard Specifications*.

In the event a traffic pattern shift must occur 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, and upon approval by the Engineer, the Contractor may install a minimum of 1 application of standard waterborne traffic paint to produce a 4 inch line at 15 mils (wet) thickness as a temporary pavement marking. Reflective media shall be applied to provide proper retroreflectivity in accordance with Article 1205-8 of the *Standard Specifications* until the Work Zone Performance pavement markings can be installed.

Apply Work Zone Performance pavement markings within 30 days of temporary pavement marking installation.

Interim pavement markings may be applied over the temporary pavement markings within 30 days of the initial installation. In such cases, apply Work Zone Performance pavement markings within 60 days of the initial temporary pavement marking installation.

Payment for temporary pavement markings installed due to weather or seasonal limitations will be made at the contract unit price for 4 inch paint pavement marking lines. There will be

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

no payment for interim pavement markings applied to extend the life of the temporary pavement markings.

C) Traffic Pattern Shifts for Contractor Schedule/Coordination Convenience

The Contractor may elect to shift traffic at any time with approval from the Engineer using a minimum of 1 application of standard waterborne traffic paint to produce a 4 inch line at 15 mils (wet) thickness as an interim pavement marking. Reflective media shall be applied to provide proper retroreflectivity in accordance with Article 1205-8 of the *Standard Specifications* until the Work Zone Performance pavement markings can be installed.

Apply Work Zone Performance pavement markings within 30 days of interim pavement marking installation.

Interim pavement markings may be reapplied within 30 days of the initial installation. In such cases, apply Work Zone Performance pavement markings within 60 days of the initial interim pavement marking installation.

There will be no payment for interim pavement markings installed for contractor schedule/coordination convenience.

D) Application Equipment

Use application equipment in accordance with Article 1205 of the *Standard Specifications.*

For applications exceeding 1,000 feet, use truck-mounted application equipment; hand-applied or non-truck-mounted methods are prohibited.

The Contractor shall not use multiple passes to achieve required material thickness, unless specified otherwise by the manufacturer.

E) Material Application

The Work Zone Performance pavement marking material shall be applied at the minimum thickness recommended by the manufacturer or the following, whichever is greater:

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Polyurea	30 mils (wet)
Epoxy	30 mils (wet)
Sprayed Thermoplastic	60 mils
Extruded Thermoplastic	90 mils
Polymer	30 mils (wet)
Cold Applied Plastic (IV)	Per the manufacturer's recommendations

Unless otherwise directed by the Engineer, when Work Zone Performance pavement markings are applied to open graded friction course (OGFC) pavements, the Work Zone Performance pavement marking shall be extruded thermoplastic with a minimum thickness of 90 mils to achieve an above pavement thickness great enough to meet the retroreflectivity requirements below.

Work Zone Performance pavement markings are not required on milled surfaces or interim lifts of pavement when additional lifts are scheduled to be installed within the next 30 days or for traffic patterns that will change within 30 days. Under these circumstances, the Contractor shall install a minimum of 1 application of standard waterborne traffic paint to produce a 4 inch line at 15 mils (wet) thickness as a temporary pavement marking. Reflective media shall be applied to provide proper retroreflectivity in accordance with Article 1205-8 of the *Standard Specifications*.

Work Zone Performance pavement marking lines, symbols and characters shall be installed to conform to the sizes, shapes, and thicknesses shown in the transportation management plans.

No track dry times shall be 10 minutes or less. Traffic shall not be placed on any material until it is sufficiently dry/cured to eliminate wheel tracking.

F) Retroreflectivity Requirements

Ensure the selected Work Zone Performance pavement marking system maintains the minimum retroreflectivity levels outlined below for at least 12 months after installation.

Retroreflectivity Requirements for Work Zone Performance Pavement Markings

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Color	Initial installation to 1 month after installation	Greater than 1 month to 6 months after installation	Greater than 6 months to 12 months after installation
White	325 mcd/lux/m2	225 mcd/lux/m2	150 mcd/lux/m2
Yellow	220 mcd/lux/m2	120 mcd/lux/m2	100 mcd/lux/m2

G) Testing Procedures

All Work Zone Performance pavement marking installations may be scanned by the Department through an independent Mobile Retroreflective Contractor. The Work Zone Performance pavement markings may be scanned within 30 days of the last pavement marking installation to ensure the retroreflectivity requirements above in Section F are met. If the Work Zone Performance pavement marking material is not scanned within 30 days of the last pavement marking installation, the 6-month retroreflectivity requirements shall govern.

The Contractor shall notify the Engineer a minimum of 7 days prior to the installation of Work Zone Performance pavement markings for the Engineer to schedule testing.

If the markings appear to be non-performing, the Engineer may request additional retroreflectivity readings. Should the reading indicate noncompliance with Section F in this special provision, the Contractor shall replace the Work Zone Performance pavement markings at no cost to the Department. Retroreflectivity is considered non-compliant when the average falls more than 15% below the requirements in the table. Pay deductions may be applied for deficiencies up to the 15% level.

H) Snowplow Damage

All Work Zone Performance pavement markings shall be durable enough to withstand a single snow event requiring snowplowing 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:

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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 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 snowplowing, the retroreflectivity values in the chart above will no longer apply. The Engineer will determine if the pavement markings are performing adequately or if replacement is necessary due to excessive damage caused solely by snowplow activities.

Replace deficient Work Zone Performance pavement markings; however, compensation will only be made at the contract unit price if the deficiency is caused solely by snowplow damage due to multiple snowplow events. Unless the temporary traffic pattern will be modified within 30 days, the Contractor shall replace all Work Zone Performance pavement markings damaged due to multiple snowplow events within 30 days.

Maintenance

Replace any Work Zone Performance pavement material that fails prematurely due to debonding or excessive wear, resulting in retroreflectivity levels below the required 12 month standard. Replacement costs for traffic control and Work Zone Performance pavement markings shall be the responsibility of the Contractor, except when excessive damage is caused by snowplowing.

If Work Zone Performance pavement markings are required to remain in place beyond 12 months, they must be scanned at or near the 12-month mark by a Mobile Retroreflective Contractor to verify compliance with minimum retroreflectivity levels. Markings that meet these levels may remain in place. Markings that fail to meet the required level must be replaced by the Contractor within 30 days of the end of the 12-month duration, with replacement compensated at the contract unit price.

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

If replacement becomes necessary, the same notification procedure described above shall be followed to have the Work Zone Performance pavement markings scanned for the retroreflectivity compliance.

Measurement and Payment

Work Zone Performance Pavement Marking Lines, ___" will be measured and paid as the actual number of linear feet of Work Zone Performance pavement marking lines 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 Work Zone Performance pavement marking 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.

Reapplications are measured and paid only when applied after 12 months from the initial installation, every 12 months thereafter, or when snowplow damage occurs as specified in Section H in this special provision. Reapplications of Polymer (Single System) materials required to meet the 180-day replacement requirement will not be measured or paid.

Work Zone Performance Pavement Marking Symbols will be measured and paid as the actual number of Work Zone Performance pavement marking symbols satisfactorily placed and accepted by the Engineer.

Work Zone Performance Pavement Marking Characters will be measured and paid as the actual number of Work Zone Performance 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.

Paint Pavement Marking Lines, ___" will be measured and paid for in accordance with Article 1205-10 of the *Standard Specifications*. There will be no direct payment for interim paint pavement marking applications.

Paint Pavement Marking Symbols will be measured and paid for in accordance with Article 1205-10 of the *Standard Specifications*. There will be no direct payment for interim paint pavement marking symbol applications.

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

Paint Pavement Marking Characters will be measured and paid for in accordance with Article 1205-10 of the *Standard Specifications*. There will be no direct payment for interim paint pavement marking character applications.

Payment at the contract unit price for the various items in the contract will be full compensation for all the items covered by this section. No direct payment will be made for: the work involved in applying the lines, including surface preparation, reapplication of molten pavement marking crossed by a vehicle, removal of all pavement marking materials spilled on the roadway surface, and repair of markings tracked by a vehicle.

Replacement of Work Zone Performance pavement markings that prematurely deteriorated, failed to adhere to the pavement, lacked reflectorization or were otherwise unsatisfactory during the life of the 12-month observation period as determined by the Engineer will be at no cost to the Department.

Payment will be made under:

Pay Item	Pay Unit
Work Zone Performance Pavement Marking Lines, ___"	Linear Foot
Work Zone Performance Pavement Marking Symbols	Each
Work Zone Performance Pavement Marking Characters	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.

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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

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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.

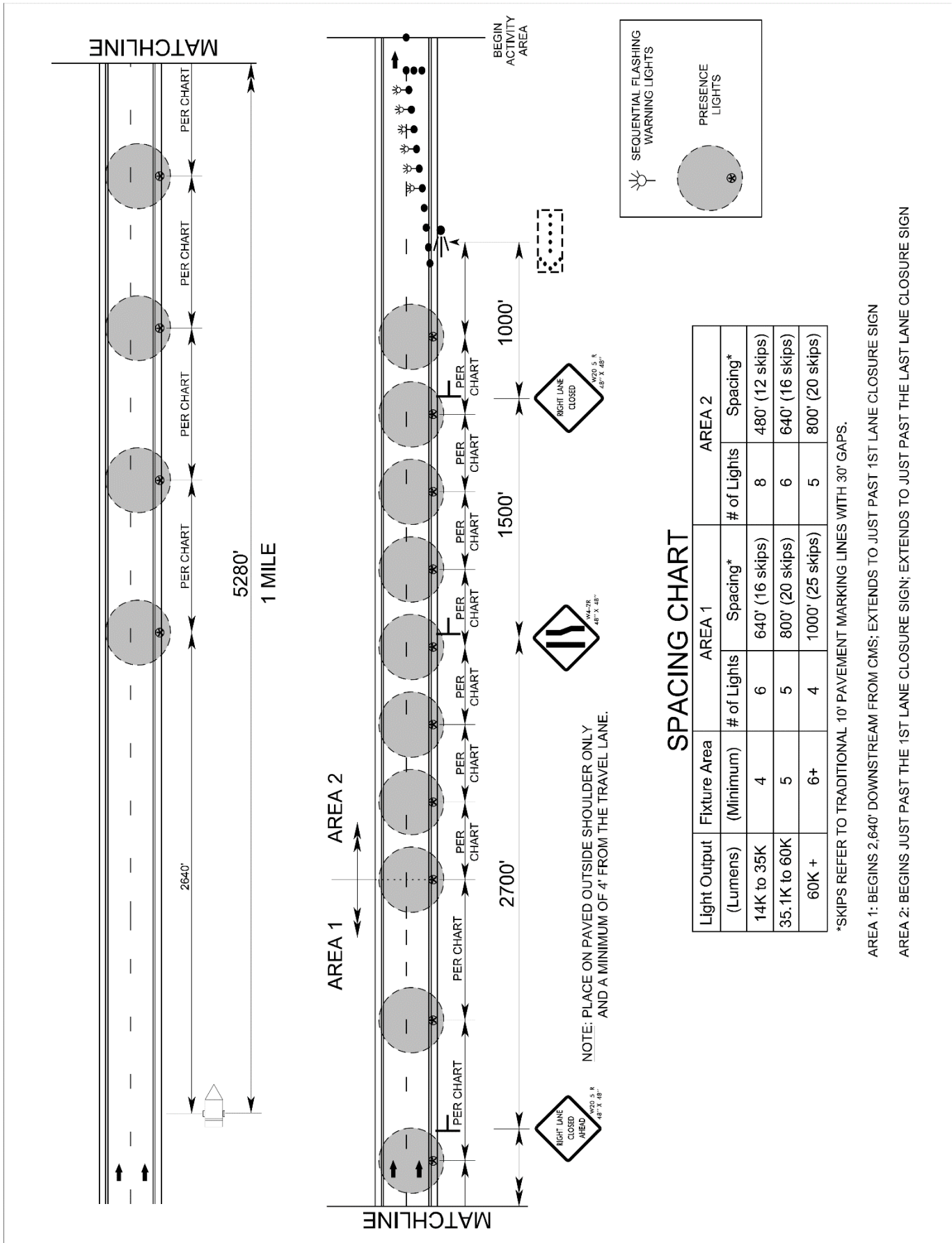
Pay Item	**Pay Unit**
Work Zone Presence Lighting	Each

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

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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

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

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I-2513AC Buncombe County
September 02, 2026

DYNAMIC ZIPPER MERGE SYSTEM:
(12/10/2019) (8/3/2021) (Rev. 10/13/2023)

Description

Provide, install, program, relocate, operate, maintain, and remove an automated, stand-alone, real-time Dynamic Zipper Merge System meeting the requirements noted herein, until project completion for the duration specified by the Engineer.

A Dynamic Zipper Merge System is a group of devices that work together using software to automatically detect traffic conditions and respond using preprogrammed response algorithms. The purpose of this system is to provide advance notification to motorists of traffic queues in advance of long-term lane closures in order to reduce the likelihood of high-speed crashes and to encourage either early or late lane merges depending on live traffic conditions.

The Dynamic Zipper Merge System shall detect the presence of a lane closure and slow/stopped traffic queues that develop in advance of the lane closure and display lane closure or slowed/stopped and driver merge instruction messages on the integrated message boards.

Materials and System Operational Requirements

A. General

These specifications cover the general operational requirements for the Dynamic Zipper Merge System. The Dynamic Zipper Merge System shall be positioned at locations indicated in the contract or designated by the Engineer.

Provide physical and electronic/software protections for all components of the system and processes pertaining thereto prevent access by unauthorized parties.

Provide the following for this project:

- Customized website integrated with each Dynamic Zipper Merge System for NCDOT and project partners.
- Traffic Management Software capable of analyzing data and accurately supplying the indicated information.

Provide the following equipment for each Dynamic Zipper Merge System:

- 5 Traffic Speed Sensors
- 3 Portable Changeable Message Signs
- 2 Full Matrix Display Portable Changeable Message Signs, capable of displaying a flashing arrow indication
- Communication equipment for all above devices to include all components and communication methods necessary to allow each device to send and receive data to and from the website and Traffic Management Software.

Docusign Envelope ID: 7B4A9D77-9A93-80F7-83F5-61E2D6CC0DDE

- Integration equipment to receive lane closure status from Connected Lane Closure Devices (see separate Special Provision).

B. Documentation

Provide a set of complete specifications and literature on the selected Dynamic Zipper Merge System. Address all the requirements of the Contract Documents in the submittal. Provide documents for each device containing all information necessary to determine product specification compliance. Provide the detailed security plan and protocol used to protect data and communications of the Dynamic Zipper Merge System to the Engineer for approval at least 10 days prior to the delivery of the Dynamic Zipper Merge System. This plan includes physical locking mechanisms where the locks are unique for this Dynamic Zipper Merge System (a key to be provided to NCDOT), password handling techniques, and limited static IPs for remote access to equipment.

C. Power Source

Provide power for devices for continuous operation, as defined in the section Malfunctions, Maintenance, and Inspection below. All utility hookups, solar panels, batteries and other power sources are incidental.

D. Installation

Locate and aim the devices to ensure data accuracy. Coordinate installation locations and details with the Engineer prior to installation.

E. Traffic Sensors

Provide sensors to withstand and operate in, without deterioration, inclement weather and visibility conditions including sunlight, light precipitation, temperature, light, fog, darkness, excessive dust and road debris.

Provide sensors which:

- Collect and report individual vehicle data;
- Collect and report data on a per lane basis;
- Collect speed, volume, and lane occupancy data, for the required direction(s) of traffic; and
- Communicate data to the Traffic Management Software at least once per minute.

Install and maintain sensors to continuously detect all public traffic on **I-26 WB and I-26 EB**. Configure sensors to allow active and inactive collection zones, so that construction traffic is differentiated from public traffic. At a minimum, detect speed, volume, and occupancy levels in each lane, each minute. Summarize data in 5 minute bins for data storage and transfer. Do not block or shield critical locations from the sensor. Test each sensor and re-test as needed to confirm the accuracy of the data reported.

Collect and report data to the Traffic Management Software which meets the following requirements at any given time during testing and operation:

- Per direction volume accuracy: greater than 90%;

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- Per lane volume accuracy: greater than 90%; and
- Per direction average speed accuracy: greater than 90%.

F. Portable Changeable Message Signs (PCMS)

Provide and maintain Portable Changeable Message Signs (PCMS) capable of displaying the traffic queue length and travel time advisories to motorists. Provide PCMS that meet or exceed the material and functional requirements as described in the Contract Documents. The PCMS shall be capable of communicating wirelessly with and being controlled by the Traffic Management Software. Provide signs which display messages and log the date, time and text of the messages when being controlled by the Traffic Management Software.

No more than 1 pixel illumination failure on the board shall be allowed at any given time during testing and operation. Continuously monitor PCMS status. Include in the monitoring procedure an evaluation of power levels, communication connections, and the number of unlit pixels. Also, use a human observer periodically to document that the correct message is displayed with the correct date and time.

G. Traffic Management Software

The software has three main functions: Queue Warning, Driver Merge Instructions, and Lane Closure Notification. Use software that meets or exceeds the following requirements for each function:

Queue Warning

The intent of the Queue Warning function is to detect traffic congestion and queue formation and notify approaching drivers of the conditions. Queue Warning is the most critical function of the system. Continuously monitor traffic and report the required operational characteristics to the software each minute. Use a combination of real-time speed and percent lane occupancy information reported by traffic sensors, compared with configurable thresholds, to initiate a slow, stopped, or driver merge instruction message. Display configurable messages on the PCMS located upstream of sensors that detect changes in speed and lane occupancy in such a way that approaching drivers see a slow message before a stopped message, and a stopped message before a late merge message. Include accurate distance until the condition in the slow and stopped messages, and round distances to the nearest ½ mile. Message examples include "SLOW TRAFFIC 2 MILES/WATCH FOR SLOW TRAFFIC," "STOPPED TRAFFIC 1 MILE/PREPARE TO STOP," and "USE BOTH LANES/TO MERGE POINT."

Configure Queue Warning messages to override all other messages on a PCMS. Send communication to project personnel when traffic conditions violate predetermined thresholds. Data collected by the Dynamic Zipper Merge System will be owned by NCDOT and must be in a file format compatible with the STOC's operating platform.

Include human observation in the monitoring procedure to document posted messages and times during an actual event. Compare those messages with the information available from the software. Complete software monitoring as needed and when requested by the Engineer.

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Driver Merge Instructions
The intent of the Driver Merge Instructions function is to detect traffic congestion and queue formation and convert the lane closure from a traditional early merge scenario to a late lane merge condition. Driver Merge Instructions is another critical function of the system. Continuously monitor traffic and report the required operational characteristics to the software each minute. Use a combination of real-time speed and percent lane occupancy information reported by traffic sensors, compared with configurable thresholds, to initiate the appropriate driver merge instruction message. Display configurable messages on the PCMS located upstream of sensors that detect changes in speed and lane occupancy in such a way that approaching drivers see an early merge message when queueing is less than one mile in advance of the taper, and a late lane merge message when queueing extends beyond one mile in advance of the merge taper. Message examples include "RIGHT LANE CLOSED/1 MILE AHEAD," "USE BOTH LANES/TO MERGE POINT." and "MERGE HERE/TAKE TURNS."

Configure Queue Warning messages to override all other messages on a PCMS. Send communication to project personnel when traffic conditions violate predetermined thresholds. Data collected by the Dynamic Zipper Merge system will be owned by NCDOT and must be in a file format compatible with the STOC's operating platform.

Include human observation in the monitoring procedure to document posted messages and times during an actual event. Compare those messages with the information available from the software. Complete software monitoring as needed and when requested by the Engineer.

Lane Closure Notification
The intent of the lane closure notification function is to detect active lane closures when no queues are present and notify approaching drivers of the conditions. Lane closure notification is a secondary function and serves as the default function when Queue Warning is inactive. An example message for this function is "RIGHT LANE CLOSED/3 MILES AHEAD."

When no lane closures are in place and no queues are present, each PCMS shall display flashing dots in all four corners to indicate the system is operating correctly.

Include human observation in the monitoring procedure to document posted messages when a Queue Warning event is not occurring.

Reporting and Operational Requirements
Communicate with and/or control all of the devices belonging to the Dynamic Zipper Merge System. Poll the sensors and PCMS a minimum of once per minute. Collect from each device, as applicable, and store in configurable bins the following data: device name and location, 50th percentile and 85th percentile speeds, volume, lane occupancy, message sign history, as well as battery status and communication status. Make historical data available to NCDOT staff at all times for the duration of work zone activity. Provide an electronic copy of all data, including

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date and duration of system malfunctions, to NCDOT staff after all work zone activity is completed and the Dynamic Zipper Merge System has been removed.

H. Website

The purpose of the website is to be a real time traffic operations dashboard showing current traffic conditions, real time speeds, and posted messages to the nearest minute. Display a full color map of the project area, using Google Maps or equivalent, which shows roadways impacted by project activities and for which data is being collected. Display current average speed at each traffic sensor for which data is available. Display a representation of each device in its approximate location, relative to the roadway and other nearby features, and indicate the operational status of each device. Display the messages posted on the message signs. Refresh information at least once per minute. In the event devices are moved to a new location in the field, automatically reflect these changes to the system layout on the website.

I. Traffic Control Devices

Provide traffic control devices as needed to set up, operate, maintain and tear down the Dynamic Zipper Merge System as shown in the Contract Documents. Coordinate device placement with other Contractors as needed to meet or exceed placement requirements in the Contract Documents.

If applicable, all PCMS used for advance notice of a variable speed zone within the Dynamic Zipper Merge System shall be removed and replaced with double indicated “VARIABLE SPEED ZONE AHEAD” static sign as shown on the detail.

J. Malfunctions, Maintenance, and Inspection

Operate the Dynamic Zipper Merge System, including all components listed above, continuously (24 hours per day, 7 days per week) when deployed on the project, for the duration specified by the Engineer.

In addition, the Contractor shall have portable mounted lane closure signs as detailed in Roadway Standard Drawing 1101.02, Sheet 4, available on site to be used in the case of a system malfunction. These static lane closure signs shall not be visible to traffic except in the case of a system malfunction and will remain in place until the system is fully functional again.

Continuously operate the Dynamic Zipper Merge System with no major malfunctions throughout its operation. System malfunctions include, but are not limited to, the inability of the equipment to provide accurate, real-time traffic data, inability of the equipment to determine lane closure status from connected lane closure devices; inability to withstand a construction roadside environment or normal weather conditions; or interference from construction equipment. Monitor and inspect equipment and data, and on a regular basis to avoid malfunctions. Upon discovery or notification of a system malfunction, the Contractor shall immediately make the pre-staged static lane closure signs visible to traffic and make all necessary corrections to the components of the system such that system malfunctions are corrected within a 24-hour period through repair or replacement of the equipment.

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Components include sensors, message signs, communications equipment and all hardware and software required to place the real time information on the devices to operate according to Contract Documents.

It is the responsibility of the Contractor to detect data malfunctions. Monitor, inspect, and maintain sensors so that malfunctions in data collection can be detected as soon as possible. Causes of malfunction may include high winds, shifting earth beneath or around the device, or interference by construction equipment. Monitoring, at a minimum, includes evaluation and documentation of power levels, communication connections, and accuracy of data provided to the Traffic Management Software. Monitoring data accuracy may include re-calibration and aiming of the device or retesting accuracy using human observers. Monitor as needed and when requested by the Engineer.

K. Complete and Operational System

Direct and indirect costs associated with operating the Dynamic Zipper Merge System are incidental to this bid item and may include FCC licensing, cellular communication, wireless data networks, satellite and internet subscription charges, solar power system support and battery charging and maintenance.

Construction Methods

A. System Manager

Provide one person, available 24 hours per day, as the System Manager for the Dynamic Zipper Merge System. Provide this person's 24-hour contact information to the Engineer. Provide a system manager who is locally available to supervise, monitor, and maintain the system components including the website, relocate devices as necessary, and respond to emergencies.

B. Dynamic Zipper Merge System Deployment

Deliver all of the required devices to the place and time designated by the Engineer and confirm they are in good condition and in working order. Each PCMS shall be in new condition when delivered to the project site. Coordinate with the Engineer to determine final sensor locations, then deploy and install sensors. Complete stand-alone tests, system operational tests, final deployment, and system initiation prior to impacting traffic.

System Logic and Programming

The Contractor shall use the logic provided by NCDOT to program the Dynamic Zipper Merge System. This logic indicates what each PCMS will display in response to changing traffic conditions according to each speed sensor. Coordinate with the Engineer, Work Zone Traffic Control, and the State Traffic Operations Center staff prior to system installation to verify the system programming is accurate. Coordinate with the Engineer in the event system programming adjustments are necessary due to field conditions.

Stand-alone Testing

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Conduct stand-alone tests of each device. Test sensors from their installed locations. PCMS may be tested in other locations. Turn all PCMS away from traffic during testing.

Complete a stand-alone test for each PCMS prior to installation, and to verify that the unit operates as specified. Include in the stand-alone test procedure tests for the following functions:

- Turning the sign on and off;
- Displaying and removing a test message;
- Counting pixels not illuminated (no more than 1 malfunctioning pixel);
- Checking message logs for accuracy; and
- Measuring sign legibility and visibility.

If a unit fails to pass the stand-alone test, repair or replace the unit, and repeat the test until successful.

System Operational Testing

Provide a System Operational Testing Plan to the Engineer for approval, at least 7 days prior to beginning testing. The Plan shall detail a five-day operational test procedure of the System Operational Requirements. Include in the plan procedures operation of the software using real time information from sensors already tested and installed and tested signs located in an off-project location. Begin testing 14 days prior to implementation to verify the system operates in a fully functional manner and as described.

Provide complete operations support from the Software supplier during the operational test, if applicable. Provide verification that the reported drive times, speeds, and volumes through the work zone accurately reflect actual field conditions. Use a human observer to monitor and document the posted messages. Post test messages two times per day during the test period to verify functionality and communications and verification that proper messages are being posted to the PCMS. If any equipment malfunctions occur for a combined period of two hours or more during the operational test on any day, restart the five-day test and no credit will be given for that day of the operational test period.

The Contractor shall be responsible for replacing all defective equipment at no additional cost to the Department.

Indicate the date and time of any activity necessary to maintain operation of the Dynamic Zipper Merge System during the operational test period. Include in each entry, at a minimum, the following information:

- A description of the malfunction;
- Identity of the malfunctioning equipment;
- Cause of equipment malfunction (if known);
- A description of the type of work performed; and
- Time and date of repair completion.

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Once the operational test report is received and approved by the Engineer, the Dynamic Zipper Merge System will be considered operational, and the system will be accepted for use.

Measurement and Payment

Dynamic Zipper Merge System Deployment will be measured and paid on a Lump Sum basis upon completion of the first Dynamic Zipper Merge System delivered to the project site, installed, tested, and found to be fully operational.

Dynamic Zipper Merge System Relocation will be measured and paid on a per each basis upon completion of each system removal from one location on the project and installation to a different location on the project. Payment will be paid once the system is fully operational.

Dynamic Zipper Merge System will be measured and paid on a daily basis for each satisfactorily installed Dynamic Zipper Merge System, including all necessary labor, equipment, materials, communications, licensing, and software to maintain operation of the system. Each Dynamic Zipper Merge System is expected to operate continuously (24 hours per day, 7 days per week) with no major malfunctions. Monitor and maintain the system according to the Malfunctions, Maintenance, and Inspection section above.

All work zone signs will be paid for at the contract unit price according to Article 1110-4 in the Standard Specifications for Roads and Structures.

In the event of a system or data malfunction, payment will be made for the first day of the malfunction. If the malfunctioning Dynamic Zipper Merge System is not completely operational at the end of 24 hours, additional payment will not be made until the system's operation is fully restored.

Pay Item	**Pay Unit**
Dynamic Zipper Merge System Deployment	Lump Sum
Dynamic Zipper Merge System Relocation	Each
Dynamic Zipper Merge System	Day

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TC-37

I-2513AC Buncombe County
September 02, 2026

PORTABLE SIGN SUPPORT

DESCRIPTION

Furnish and fabricate supports for portable temporary signs. Properly disposed of or stockpile signing components.

MATERIALS

Refer to Division 10.

Item	Section
Work Zone Sign Supports	1089-2

Use temporary signs only with portable work zone sign stands specifically designed for one another.

Provide portable work zone sign stands that are listed on the NCDOT APL.

CONSTRUCTION METHODS

(A) Supports

Install portable work zone sign stands to stand plumb with 10 degrees left and right, within 20 degrees front and back and be capable of standing erect in windy conditions.

(B) Disposal

All materials to be removed and disposed of will become the property of the Contractor. Promptly transport the materials from the project after they have been removed unless otherwise permitted by the Engineer.

MEASURMENT AND PAYMENT

The supports, specified in the special provision, installed and accepted, will be measured for payment as follows:

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Supports, Portable Sign Support will be measured and paid as the actual number of Portable Sign Supports installed and accepted.

Disposal of _____ *I* and *Stockpile* _____ will be measured and paid as the actual number of components acceptably disposed or stockpiled. Removal is incidental to disposal. Secondary signs will be incidental work in conjunction with the primary sign. Sign assemblies consisting of more than one sign panel will be considered on sign. Sign systems include signs, supports and foundations. Supports include any foundation.

Repair or replacement of any materials within the project limits disturbed or damaged in performance of the work required under this special provision will be at no cost to the Department.

Payment will be made under:

PAY ITEM	**PAY UNIT**
Supports, Portable Sign Support	Each
Disposal of Support, Portable Sign Support	Each
Stockpile Sign System, Portable Sign Support	Each

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TC-39

I-2513AC Buncombe County
September 02, 2026

TEMPORARY WOODEN SKID SYSTEM

DESCRIPTION

Furnish and fabricate supports for temporary wooden skid systems. Properly disposed of or stockpile signing components.

CONSTRUCTION METHODS

(C) Supports

Provide supports for temporary wooden skid systems that meet the approval of the Engineer

(D) Disposal

All materials to be removed and disposed of will become the property of the Contractor. Promptly transport the materials from the project after they have been removed unless otherwise permitted by the Engineer.

MEASURMENT AND PAYMENT

The supports, specified in the special provision, installed and accepted, will be measured for payment as follows:

Supports, Temporary Wood Skid System will be measured and paid as the actual number of Temporary Wood Skid Systems installed and accepted.

Disposal of _____ will be measured and paid as the actual number of components acceptably disposed. Removal is incidental to disposal. Secondary signs will be incidental work in conjunction with the primary sign. Sign assemblies consisting of more than one sign panel will be considered on sign. Sign systems include signs, supports and foundations. Supports include any foundation.

Repair or replacement of any materials within the project limits disturbed or damaged in performance of the work required under this special provision will be at no cost to the Department.

Payment will be made under:

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I-2513AC Buncombe County
September 02, 2026

PAY ITEM	PAY UNIT
Supports, Temporary Wood Skid System	Each
Disposal of Support, Temporary Wooden Skid System	Each
Disposal of Sign System, Temporary Wooden Skid System	Each

COVERING OF SIGNS

Cover existing signs overhead and shoulder mounted with opaque material on roads open to traffic but not applicable during construction as specified in the traffic management plan. Keep signs covered until instructed to remove the covering. Provide covering for entire signs by an approved method provided by sheeting manufacturer that will prevent messages from being read or seen during both day and night conditions and that will cause no harm to the sheeting face.

Compensation:

Covering of Signs as described above shall be paid for at the contract price for each Sign.

Payment will be made under:

Pay Item	Pay Unit
Signs, Covering	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 Lighting Plans provided by the Department. 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" (*2024 Standard Specifications*).

Perform all work in conformance with Division 14 of the *2024 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 *2024 Standard Specifications* applicable to the work on this project are listed below.

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
Section 1412	Underpass Lighting

1.10 FINAL INSPECTION

The electrical subcontractor foreman onsite during project construction shall also be onsite during the final inspection by NCDOT Lighting & Electrical personnel. In instances where the same foreman cannot be present, the final inspection shall be canceled and rescheduled. As-built plans are required to be submitted to the Resident Engineer and Lighting & Electrical personnel prior to the final inspection.

2.00 STANDARD AND NON-STANDARD LIGHT EMITTING DIODE (LED) LUMINAIRES FOR LIGHT STANDARDS

2.10 DESCRIPTION

Furnish, install and place into satisfactory operation a standard or non-standard luminaire (as required), 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.

Non-standard luminaires shall be used at all stream and river crossings as shown in the Final Lighting Plans provided by the Department. Standard luminaires shall be used at all other locations.

Any light standard luminaire submitted for approval must meet the minimum requirements in the table and sections below.

Wattage	Type	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens
150W LED	Standard	3000K	83%	13,450
195W LED	Non-Standard	3000K	83%	11,400

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.
- Standard luminaires shall have a maximum Backlight, Uplight & Glare (BUG) rating of 3-0-3, and shall have 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 Final Lighting Plans provided by the Department.
- Non-standard luminaires shall have a maximum Backlight, Uplight & Glare (BUG) rating of 1-0-3, shall have an IESNA distribution of Type II with backlight spill control and shall be equipped with house side shields.
- 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 and finished in this color: AMS-STD 14115 Green / Federal Standard 595.
- 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.

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.

Include a shorting cap for each luminaire provided.

Provide wiring inside the light standard, breakaway fuseholders and fuses meeting Article 1400-2 of the *2024 Standard Specifications*, respectively.

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, color shifting, or flickering/strobing not related to incoming power issues all constitute 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 light standard luminaires 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 light standard luminaire on the bracket arm, wiring inside the standard from the circuit conductors to the LED light standard luminaire, in-line breakaway fuseholders with fuses, ground wiring at the pole of the light standard and a shorting cap.

Payment will be made under:

Light Standard Luminaires, Type RDW, 150W LED…….	Each
Light Standard Luminaires, Type RDW, 195W LED……..	Each

3.00 STEEL FRAME, CCTV DISCONNECT, PANEL P1

3.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to install a combination Main Circuit Breaker (P1) and CCTV Disconnect panel at the locations shown on the plans. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer. The Control System "FF" is mounted on the same Framing channel as P1 and CCTV Disconnect , but is paid for a separate pay item.

3.20 MATERIALS

Provide NEMA 3R disconnect combination panels that have a minimum 200A main service disconnect and a minimum of eight (8) additional spaces. Ensure disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. 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 and install service barriers so that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.

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.

Provide feeder circuit breakers sized as shown in the plans. Feeder circuit breakers shall be rated for 14,000 A minimum amp interrupting current. Ensure circuit breakers are listed as meeting UL-489.

Provide a Type 1 surge protection device (SPD) meeting UL 1449 and UL 96A, designed to contain and arrest an arc of 22,000 A and with a short circuit current rating of 200,000 A.

Mount the CCTV Service disconnect, Panel P1 and CSFF, all on 2 galvanized slotted steel framing channels. Affix each end of the framing channel onto 10' x 4" galvanized steel posts.

3.30 CONSTRUCTION METHODS

Install disconnect combination panel at the location shown in the plans. Route the feeder conductors from the disconnect to the light pole locations as shown in the plans. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

Install SPD per manufacturer's recommendation.

Permanently label conductors at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation.
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.

3.40 MEASUREMENT AND PAYMENT

The disconnect combination panel measured as provided above will be paid at the Lump Sump basis "Steel Frame, CCTV Discon, Panel P1". Such price and payment will be considered full compensation for the disconnect panel, breakers, surge protection device, exposed vertical conduit runs to the panel and steel posts for mounting. All remaining hardware, fittings, and conduit bodies required to install the disconnect panel and to connect the electrical service to the disconnect panel will be considered incidental.

Payment will be made under:

Steel Frame, CCTV Discon, Panel P1.....Lump Sum

4.00 PAINTED LIGHT STANDARDS

4.10 DESCRIPTION

The Contractor shall provide and install green-finished, powder-coated, single arm light standards, luminaire bracket arms, exposed connecting hardware and impact attenuation devices at the locations noted on the plans. Light standards and luminaire arm brackets shall be galvanized steel and be powder coated at the factory after galvanizing. Field painting is not acceptable.

4.20 MATERIALS

Same as Article 1404-2 of the *2024 Standard Specifications,* except the Light Standards shall be finished green in color using a thermoset powder-coated paint with a minimum 2.0 mil thickness. Any damage to Light Standards or finish during installation and/or construction shall be repaired or replaced in like-kind, at no additional cost to the Department.

Paint color shall be Federal Standard 595 #14115.

4.30 CONSTRUCTION METHODS

Same as Article 1404-3 of the *2024 Standard Specifications.*

4.40 MEASUREMENT AND PAYMENT

Painted light standard will be measured and paid as the actual number of painted light standards with bracket arm assemblies, and breakaway supports, of each appropriate mounting height and bracket arm type and length, that have been installed and accepted. The Light Standard Junction Box will be paid under Section 1411. The ground rod in the Light Standard Junction Box is incidental to the light standard.

Payment will be made under:

Painted Light Standard, 45’ SA 15’ Arm.....Each
Painted Light Standard, 45’ TA 15’ Arm.....Each
Painted Light Standard, 35’ SA 15’ Arm.....Each
Painted Light Standard, 35’ TA 15’ Arm.....Each

5.00 REMOVE LIGHT STANDARDS

5.10 DESCRIPTION

The work covered by this section consists of the removal of existing single arm metal light standards on breakaway bases and concrete foundations at locations shown on the Lighting Plans provided by the Department. The standards are less than 50’ mounting height, and are attached to the foundations with anchor bolts.

Concrete foundations to be removed or abandoned may be located in areas where, due to knockdowns, there are no light standards to be removed.

5.20 MATERIALS

No materials are required for this work except such miscellaneous items as tape and terminal devices to dead-end circuits serving the light standards.

5.30 CONSTRUCTION METHODS

Maintain operation of the existing lighting system until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NCDOT Resident Engineer and Division Traffic Engineer to assure that circuits can be de-energized where and when necessary.

Carefully remove the luminaire with control node from pole-arm. The luminaire and control nodes shall be returned to the Department. Contact Eric Frazier, Energy Management Engineer, by phone at 919-707-4554 or email at erfrazier@ncdot.gov two weeks prior to removal to coordinate delivery of the returned equipment.

The Contractor is responsible for any equipment lost, stolen or damaged after removal and shall replace any equipment that is lost, stolen or damaged after removal with Department approved equivalent new equipment at no additional cost to the Department.

Remove light standard and arms, couplings, anchor nuts, washers, transformer bases with doors and connecting bolts and fuse holders. Dispose of all removed equipment from grassy shoulder areas in a manner acceptable to the Engineer.

Remove or abandon existing concrete light standard foundations as defined in Section 1400-10 of the *2024 Standard Specifications*. Dispose of the removed concrete, reinforcing steel and anchor bolts in a manner acceptable to the Engineer. Backfill the holes with approved material and compact backfill to 95% density in accordance with Section 235-3(C) of the *2024 Standard Specifications*.

Remove the conductors and abandon or remove the conduit for the removed light standards as shown on the Lighting Plans provided by the Department. Refer to Section 1400-10 of the *2024 Standard Specifications*.

5.40 MEASUREMENT AND PAYMENT

The quantity of removed light standards to be paid for will be the actual number which have been dismounted from existing foundations, disposed of and accepted.

The quantity of removed foundations to be paid for will be the actual number which have been removed or abandoned and accepted.

The removed light standards measured as provided above will be paid for at the contract unit price per each “Remove Single Arm Light Standard”. Such price and payment will be considered full compensation for disassembly and disposal of the shaft, arm, fuseholders, transformer base and hardware. Delivery of the luminaire and control node is incidental to the light standard removal.

The removed foundations measured as provided above will be paid for at the contract unit price per each “Remove Light Standard Foundation”. Such price and payment will be considered full

compensation for removing or abandoning foundation concrete, reinforcing steel, transformer bases and anchor bolts. It also includes backfilling the holes with suitable material and compaction the backfill material as required.

Payment will be made under:

Remove Single Arm Light Standard……..……Each
Remove Light Standard Foundation…..……..……Each

6.00 REMOVE CONTROL SYSTEM

6.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to remove an existing control system at the locations shown on the plans.

6.20 MATERIALS

No materials are required for this work except such miscellaneous items as tape and terminal devices to dead-end circuits at the control panel.

6.30 CONSTRUCTION METHODS

Maintain operation of the existing lighting system until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NCDOT Resident Engineer and Division Traffic Engineer to assure that circuits can be de-energized where and when necessary.

Disconnect circuitry and remove control system enclosure from conduit and support structure, leaving all internal components intact. Remove underground circuitry, abandon or remove concrete pad and support structure.

All hoisting and lifting shall be with rope or web slings fastened in such a manner as to prevent damaging or marking any of the salvaged materials. The Contractor shall provide proper transportation, protection and supports so that rain, etc. will not damage equipment. The Contractor shall furnish labor, blocking materials and equipment to unload and properly store all salvaged materials.

Dispose of the removed concrete, reinforcing steel, support structure and conduit in a manner acceptable to the Engineer. Backfill the holes with approved material and compact backfill to 95% density in accordance with Section 235-3(C) of the *2024 Standard Specifications*.

Abandon or remove the conductors and conduit as required by construction. Refer to Standard Specifications Section 1400-6.

Deliver removed control systems to the NCDOT Division 13 Warehouse located at the address below. Contact Deputy Division Traffic Engineer Kevin Sexton by phone at 828-298-0094 two weeks prior to removal to coordinate delivery of the removed control system.

NCDOT Division Traffic Services Office
11 Old Charlotte Highway
Asheville, NC 28803

6.40 MEASUREMENT AND PAYMENT

The removal of existing lighting control systems measured as provided above will be paid for at the contract unit price per each "Remove Control System". Such price and payment will be considered full compensation for disconnecting circuitry, disassembly, removal of existing foundation and support structure, disposing of concrete, backfilling, compaction, delivery of the control panel to the Department, and all incidentals necessary to complete the work.

Payment will be made under:

Remove Control System.....Each

7.00 LIGHTING CONTROL EQUIPMENT

7.10 DESCRIPTION

The work covered under this section consists of furnishing and installing an entire control system, including enclosure, control panel, breakers, terminal blocks, wiring, conduits, and surge suppressor to be mounted to the steel frame assembly described in Section 3.0 of these Special Provisions.

The control system will be standard electrical components in a stainless steel enclosure mounted on a metal pole as shown in the contract.

7.20 MATERIALS

Refer to Division 10 of the *2024 Standard Specifications*.

Item	**Section**
Conduit	1091-3
Wire and Cable	1091-2, 1400-2

Provide wire in accordance with the *2024 Standard Specifications*.

Use a piece of 4” rigid galvanized steel conduit (RGC), embedded in concrete as shown in the plans, for mounting the control system.

Provide a NEMA type 3R stainless steel enclosure with external stainless mounting flanges, drip shield, back panel and continuous hinge door with a print pocket. Provide a door closing mechanism interlocked with a flange mounted operator handle to prevent the opening of the door with the service circuit breaker in the ON position, except by use of safety override devices.

Provide an enclosure approximately 36" (h) x 30" (w) x 10" (d) unless noted otherwise in the plans. Provide only openings necessary for the entrance of conduits as shown in the plans. Do not use knockouts. Ensure the enclosure conforms with NEC Article 312 and mount the devices so the NEC clearances will be provided, except use 1.5" where not specified or noted in the tables for minimum wire bending space.

Use minimum 1-5/8” x 1-5/8” galvanized slotted steel framing channel with straps and bolts for the mounting brackets and hardware for attaching the enclosure. Use galvanized finish on the brackets and hardware and coat all field cuts or scratches with organic zinc repair paint.

Provide a neutral bar, bonded to the panel, with sufficient box lug type terminals to accept the required number of wires.

Mount components to the back panel with manufacturer supplied mounting brackets or permanently attached screw studs.

Use a service circuit breaker providing a minimum interrupting rating of 22,000 A. Provide a thermal magnetic, molded case, permanent trip breaker. Provide multi-tap, solderless, load side box lugs or distribution terminal blocks of the appropriate size. Use insulating material approved for NEMA 3R applications. Provide a service barrier for the line side lugs as required by NEC Article 230-62(C). Provide a breaker with a voltage and amperage rating as indicated in the plans.

Use feeder circuit breakers which are rated 14,000 A minimum interrupting capacity and have an open type molded case with a non-adjustable thermal magnetic trip setting as noted in the plans.

Where Communication Gateways are required, provide a single pole, open type gateway circuit breaker rated at 240 VAC phase to ground with a minimum interrupting current capacity of 5,000 A and a high magnetic trip setting of 15 A.

Use a Type 1 surge protection device (SPD) meeting UL 1449 and UL 96A, designed to contain and arrest an arc of 40,000 A and with a short circuit current rating of 200,000 A. Install the SPD on the load side of the service breaker.

Use terminals and lugs rated for the connection of the appropriate size copper conductors. All conductors shall be made of copper and neatly wrapped in bundles or run in plastic raceways.

Perform all galvanizing in accordance with Section 1076.

Provide a drawing to scale showing the location, brand and catalog number of each component of the control system for approval. The completed light control system shall be marked "Suitable

for Use as Service Equipment", in a prominent location in the enclosure, in accordance with NEC Article 409.110, and shall be marked with an arc flash hazard warning in accordance with NEC Article 110.16. If the control system is not made in a certified UL 508A Panel Shop, a third party, recognized by the Department of Insurance as having the authority, shall label the control systems.

7.30 CONSTRUCTION METHODS

Fasten the enclosure to the pole by means of a galvanized bracket assembly as shown in the plans. Make all cuts square and remove all rough edges. Have mounting holes match existing mounting holes of the enclosure.

Arrange all conduits entering the enclosure in a neat symmetrical manner and extend directly downward. Install six RGC feeder circuit conduits as shown in the plans.

Install a Control System Junction Box as shown in the plans. Stub all feeder circuit conduits and spare conduits from Control System in the Control System Junction Box. See Section 1412 of the *2024 Standard Specifications* for junction box construction methods. See plans for conduit sizes. Place pull cord in any unused conduits and cap unused conduit in junction box.

To prevent the creation of electrically parallel paths, install a bonded conduit choke on the underground termination point of the system grounding conductor conduit in accordance with NEC Article 250.64(E).

Install a grounding electrode system consisting of a minimum of two ground rods spaced not less than 6 feet apart at all new lighting control system panels. Connect ground rods with an appropriately sized bonding jumper.

Apply two coats of organic zinc repair paint to all field cut metal and conduit threads as specified in Article 1076-7 of the *2024 Standard Specifications*.

Install a 4” to 2” galvanized reducing bushing to the top of the 4” RGC the control system enclosure is mounted to. Install a 10’ section of 2” RGC on the reducing bushing and install a cap on the top of the 2” RGC.

7.40 MEASUREMENT AND PAYMENT

Lighting Control Equipment will be measured and paid for as the actual number of the lighting control systems that have been provided, installed and accepted. Such price and payment shall be considered full compensation for the conduits, enclosure with components and mounting hardware.

Payment will be made under:

Light Control Equipment, Type RW, 240/480V…..……. Each

8.00 ELECTRICAL CONDUIT SYSTEM ON BREVARD RD BRIDGE

8.10 DESCRIPTION

The work covered by this section consists of furnishing and installing a conduit system embedded in the barrier rail for connection to Duke Energy light poles installed on the structure.

8.20 MATERIALS

Submit electronic copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

Non-metallic conduit shall be rigid PVC (Polyvinyl chloride) heavy wall approved for underground use with concrete encasement per UL 651 “Rigid Non-Metallic Conduit”. Use terminations designed for PVC conduit, to seal and stub out each PVC conduit, and to provide watertight protection.

Provide UL listed combination expansion/deflection couplings that are weatherproof, do not require the use of an external bonding jumper and provide a 4” minimum of conduit movement and a deflection of up to 30 degrees.

Use plywood and foam board, or other similar materials to construct formed openings in the barrier rail. Provide dual 1/8” stainless steel cover plates as shown in the plans to cover the formed opening. Attach a grounding lug to the inside of the bottom plate via a blind tapped hole. Use concrete inserts and stainless steel or brass bolts to attach the checkered plate.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Include stainless steel U-bolts for locking the bottom plate to the barrier.

Coordinate with Duke Energy to acquire the correct anchor bolt pattern for light pedestals installed on the structure.

8.30 CONSTRUCTION METHODS

Securely fasten all conduit and formed opening frames prior to placing any concrete. Each conduit run between termination points should be as straight as possible. The total angular deflection of all bends in a conduit run should not exceed 180 degrees. Total deflection greater than 180 degrees requires advanced approval by the Engineer and the Duke Energy Project

Engineer. After the conduit is encased in concrete, the Contractor shall clean each conduit by snaking with a steel band with an approved tube cleaner equipped with a mandrel of a diameter not less than 85% of the nominal inside diameter of the conduit. Coordinate conduit cleaning of the bridge lighting conduit system with Duke Energy personnel and have Duke Energy personnel on hand to witness cleaning.

Construct the formed opening with a frame built of plywood, or similar material, encased with rigid foam insulation board, or similar material, that can easily be chiseled away and the frame removed once the concrete has hardened. The frame shall be constructed so that the outer frame matches the formed opening dimensions shown in the plans. Position the formed opening frame near the ends of the bridge barrier rail, but do not conflict with guardrail attachment points. Center the formed opening frame between the vertical "S" bars to cut as few "S" bars as possible. The bridge designer must approve "S" bar cuts and will determine if additional reinforcement is required. Longitudinal "B" bars may be cut to allow the formed opening frame to fit in the barrier.

All conduit and formed opening frame work must be inspected and approved by the Engineer and Duke Energy Project Engineer before concealment.

The formed opening shall be constructed with a 2" recessed flange at depth of 2" so that the bottom and top steel plates recess flush with the barrier when installed. Install 2" x ¼" threaded inserts as shown in the plans. Threaded inserts shall be placed with a minimum of 1-½" of concrete cover between the outer edge of the insert and the inside of the formed opening. Locate and field drill mounting holes in the bottom and top plates which align with the location of the concrete inserts. During forming of the barrier rail, cast stainless steel U-bolts into the rail at the cut out locations of the bottom plate.

Extend conduits to an adequate length inside the formed opening frame and securely terminate. Provide a minimum of 2" concrete cover between the face of the barrier and the conduit. After the formed opening frame is removed, trim conduit as needed to fit inside the formed opening. Use bushings at all conduit termination points within the formed opening.

Provide and install a bonding jumper to connect the grounding lug on the inside of the bottom plate to the feeder circuit ground. The bonding jumper shall be of sufficient length to allow the bottom plate to be removed and placed on the bridge deck without disconnection.

Provide and install expansion/deflection couplings at all construction joints and bent expansion joints. Use PVC to RGC transition adapters as required to connect conduit system to expansion/deflection couplings.

Install anchor bolts according to pattern provided by Duke Energy. Protect exposed threaded portion of anchor bolts, to guard against damage from concrete installation.

Seal and cap all conduits exposed in the light pedestals on the structure.

Coordinate electrical conduit system work with work by others as directed by the Engineer.

For the bridge at Brevard Rd, the conduit will terminate in in-ground junction boxes, for future Duke Energy connections.

8.40 MEASUREMENT AND PAYMENT

The Electrical Conduit System measured as provided above will be paid at the Lump Sump basis "Brevard Rd Bridge ECS". Such price and payment will be considered full compensation for all materials, equipment and labor necessary to complete the conduit installation in the bridge barrier rail in accordance with the plans and these Special Provisions.

Payment will be made under:

Brevard Rd Bridge ECS.....Lump Sum

9.00 STATE ST UNDERPASS LIGHTING SYSTEM

9.10 DESCRIPTION

The work covered by this section consists of furnishing and installing a conduit system encased in concrete and buried. The work shall be in accordance with these special provisions, the plans, and the National Electrical Code (NEC). The conduit systems shall be installed in accordance with NEC requirements as an approved raceway for electrical circuits.

These Special Provisions are for materials and equipment to construct and put in working order the proposed electrical conduit system; however, every fitting, minor detail, or feature may not be shown or described. The electrical subcontractor is assumed to be an expert in the trade, capable of understanding the intent of the plans and special provisions and constructing the project in accordance with the best practice of the trade.

The electrical subcontractor actually performing the work described in these special provisions shall have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The electrical subcontractor shall provide for someone who has passed the N. C. State Board of Examiners of Electrical Contractors test for either limited, intermediate or unlimited classification, to be available on the job site as necessary when work is being performed or when requested by the Engineer. This person shall have a set of plans and special provisions in possession on the job site and shall maintain accurate "as built" plans and shall be qualified to instruct and direct all of the electrical subcontractor's employees regarding the work.

The Contractor shall electronically submit catalog cuts for all proposed materials for the Engineer's review and approval. Each submittal shall show the brand name, stock number, description, size, rating and manufacturing specification. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Material shall not be delivered to the project prior to approval of submittals.

9.20 MATERIALS

Provide polyvinyl chloride (PVC) conduit and fittings in accordance with Article 1091-3 of the Standard Specifications.

Cast outlet boxes shall be zinc electroplated with a grounding lug. The boxes shall be minimum 4” diameter and deep enough to assure a minimum of 2" concrete over the conduit. Cast outlet boxes/junction boxes shall be installed with blank covers and gaskets to provide a weatherproof installation. The boxes shall be designed for flush-mounted installations in poured concrete. Field drilled holes may be provided in lieu of drilled and tapped conduit entrances. Lightweight, stamped metal boxes with knockouts are not acceptable.

Incidental bolts, nuts, and washers shall be high strength and galvanized in accordance with Article 1072-7 of the Standard Specifications.

Pull lines shall be specifically designed for pulling a rope through conduit so that electrical circuits can be installed. The pull line shall be 2-ply line with a tensile strength of 240 pounds minimum, shall be resistant to tangling when being dispensed and shall be rot and mildew resistant.

9.30 CONSTRUCTION METHODS

Conduit shall be installed continuous, watertight, free of kinks, and all runs shall be made with as few couplings as standard lengths will permit. The total angle of all bends between outlets shall not exceed 270° (3-90° bends), unless approved by the Engineer.

Protection shall be provided at all times against the entrance of water or other foreign matter into the conduit. Conduit shall be plugged or capped when work is temporarily suspended, including nightly stoppage of work.

Expansion fittings shall be provided where conduit crosses structure expansion joints.

All conduit and boxes shall be securely fastened with ties prior to placing any concrete. After the conduit is encased in concrete, the Contractor shall clean each conduit by snaking with a steel band with an approved tube cleaner equipped with a mandrel of a diameter not less than 85% of the nominal inside diameter of the conduit.

All exposed raw metal surfaces in cast boxes shall be covered with a cold galvanized, zinc rich paint to ensure against corrosion in the area where galvanizing has been damaged.

Stub conduit at each end of the culvert wing wall and cap for future use. Identify the location of conduit stub points by installing a vertical piece of scrap conduit 12” above finished grade above the stub point. Include tracer wire in conduit stubs to aid in future identification.

All conduit-to-box connections shall be made with appropriately sized PVC box adapters. Install pull line in all conduit runs. Include enough slack to allow easy attachment to pull rope.

All work shall be inspected and approved by the Engineer before concealment.

9.40 MEASUREMENT AND PAYMENT

The Electrical Conduit System measured as provided above will be paid at the Lump Sump basis “State St Bridge ECS”. Such price and payment will be considered full compensation for all materials, equipment and labor necessary to complete the conduit installation behind or within the stacked-stone wall in accordance with the plans and these Special Provisions.

Payment will be made under:

State St Bridge ECS.....Lump Sum

10.00 ELECTRICAL CONDUIT SYSTEM ON MAINLINE AND RAMP BRIDGES OVER HOMINY CREEK

10.10 DESCRIPTION

The work covered by this section consists of furnishing and installing a conduit system embedded in the barrier rail for connection to light poles installed off both ends of the structure.

10.20 MATERIALS

Submit electronic copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

Non-metallic conduit shall be rigid PVC (Polyvinyl chloride) heavy wall approved for underground use with concrete encasement per UL 651 “Rigid Non-Metallic Conduit”. Use terminations designed for PVC conduit, to seal and stub out each PVC conduit, and to provide watertight protection.

Provide UL listed combination expansion/deflection couplings that are weatherproof, do not require the use of an external bonding jumper and provide a 4” minimum of conduit movement and a deflection of up to 30 degrees.

Use plywood and foam board, or other similar materials to construct formed openings in the barrier rail. Provide dual 1/8” stainless steel cover plates as shown in the plans to cover the formed opening. Attach a grounding lug to the inside of the bottom plate via a blind tapped hole. Use concrete inserts and stainless steel or brass bolts to attach the checkered plate.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Include stainless steel U-bolts for locking the bottom plate to the barrier.

Use the correct anchor bolt pattern for light pedestals installed on the structure.

10.30 CONSTRUCTION METHODS

Securely fasten all conduit and formed opening frames prior to placing any concrete. Each conduit run between termination points should be as straight as possible. The total angular deflection of all bends in a conduit run should not exceed 180 degrees. Total deflection greater than 180 degrees requires advanced approval by the Engineer. After the conduit is encased in concrete, the Contractor shall clean each conduit by snaking with a steel band with an approved tube cleaner equipped with a mandrel of a diameter not less than 85% of the nominal inside diameter of the conduit. Witness conduit cleaning of the bridge lighting conduit system.

Construct the formed opening with a frame built of plywood, or similar material, encased with rigid foam insulation board, or similar material, that can easily be chiseled away and the frame removed once the concrete has hardened. The frame shall be constructed so that the outer frame matches the formed opening dimensions shown in the plans. Position the formed opening frame near the ends of the bridge barrier rail, but do not conflict with guardrail attachment points. Center the formed opening frame between the vertical "S" bars to cut as few "S" bars as possible. The bridge designer must approve "S" bar cuts and will determine if additional reinforcement is required. Longitudinal "B" bars may be cut to allow the formed opening frame to fit in the barrier.

All conduit and formed opening frame work must be inspected and approved by the Engineer before concealment.

The formed opening shall be constructed with a 2" recessed flange at depth of 2" so that the bottom and top steel plates recess flush with the barrier when installed. Install 2" x ¼" threaded inserts as shown in the plans. Threaded inserts shall be placed with a minimum of 1-½" of concrete cover between the outer edge of the insert and the inside of the formed opening. Locate and field drill mounting holes in the bottom and top plates which align with the location of the concrete inserts. During forming of the barrier rail, cast stainless steel U-bolts into the rail at the cut out locations of the bottom plate.

Extend conduits to an adequate length inside the formed opening frame and securely terminate. Provide a minimum of 2" concrete cover between the face of the barrier and the conduit. After the formed opening frame is removed, trim conduit as needed to fit inside the formed opening. Use bushings at all conduit termination points within the formed opening.

Provide and install a bonding jumper to connect the grounding lug on the inside of the bottom plate to the feeder circuit ground. The bonding jumper shall be of sufficient length to allow the bottom plate to be removed and placed on the bridge deck without disconnection.

Provide and install expansion/deflection couplings at all construction joints and bent expansion joints. Use PVC to RGC transition adapters as required to connect conduit system to expansion/deflection couplings.

Install anchor bolts according to correct pattern. Protect exposed threaded portion of anchor bolts, to guard against damage from concrete installation.

Seal and cap all conduits exposed in the light pedestals on the structure.

Coordinate electrical conduit system work with work by others as directed by the Engineer.

10.40 MEASUREMENT AND PAYMENT

The Electrical Conduit System measured as provided above will be paid at the Lump Sump basis "Bridges Over Hominy Creek ECS". Such price and payment will be considered full compensation for all materials, equipment and labor necessary to complete the conduit installation in the bridge barrier rail in accordance with the plans and these Special Provisions.

Payment will be made under:

Bridges Over Hominy Creek ECS.....Lump Sum

11.00 MEDIAN BARRIER FORMED OPENING

11.10 DESCRIPTION:

The work covered by this section consists of furnishing and installing formed openings embedded in the median barrier for connection and splicing of lighting conduit and conductors.

11.20 MATERIALS

Use plywood and foam board, or other similar materials to construct formed openings in the barrier rail at the locations shown in the plans. Provide a 5/16" galvanized checkered steel plate, sized as shown in the plans, to cover the formed opening. Attach a grounding lug to the inside of the plate via a blind tapped hole. Use stainless steel concrete inserts and stainless steel or brass bolts to attach the checkered plate.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

11.30 CONSTRUCTION METHODS

Securely fasten all conduit and formed opening frames prior to placing any concrete. Each conduit run between termination points should be as straight as possible. The total angular deflection of all bends in a conduit run should not exceed 270 degrees.

Construct the formed opening with a frame built of plywood, or similar material, encased with rigid foam insulation board, or similar material, that can easily be chiseled away and the frame removed once the median barrier concrete has cured. The frame shall be constructed so that the outer frame matches the formed opening dimensions shown in the plans.

Position the formed opening frame as shown in the plans, and securely attach the formed opening frame to median barrier rebar cage. Slightly recess the formed opening frame to prevent snagging of the slipform machinery.

All conduit and formed opening frame work must be inspected and approved by the Engineer before concealment.

The formed opening shall be constructed with a 2" recessed flange at depth of 5/16" so that the checkered galvanized steel plate recesses flush with the barrier when installed. Install 2" x ¼" threaded inserts during slipforming as shown in the plans. Threaded inserts shall be placed with a minimum of 1-½" of concrete cover between the outer edge of the insert and the inside of the formed opening. Locate and field drill mounting holes in the checkered galvanized cover which align with the location of the concrete inserts. To ensure against corrosion in the areas where galvanizing of the cover has been damaged or drilled, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Extend conduits to an adequate length inside the formed opening frame and securely terminate. Provide a minimum of 2" concrete cover between the face of the barrier and the conduit. After the formed opening frame is removed, trim conduit as needed to fit inside the formed opening. Use bushings at all conduit termination points within the formed opening.

Provide and install a bonding jumper to connect the grounding lug on the inside of the galvanized steel plate to the feeder circuit ground. The bonding jumper shall be of sufficient length to allow the galvanized steel plate to be removed and placed on the roadway surface without disconnection.

Coordinate formed opening and conduit work with others as directed by the Engineer.

11.40 MEASUREMENT AND PAYMENT

The formed openings measured as provided above will be paid for at the contract unit price per each "Formed Opening (FO18)". Such price and payment will be considered full compensation for all materials, equipment and labor necessary to complete the formed opening installation in the median barrier in accordance with the plans and these Special Provisions.

Payment will be made under:

Formed Opening - FO18…….Each

12.00 COORDINATION WITH STATEWIDE LIGHTING MAINTENANCE FIRM

12.10 DESCRIPTION

The existing lighting system installed at the I-26/Brevard Rd and I-26/Amboy Rd interchanges are being monitored by Brady/Trane Services (Brady) under a Statewide service agreement. As part of the service agreement with Brady, a smart lighting control system (GE LightGrid) has

been installed at this interchange to monitor the power usage and status of the lighting system. The smart lighting control system consists of a wireless gateway installed at the control panel location and smart nodes installed on each luminaire.

The Contractor shall coordinate with Brady at 800-849-1915 or warranty.request@bradyservices.com regarding removal of all existing LightGrid equipment.

12.20 MATERIALS

No materials are required for this section.

12.30 CONSTRUCTION METHODS

Remove existing gateways and nodes, and deliver to NCDOT. Refer to 5.30 and 6.30 of these Special Provisions.

12.40 MEASUREMENT AND PAYMENT

No direct payment will be made for these services as this is considered incidental to the removal of existing control panels and luminaires. Refer to 5.30 and 6.30 of these Special Provisions.

13.00 ELECTRICAL CONDUIT INSTALLATION

13.10 DESCRIPTION

Provide and install electrical conduit for future Duke Energy lighting at the locations shown on the plans. Include all materials, equipment and labor for trenching, jacking, boring or directional boring and backfilling.

Pages LT-24 through LT-39 of these Special Provisions contain Duke Energy's "Customer Guide for Installing Conduit" (*the guide*). All conduit supplied by the contractor shall meet the requirements of *the guide*, and shall be installed per the installation methods detailed in *the guide*. For the purposes of this project, all instances of "customer" in *the guide* shall be interpreted as "contractor". The cable requirements mentioned in *the guide* are not applicable for this project.

The contractor shall coordinate inspection of the completed electrical conduit system with Duke Energy.

PURPOSE OF THIS DOCUMENT

THIS DOCUMENT PROVIDES INFORMATION AND REQUIREMENTS A CUSTOMER WILL NEED TO PROPERLY INSTALL CONDUIT IN BOTH RESIDENTIAL AND COMMERCIAL APPLICATIONS.

DEFINITIONS

SERVICE: 600-VOLT RATED UNDERGROUND CONDUCTORS BETWEEN THE UTILITY ELECTRIC SYSTEM AND THE CUSTOMERS ELECTRIC SYSTEM.

SERVICE POINT (POINT OF DELIVERY): THE POINT OF CONNECTION BETWEEN THE FACILITIES OF THE SERVING UTILITY AND THE PREMISE WIRING.

SECONDARY: 600-VOLT RATED CONDUCTOR BETWEEN PAD-MOUNTED TRANSFORMERS AND SECONDARY PEDESTALS OR BETWEEN SECONDARY PEDESTALS.

SECONDARY PEDESTAL (ALSO LISTED AS "PEDESTAL" IN THIS DOCUMENT): ABOVE-GROUND ENCLOSURE THAT ACTS AS A JUNCTION POINT FOR SECONDARY CONDUCTORS OR SECONDARY CONDUCTORS AND SERVICES.

PULL BOX: FLUSH-MOUNTED ENCLOSURE THAT ACTS AS A JUNCTION POINT FOR SECONDARY OR PRIMARY CONDUCTORS.

PAD-MOUNTED TRANSFORMER (ALSO LISTED AS "TRANSFORMER" IN THIS DOCUMENT): PAD-MOUNTED ABOVE-GROUND STYLE TRANSFORMER MOUNTED IN A STEEL ENCLOSURE FOR CONVERTING MEDIUM VOLTAGE TO SERVICE/SECONDARY VOLTAGE LEVELS.

GROUND ROD: GROUNDING ELECTRODE FOR USE AS A DIRECT CONNECTION TO EARTH.

MINIMUM COVER: THE MINIMUM ALLOWABLE DISTANCE BETWEEN THE TOP OF A BURIED CONDUIT TO FINAL GRADE.

SWITCHGEAR: AN ABOVE-GROUND PAD-MOUNTED STEEL ENCLOSURE CONTAINING MEDIUM VOLTAGE SWITCHING EQUIPMENT.

RISER OR RISER POLE: THE POINT OF CONNECTION BETWEEN THE UTILITY OVERHEAD POWER SYSTEM AND AN UNDERGROUND SYSTEM.

THREE-PHASE (REFERENCE FOR PRIMARY VOLTAGE IN THIS DOCUMENT): A MULTI-PHASE SYSTEM CONSISTING OF THREE SEPARATE PHASE CONDUCTORS IN A BUNDLED OR TRIPLEXED CONFIGURATION.

SINGLE-PHASE (REFERENCE FOR PRIMARY VOLTAGE IN THIS DOCUMENT): A PRIMARY VOLTAGE SYSTEM CONSISTING OF ONE CONDUCTOR.

LIGHTING CABLE: 600-VOLT RATED CONDUCTORS SERVING A STREET LIGHT.

CABLE ENTRANCE ZONES: AREAS DEFINED WITHIN A PROPOSED TRANSFORMER, SWITCHGEAR, AND PEDESTAL FOR USE IN STUBBING UP ELECTRICAL CONDUITS.

PRIMARY: MEDIUM VOLTAGE CABLE TYPICALLY NOT EXCEEDING 1/0 AWG IN SIZE (TYPICALLY 7.2 KV TO 14.4 KV PHASE TO GROUND). CAN BE SINGLE-PHASE OR THREE-PHASE.

FEEDER: MEDIUM VOLTAGE CABLE GREATER THAN 1/0 AWG IN SIZE (TYPICALLY 7.2 KV TO 14.4 KV PHASE TO GROUND), THREE-PHASE ONLY.

LOOP: REFERS TO A CIRCUIT THAT CAN BE FED FROM REDUNDANT (2) SOURCES. IT IS CRITICAL FOR EACH CABLE ON THE SAME LOOP TO BE SEPARATED WITHIN A TRENCH.

MANDREL: CYLINDRICAL OBJECT PULLED THROUGH A CONDUIT SYSTEM TO VERIFY THE INTEGRITY OF THE SYSTEM AND THAT CABLE CAN BE SUCCESSFULLY PULLED THROUGH THE SYSTEM.

DUKE ENERGY.

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CUSTOMER RESPONSIBILITIES

- THE CONDUIT DESIGN WILL BE PROVIDED BY THE DUKE ENERGY DESIGNER. THE DESIGN WILL SHOW THE LOCATION WHERE ALL FACILITIES (CONDUIT, PULL BOXES/MANHOLES, PEDESTALS, TRANSFORMERS, SWITCHGEAR, POLES, ETC.) WILL BE INSTALLED. ANY PROPOSED CHANGES IN THE CONDUIT DESIGN MUST BE REVIEWED AND APPROVED BY THE DUKE ENERGY DESIGNER PRIOR TO INSTALLATION.
- PROVIDE ALL MATERIAL RELATED TO THE CONDUIT SYSTEM AND THE LABOR TO INSTALL THIS MATERIAL.
- COMPLY WITH ALL REQUIREMENTS LISTED IN THIS DOCUMENT.
- INSPECT THE CONDUIT SYSTEM AND CORRECT ALL INSTANCES OF NON-COMPIANCE WITH THE REQUIREMENTS LISTED IN THIS DOCUMENT.
- CUSTOMER IS RESPONSIBLE FOR INSTALLING CONDUIT AND CABLE UP TO THE POINT OF DELIVERY AS DEFINED IN THE SERVICE REQUIREMENTS MANUAL.

DUKE ENERGY RESPONSIBILITIES

- THE CONDUIT DESIGN WILL BE PROVIDED BY THE DUKE ENERGY DESIGNER. THE DESIGN WILL SHOW THE LOCATION WHERE ALL FACILITIES (CONDUIT, PULL BOXES/MANHOLES, PEDESTALS, TRANSFORMERS, SWITCHGEAR, POLES, ETC.) WILL BE INSTALLED. ANY PROPOSED CHANGES IN THE CONDUIT DESIGN MUST BE REVIEWED AND APPROVED BY THE DUKE ENERGY DESIGNER PRIOR TO INSTALLATION.
- PROVIDE ALL CABLE AND ASSOCIATED MATERIALS ALONG WITH THE LABOR TO INSTALL THESE MATERIALS UP TO THE POINT OF DELIVERY.
- COORDINATE WITH THE CUSTOMER TO DETERMINE THE BEST METHOD OF MARKING THE ROUTE OF ALL APPLICABLE PRIMARY AND SECONDARY CABLE, AND THE LOCATION OF ALL EQUIPMENT (TRANSFORMERS, SWITCHGEAR, ETC.), PEDESTALS, PULL BOXES, RISERS AND STREET LIGHT POLES. EQUIPMENT WILL NORMALLY BE PLACED DIRECTLY ON TOP OF THE CABLE ROUTE TO REDUCE THE NUMBER OF 90-DEGREE BENDS.
- SPECIFY THE SIZE, NUMBER AND POSITION OF CONDUITS THAT WILL BE INSTALLED IN EACH PIECE OF EQUIPMENT (TRANSFORMER, PEDESTAL, ETC.).
- INSPECT THE CONDUIT SYSTEM PRIOR TO THE INSTALLATION OF CABLE.
- DUKE ENERGY RESERVES THE RIGHT TO REFUSE ACCEPTANCE OF ANY PORTION OF A CONDUIT SYSTEM THAT DOES NOT MEET ALL THE REQUIREMENTS LISTED IN THIS DOCUMENT. IT WILL BE THE CUSTOMER'S RESPONSIBILITY TO CORRECT ALL INSTANCES OF NON-COMPLIANCE.
- ONCE THE CONDUIT SYSTEM HAS BEEN INSPECTED BY DUKE ENERGY AND ALL CABLE AND EQUIPMENT HAVE BEEN INSTALLED, DUKE ENERGY WILL MAKE ANY NECESSARY FUTURE REPAIRS OR ALTERATIONS TO THE CONDUIT SYSTEM AT ITS EXPENSE.

TRENCH REQUIREMENTS

- THE UNDERGROUND TRENCH CONTAINING ELECTRIC CABLES IS FOR THE SOLE USE OF DUKE ENERGY. NO OTHER UTILITIES OR FACILITIES FOR IRRIGATION, LIGHTING, SECURITY, PLUMBING, OR ANY OTHER PURPOSE MAY BE INSTALLED IN THE TRENCH WITHOUT THE EXPRESS PERMISSION OF DUKE ENERGY.
- THE BOTTOM OF THE TRENCH MUST BE SMOOTH AND FREE OF ROCKS, ROOTS, CONSTRUCTION DEBRIS OR ANY OTHER HARD OR SHARP OBJECT. IF NECESSARY, INSTALL A FEW INCHES OF CLEAN BACKFILL TO COVER ANY OF THESE ITEMS THAT CANNOT BE REMOVED.
- ALL CONDUIT MUST BE INSTALLED AT THE PROPER DEPTH AND WITH PROPER SEPARATION AS SHOWN ON THE TABLES ON DWG. 22.08-101D.
- THE MAXIMUM TRENCH DEPTH MUST NOT EXCEED FOUR (4) FEET, EXCEPT WHERE REQUIRED AT ENTRANCE POINTS FOR CONDUIT BENDS INTO PIT PADS OR PULL BOXES.
- THE CUSTOMER MUST BACKFILL ALL TRENCHES WHERE CUSTOMER-INSTALLED CONDUIT WAS PROVIDED.
- ALL BACKFILL MUST BE FREE OF ROCKS, CONSTRUCTION DEBRIS, OR ANY OTHER HARD OBJECTS.
- ALL BACKFILL MUST BE COMPACTED TO THE FIRMNESS OF UNDISTURBED SOIL.
- THE CUSTOMER WILL BE RESPONSIBLE FOR ANY SETTLING OR WASHOUT OF THE TRENCH.

DUKE ENERGY.

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ALL CONDUIT MUST BE INSTALLED AT THE PROPER DEPTH AND WITH PROPER SEPARATION AS SHOWN BELOW.

TABLE 1: MINIMUM CONDUIT COVER		
CABLE OR APPLICATION	MINIMUM COVER (X)	SPECIFIC NOTES
SECONDARY / SERVICE	30"	SEE NOTE 2
PRIMARY (1Ø OR 3Ø)	36"	SEE NOTE 2
ROAD CROSSINGS (ANY VOLTAGE)	36"	-
PARKING LOT CROSSINGS (ANY VOLTAGE)	36"	SEE NOTE 2

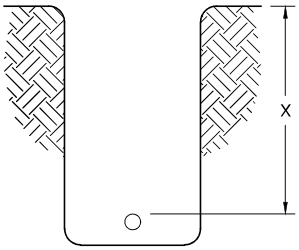
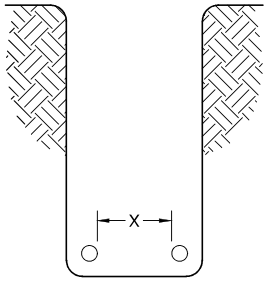


TABLE 2: REQUIRED MINIMUM HORIZONTAL SEPARATION BETWEEN CONDUITS.					
COLUMN 1	MINIMUM HORIZONTAL SEPARATION FROM CABLES IN COLUMN 1 (X)				
CABLE	SECONDARY/ SERVICE	PRIMARY, 200A (1Ø OR 3Ø)	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE NOT** PART OF THE SAME LOOP	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE** PART OF THE SAME LOOP	FEEDER (>200A)
SECONDARY / SERVICE	NO REQUIRED SEPARATION SEE FIGURE 1	NO REQUIRED SEPARATION SEE FIGURE 1			36" SEE FIGURE 3
PRIMARY, 200A (1Ø OR 3Ø)	NO REQUIRED SEPARATION SEE FIGURE 1		NO REQUIRED SEPARATION SEE FIGURE 1	36" SEE FIGURE 2	36" SEE FIGURE 3
FEEDER (>200A)	36" SEE FIGURE 3	36" SEE FIGURE 3			36" SEE FIGURE 3



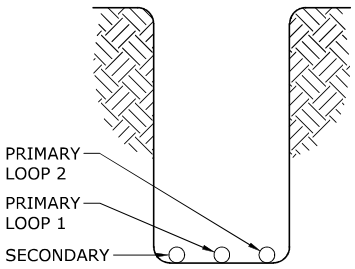


FIGURE 1
NO SEPARATION BETWEEN CONDUITS

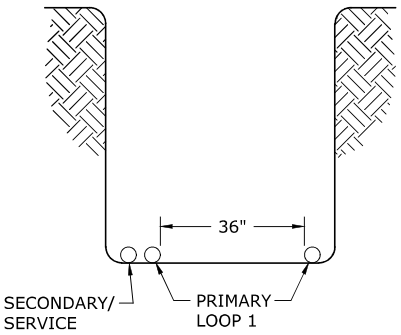


FIGURE 2
36" SPACING BETWEEN CONDUITS OF SAME PRIMARY LOOP

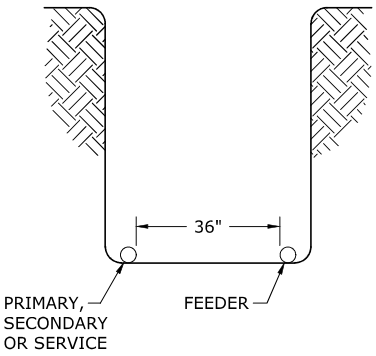


FIGURE 3
36" SPACING BETWEEN FEEDER CONDUITS AND THOSE CONTAINING ANY OTHER TYPE OF CABLE

NOTES:

1. DISTANCES ARE MEASURED TO THE SURFACE OF THE CABLE OR CONDUIT.
2. PRIMARY CABLES LESS THAN 30" DEEP OR SECONDARY CABLES LESS THAN 24" DEEP MUST BE INSTALLED IN MINIMUM SCHEDULE 40 CONDUIT WITH A MINIMUM OF TWO (2) INCHES OF CONCRETE ABOVE AND BESIDE THE CONDUIT AND A MINIMUM OF SIX (6) INCHES OF COVER.
3. FEEDER (>200A) CONDUITS MUST BE SEPARATED HORIZONTALLY FROM CONDUITS CONTAINING ANY OTHER TYPE OF CABLE BY 36".
4. EITHER ONE WIDE TRENCH OR TWO NARROW TRENCHES MAY BE USED, BASED ON ECONOMICS, TO OBTAIN REQUIRED HORIZONTAL SEPARATION.

DUKE ENERGY.

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MATERIAL REQUIREMENTS

- PVC CONDUIT AND CONDUIT FITTINGS MUST BE SCHEDULE 40 OR GREATER, RATED FOR USE WITH 90° C ELECTRICAL CABLE, UL LISTED AND GRAY IN COLOR. NO WATER, SEWER, GAS OR TELECOMMUNICATION PIPE MAY BE USED. EACH LENGTH OF CONDUIT AND EACH BEND MUST HAVE AN INTEGRAL BELL ON ONE END. THE CONDUIT MANUFACTURER'S NAME, CONDUIT SIZE, TYPE AND DATE CODE MUST BE PRINTED ON THE SURFACE OF THE CONDUIT.
- HDPE CONDUIT MUST BE SDR 13.5 OR GREATER, RATED FOR USE WITH 90°C ELECTRICAL CABLE, AND BLACK WITH EITHER 3 OR 4 RED STRIPES OR TOTALLY RED. THE CONDUIT MANUFACTURER'S NAME, CONDUIT SIZE, TYPE AND DATE CODE MUST BE PRINTED ON THE SURFACE OF THE CONDUIT.

CONDUIT SIZE WILL BE AS FOLLOWS.

APPLICATION	CONDUIT SIZE
SINGLE-PHASE 25KV 1/0 AWG PRIMARY	2"
SINGLE-PHASE 35KV 1/0 AWG PRIMARY	3"
THREE-PHASE 25KV 1/0 AWG PRIMARY	4"
THREE-PHASE 35KV 1/0 AWG PRIMARY	6"
THREE-PHASE PRIMARY (GREATER THAN 1/0 AWG)	6"
600V SECONDARY (TX TO PEDESTAL)	3"
600V SERVICES (RESIDENTIAL) (SEE NOTE 1)	2-1/2"
LIGHTING CABLE	2"

NOTE 1: DUKE ENERGY WILL PROVIDE THE REQUIRED CONDUIT SIZE FOR RESIDENTIAL BUILDINGS WHERE THE SERVICE CABLE WILL FEED GANGED METER PANELS.

NOTE 2: OTHER FACTORS SUCH AS LENGTH OF PULL, NUMBER OF BENDS, AVAILABILITY OF MATERIAL, ETC. MAY JUSTIFY OR REQUIRE LARGER SIZES THAN THOSE SHOWN IN THIS TABLE.

- WHEN HDPE CONDUIT IS USED, PVC BENDS MUST BE ATTACHED TO ALLOW THE CONDUIT SYSTEM TO ENTER TRANSFORMERS, SWITCHGEAR, PEDESTALS, ETC. THE FOLLOWING OPTIONS ARE THE ONLY APPROVED METHODS TO CONNECT HDPE CONDUIT TO PVC CONDUIT OR FITTINGS. THESE OPTIONS MAY ALSO BE USED TO JOIN TWO PIECES OF HDPE CONDUIT, EXCEPT WHEN ONE OF THE PIECES WILL BE USED TO PULL THE OTHER INTO POSITION THROUGH A DIRECTIONAL BORE.

A. SHUR LOCK II COUPLINGS: THESE ARE PLASTIC, SLIP-ON COUPLINGS, WITH STAINLESS STEEL BANDS MADE BY DURALINE.



B. BONDUIT ADHESIVE: THIS ADHESIVE IS FORMULATED TO BOND TO BOTH HDPE AND PVC.



C. MOR CLAMP COUPLINGS: THESE ARE BOLTED, STAINLESS STEEL, SLIP-ON COUPLINGS MADE BY DURALINE. THESE COUPLINGS ARE EXPENSIVE, SO THEY WILL TYPICALLY BE USED ONLY ON LARGE CONDUIT AND ONLY WHEN NECESSARY BECAUSE THE CONDUIT IS OUT-OF-ROUND.



THESE METHODS ALSO ALLOW HDPE CONDUIT PIECES TO BE JOINED TOGETHER OR FOR HDPE CONDUIT TO BE JOINED TO PVC CONDUIT.

- ALL PVC COUPLINGS MUST HAVE A CENTER STOP.
- ALL 6" BENDS MUST HAVE A 48" MINIMUM RADIUS AND ALL OTHER BENDS MUST HAVE A 36" MINIMUM RADIUS. ALL BENDS MUST HAVE AN INTEGRAL BELL ON ONE END.
- PULL STRINGS MUST BE MADE OF A MATERIAL THAT WILL NOT ROT, (I.E., NYLON).

DUKE ENERGY.

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1 8/17/20	FLETCHER	EANES	GRAHAM
0 7/31/20	FLETCHER	EANES	GRAHAM

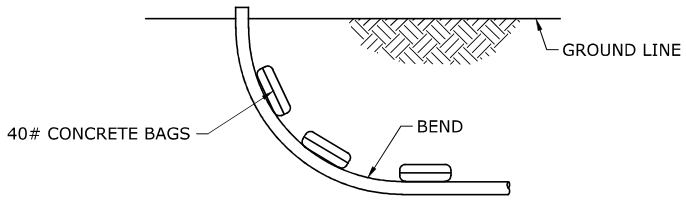
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CONDUIT AND FITTING INSTALLATION

- EXAMINE ALL CONDUIT AND CONDUIT ACCESSORIES BEFORE THEY ARE INSTALLED FOR SHARP EDGES, OUT-OF-ROUND SHAPE, CRACKS, CHIPS, BURRS, AND INSIDE PROTRUSIONS THAT WOULD DAMAGE THE CABLE WHEN IT IS PULLED INTO POSITION. SUCH PIECES SHALL NOT BE INSTALLED.
- REMOVE ANY SHARP EDGES THAT ARE CREATED ON THE INSIDE OR OUTSIDE OF CONDUIT WHEN IT IS CUT.
- ALL SECTIONS OF PVC CONDUIT AND ALL FITTINGS MUST BE CEMENTED TOGETHER USING A PVC CONDUIT SOLVENT CEMENT RATED FOR USE WITH ELECTRICAL PVC CONDUIT THAT CHEMICALLY BONDS THE TWO PVC PARTS TOGETHER. DO NOT USE CEMENT DESIGNED FOR USE WITH PLUMBING PVC PIPE. THE MATING SURFACES MUST BE 1) PROPERLY CLEANED; 2) A THIN, UNIFORM COATING OF CEMENT APPLIED OVER THE ENTIRE MATING SURFACES (THE OUTER SURFACE OF A PLAIN END AND THE INNER SURFACE OF A BELL END); 3) FULLY SEAT BOTH PIECES; AND 4) TWIST THE PIECES ONE QUARTER TURN TO THEIR REQUIRED POSITION.
- CONDUIT MUST LIE FLAT ON THE BOTTOM OF THE TRENCH.
- A CONTINUOUS PULL STRING, WITH NO KNOTS OR SPLICES, MUST BE PROVIDED THROUGHOUT THE LENGTH OF EACH INDIVIDUAL CONDUIT SEGMENT AND EXTEND AT LEAST THREE FEET OUTSIDE OF EACH STUB-UP. FOR EXAMPLE, A SINGLE PULL STRING MUST EXTEND FROM A TRANSFORMER, PASS THROUGH ALL BENDS AND CONDUIT PIECES, AND THEN EXIT AT A PEDESTAL.
- PULL STRINGS MUST BE TESTED TO VERIFY THEY WERE NOT INADVERTENTLY GLUED TO A PIECE OF CONDUIT OR A FITTING. THE CUSTOMER WILL BE REQUIRED TO INSTALL NEW PULL STRINGS IN ANY CONDUIT SEGMENT WHERE THE INITIAL PULL STRINGS ARE NOT USABLE.
- EACH CONDUIT SEGMENT (TRANSFORMER TO TRANSFORMER, TRANSFORMER TO PEDESTAL, PEDESTAL TO SERVICE RISER, ETC.) MUST BE COLOR CODED ON EACH END WITH THE SAME COLOR OF VINYL TAPE OR SPRAY PAINT OR, WEATHER-RESISTANT, NON-FADABLE ADHESIVE LABELS MAY BE APPLIED. WHEN MULTIPLE BENDS OR CONDUITS ARE BANDED TOGETHER, SUCH AS IN A TRANSFORMER, THE COLOR CODING OR LABELS ON EACH BEND OR CONDUIT MUST BE READILY VISIBLE.
- CUSTOMER SHALL PULL A SOLID MANDREL, NO MORE THAN 1/2 INCH SMALLER THAN THE INSIDE DIAMETER OF THE CONDUIT, THROUGH ALL CONDUIT SEGMENTS TO VERIFY THEY ARE IN GOOD CONDITION AND FREE OF OBSTACLES.
- CONDUITS MUST BE PLUGGED TO PREVENT DEBRIS, RAIN, ETC. FROM ENTERING THE CONDUIT. TAPE OR RAGS ARE NOT SUFFICIENT. THESE PLUGS MUST **NOT** BE CEMENTED ONTO THE CONDUIT OR FITTING.
- NO WIRES, CABLES, CONDUITS, INNER-DUCTS, OR ANY OTHER ITEMS MAY BE INSTALLED IN THE CONDUITS INSTALLED FOR DUKE ENERGY. THIS INCLUDES FACILITIES FOR LIGHTING, SECURITY, LANDSCAPING, COMMUNICATION, OTHER UTILITIES OR THE CUSTOMER. THE CUSTOMER WILL BE REQUIRED TO REMOVE ANY SUCH FACILITIES THAT ARE FOUND.
- WHEN MULTIPLE DEVELOPERS ARE INSTALLING CONDUIT FOR DUKE ENERGY ALONG A SINGLE CONDUIT SEGMENT (ONE TRANSFORMER TO ANOTHER TRANSFORMER, A TRANSFORMER TO A PEDESTAL, ETC.), THE DEVELOPERS ARE REQUIRED TO JOIN THEIR CONDUIT SECTIONS TOGETHER, INSTALL A SINGLE PULL STRING FROM ONE END OF THE CONDUIT SEGMENT (THE TRANSFORMER, PEDESTAL, ETC.) TO THE OTHER END OF THE CONDUIT SEGMENT, AND TO PROPERLY LABEL BOTH ENDS OF THE CONDUIT SEGMENT.
- MULTIPLE BENDS/CONDUITS MUST BE FIRMLY BANDED TOGETHER IN THE PROPER CONFIGURATION AND WITHIN THE REQUIRED DIMENSIONS PROVIDED IN THIS DOCUMENT WHEN INSTALLED IN TRANSFORMERS, SWITCHGEAR, PEDESTALS, ETC.
- ALL CONDUITS MUST BE FREE OF WATER, MUD, DIRT OR ANY OTHER FOREIGN MATTER. THE CUSTOMER MUST INSPECT, CLEAN AND REPAIR ANY CONDUITS THAT CONTAIN FOREIGN MATTER.
- PLACE TWO, FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90° BEND CONTAINING SECONDARY/ SERVICE CABLE AND THREE, FORTY (40) POUND BAGS AGAINST BENDS CONTAINING PRIMARY CABLE TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- IT IS NOT NECESSARY TO DOUBLE THE REQUIRED NUMBER OF CONCRETE BAGS WHEN TWO BENDS ARE INSTALLED SIDE-BY-SIDE. USE THE NUMBER OF BAGS REQUIRED FOR A SINGLE BEND AND POSITION THE BAGS SO THEY WILL COVER BOTH BENDS.
- BAGS OF CONCRETE ARE NOT REQUIRED ON 90 DEGREE BENDS WHEN THE TOTAL LENGTH OF THE CONDUIT SECTION IS 100 FEET OR LESS.
- BAGS OF CONCRETE ARE NOT REQUIRED FOR RESIDENTIAL SERVICES THAT WILL NOT UTILIZE MECHANICAL PULLING EQUIPMENT FOR INSTALLING THE CABLE INTO THE CONDUIT.



SECURING BENDS WITH BAGS OF CONCRETE

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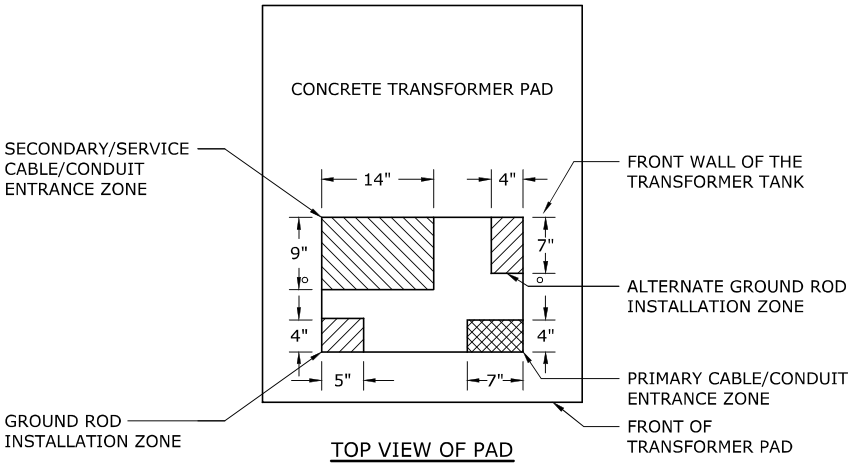
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CONDUIT POSITIONING IN TRANSFORMERS

1. SINGLE-PHASE PAD-MOUNTED TRANSFORMERS

- CONDUITS SHALL NOT BE INSTALLED OUTSIDE THE DESIGNATED ZONES SHOWN IN THE DRAWING BELOW. THE PAD CANNOT BE INSTALLED IF THESE DIMENSIONS ARE EXCEEDED. DUKE ENERGY RECOMMENDS THAT A TEMPLATE BE CONSTRUCTED AND USED TO VERIFY PROPER LOCATION OF THESE CONDUITS. THE OPENING ON THE CONCRETE PAD IS 26" X 16".

SINGLE-PHASE TRANSFORMER CABLE ENTRANCE ZONES

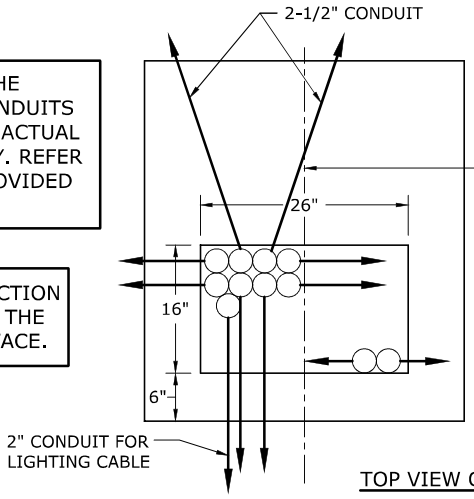


TOP VIEW OF PAD

CONDUIT CONFIGURATIONS IN DEC SINGLE-PHASE PAD-MOUNTED TRANSFORMER PADS

THIS DRAWING SHOWS THE MAXIMUM NUMBER OF CONDUITS THAT CAN BE INSTALLED. ACTUAL INSTALLATIONS MAY VARY. REFER TO THE JOB DRAWING PROVIDED BY DUKE ENERGY.

ARROWS SHOW THE DIRECTION THE BOTTOM PORTION OF THE 90-DEGREE BENDS WILL FACE.



NO OTHER UTILITIES MAY BE INSTALLED UNDER A TRANSFORMER PAD.

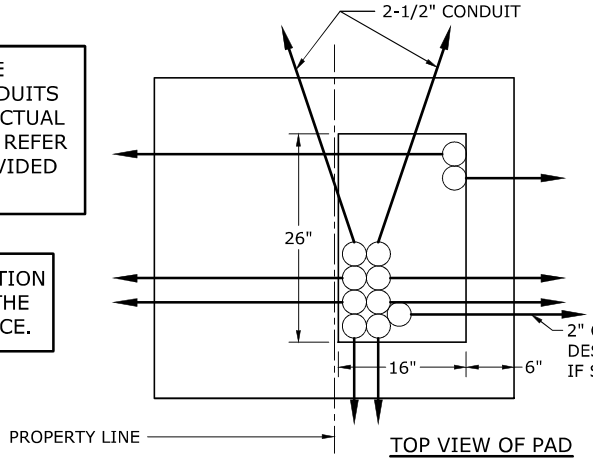
ALL CONDUITS ARE 3" UNLESS NOTED OTHERWISE.

TOP VIEW OF PAD

CONDUIT CONFIGURATIONS IN DEP SINGLE-PHASE PAD-MOUNTED TRANSFORMER PADS

THIS DRAWING SHOWS THE MAXIMUM NUMBER OF CONDUITS THAT CAN BE INSTALLED. ACTUAL INSTALLATIONS MAY VARY. REFER TO THE JOB DRAWING PROVIDED BY DUKE ENERGY.

ARROWS SHOW THE DIRECTION THE BOTTOM PORTION OF THE 90-DEGREE BENDS WILL FACE.



NO OTHER UTILITIES MAY BE INSTALLED UNDER A TRANSFORMER PAD.

ALL CONDUITS ARE 3" UNLESS NOTED OTHERWISE.

TOP VIEW OF PAD

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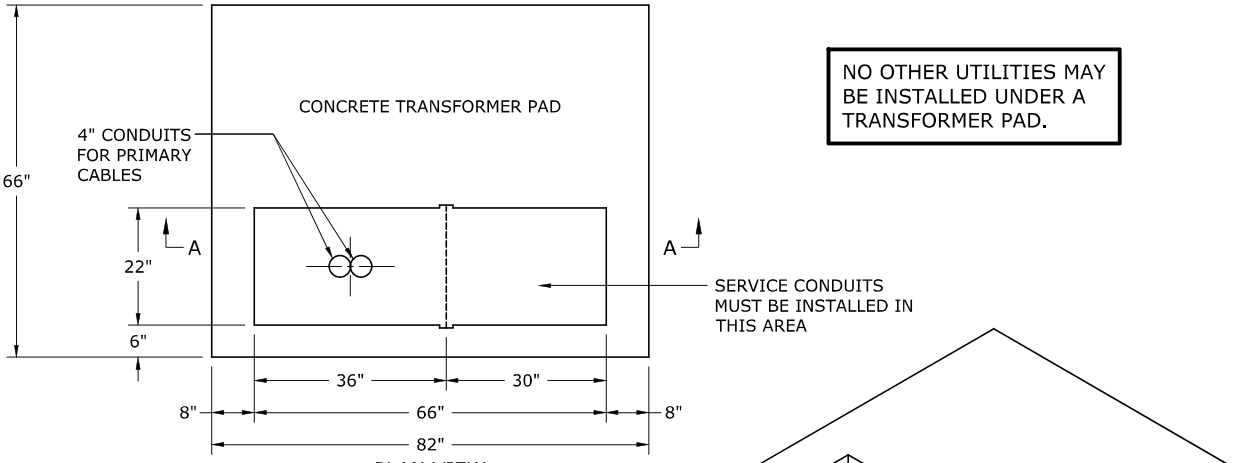
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- INSTALL EQUIPMENT ABOVE THE TRENCH TO ELIMINATE THE NUMBER OF REQUIRED CONDUIT BENDS.
- A MAXIMUM OF EIGHT (8) SECONDARY/SERVICE CONDUITS, TWO (2) PRIMARY CABLE CONDUITS, AND ONE (1) LIGHTING CABLE CONDUIT CAN BE INSTALLED IN SINGLE-PHASE TRANSFORMERS; HOWEVER, QUITE OFTEN, FEWER CONDUITS WILL BE REQUIRED. WHEN FEWER THAN EIGHT (8) SECONDARY/SERVICE CONDUITS WILL BE INSTALLED, KEEP THE CONDUITS AS FAR TO THE LEFT SIDE OF THE 9" X 14" SECONDARY/SERVICE CONDUIT ENTRANCE ZONE AS POSSIBLE. NO PART OF ANY CONDUIT MAY EXTEND OUTSIDE OF THIS ZONE.
- BE CERTAIN TO LEAVE A SPACE BESIDE THE CONDUITS FOR THE INSTALLATION OF THE GROUND ROD.
- THE TRANSFORMER PAD MUST BE POSITIONED SO THE FRONT OF THE TRANSFORMER WILL FACE THE STREET IN DEC LOCATIONS AND BE TURNED TO THE RIGHT IN DEP LOCATIONS.
- THERE SHALL BE NO ABOVE-GROUND OBSTRUCTIONS WITHIN TEN (10) FEET OF THE FRONT OF THE TRANSFORMER OR WITHIN THREE (3) FEET OF THE SIDES AND BACK.
- THE GROUND UNDER THE PAD SHALL BE LEVEL AND THOROUGHLY COMPACTED.
- EXTEND CONDUITS THREE (3) INCHES ABOVE THE SOIL.
- PLACE TWO (2), FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH BEND CONTAINING SECONDARY/SERVICE CABLE AND THREE (3), FORTY (40) POUND BAGS AGAINST BENDS CONTAINING PRIMARY CABLE AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- INSTALL PLUGS IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUITS. DO **NOT** GLUE THE PLUGS ONTO THE CONDUIT.

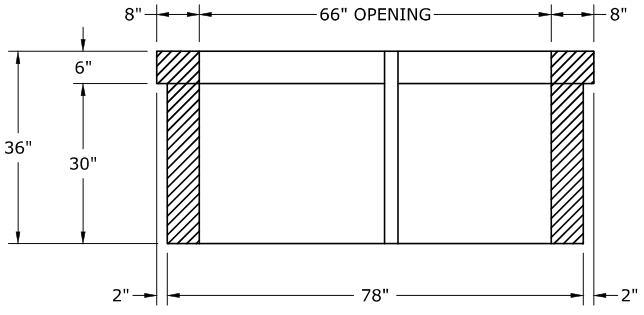
2. THREE-PHASE PAD-MOUNTED TRANSFORMERS 75KVA THROUGH 300KVA

- CONDUITS FOR PRIMARY AND SERVICE CABLES SHALL BE INSTALLED AS SHOWN IN THE DRAWING BELOW.

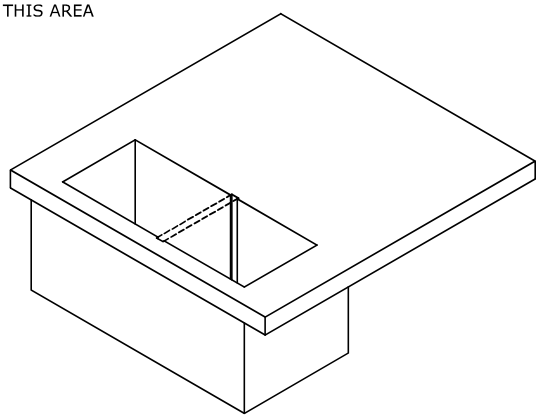
CONDUIT POSITIONS IN SMALL THREE-PHASE PAD-MOUNTED TRANSFORMER PADS



PLAN VIEW



SECTION A-A



3				
2				
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0	4/30/21	FLETCHER	EANES	GRAHAM
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CUSTOMER GUIDE FOR INSTALLING CONDUIT

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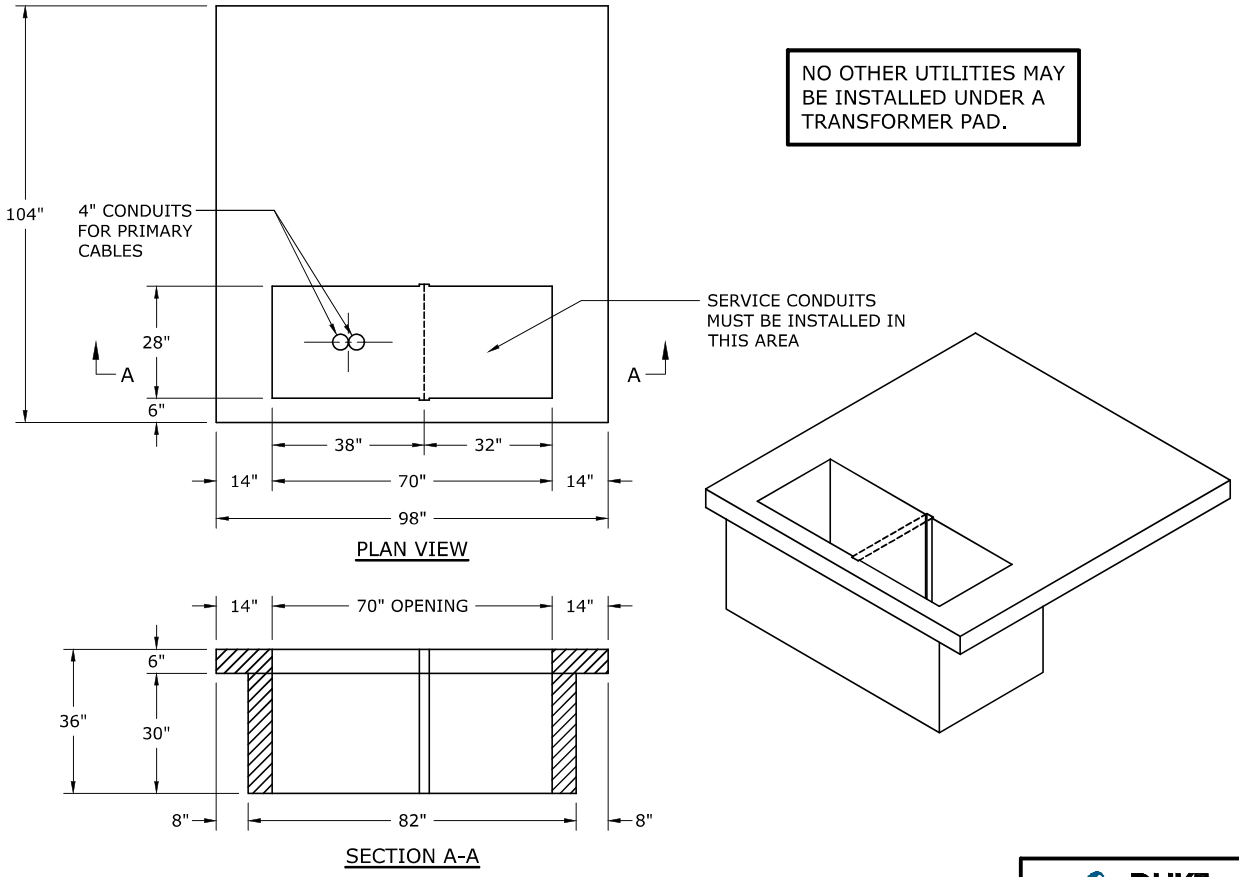
22.08-101H

- THERE SHALL BE NO ABOVE-GROUND OBSTRUCTIONS WITHIN TEN (10) FEET OF THE FRONT OF THE TRANSFORMER OR WITHIN THREE (3) FEET OF THE SIDES AND BACK. IF A METER IS INSTALLED ON THE TRANSFORMER, NO OBSTRUCTIONS MAY BE WITHIN FOUR (4) FEET OF THAT SIDE.
- SIDE VENTILATION MAY BE REQUIRED IF A WALL IS TO BE CONSTRUCTED AROUND THE TRANSFORMER. CONTACT DUKE ENERGY TO OBTAIN THE REQUIRED SEPARATION BETWEEN THE TRANSFORMER AND A WALL.
- THE GROUND UNDER THE PAD SHALL BE LEVEL AND THOROUGHLY COMPACTED.
- INSTALL BENDS FOR THE PRIMARY CABLE IN THE CENTER OF THE DESIGNATED PRIMARY CABLE AREA AS SHOWN ON DWG. 22.08-101H.
- CONDUITS FOR SECONDARY/SERVICE CABLES ARE TO BE CENTERED IN THE AREA SHOWN ON DWG. 22.08-101H. NO PART OF ANY CONDUIT MAY EXTEND OUTSIDE OF THE DIMENSIONS SHOWN.
- PLACE THREE, FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90° BEND CONTAINING PRIMARY CABLE AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- ALL CONDUITS IN A PIT PAD SHALL EXTEND 6” ABOVE THE GRAVEL BED IN THE PIT.
- INSTALL PLUGS IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUITS. DO NOT GLUE THE PLUGS ONTO THE CONDUIT.

3. <u>THREE-PHASE PAD-MOUNTED TRANSFORMERS 500KVA THROUGH 5000KVA</u>

- CONDUITS FOR PRIMARY AND SERVICE CABLES SHALL BE INSTALLED AS SHOWN IN THE DRAWING BELOW.

CONDUIT POSITIONS IN LARGE THREE-PHASE PAD-MOUNTED TRANSFORMER PADS



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REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

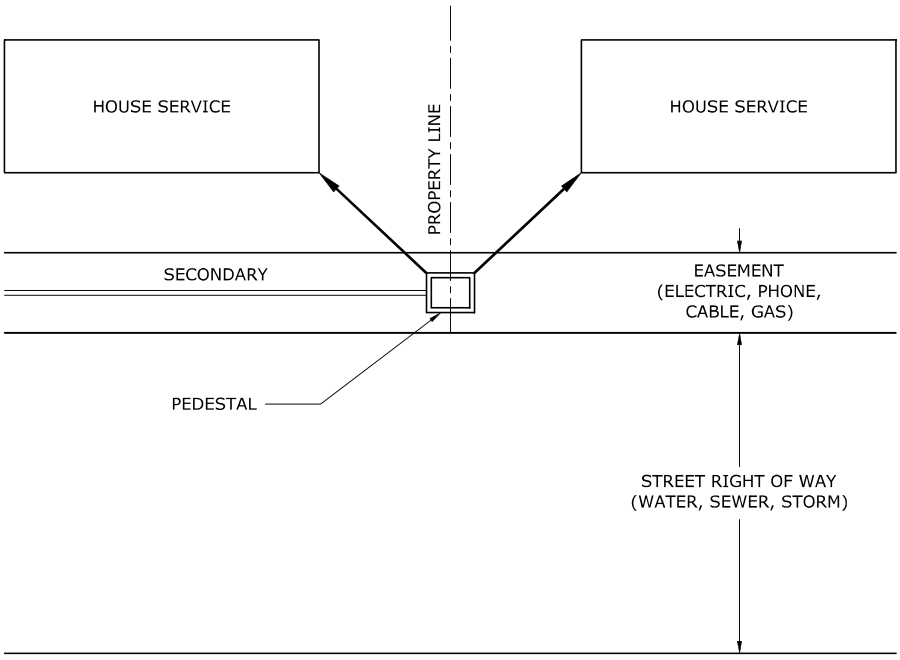
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22.08-101I

- THERE SHALL BE NO ABOVE-GROUND OBSTRUCTIONS WITHIN TEN (10) FEET OF THE FRONT OF THE TRANSFORMER OR WITHIN THREE (3) FEET OF THE SIDES AND BACK. IF A METER IS INSTALLED ON THE TRANSFORMER, NO OBSTRUCTIONS MAY BE WITHIN FOUR (4) FEET OF THAT SIDE.
- SIDE VENTILATION MAY BE REQUIRED IF A WALL IS TO BE CONSTRUCTED AROUND THE TRANSFORMER. CONTACT DUKE ENERGY TO OBTAIN THE REQUIRED SEPARATION BETWEEN THE TRANSFORMER AND A WALL.
- THE GROUND UNDER THE PAD SHALL BE LEVEL AND THOROUGHLY COMPACTED.
- INSTALL CONDUITS FOR THE PRIMARY CABLE IN THE CENTER OF THE DESIGNATED PRIMARY CABLE AREA AS SHOWN ON DWG. 22.08-101I.
- CONDUITS FOR SECONDARY/SERVICE CABLES ARE TO BE CENTERED IN THE AREA SHOWN ON DWG. 22.08-101I. NO PART OF ANY CONDUIT MAY EXTEND OUTSIDE OF THE DIMENSIONS SHOWN.
- PLACE THREE (3), FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90° BEND CONTAINING PRIMARY CABLE AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- ALL CONDUITS IN A PIT PAD SHALL EXTEND 6" ABOVE THE GRAVEL BED IN THE PIT.
- INSTALL PLUGS IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUITS. DO **NOT** GLUE THE PLUGS ONTO THE CONDUIT.

CONDUIT POSITIONING IN ABOVE-GRADE PEDESTALS

LOCATION OF ABOVE-GRADE PEDESTALS



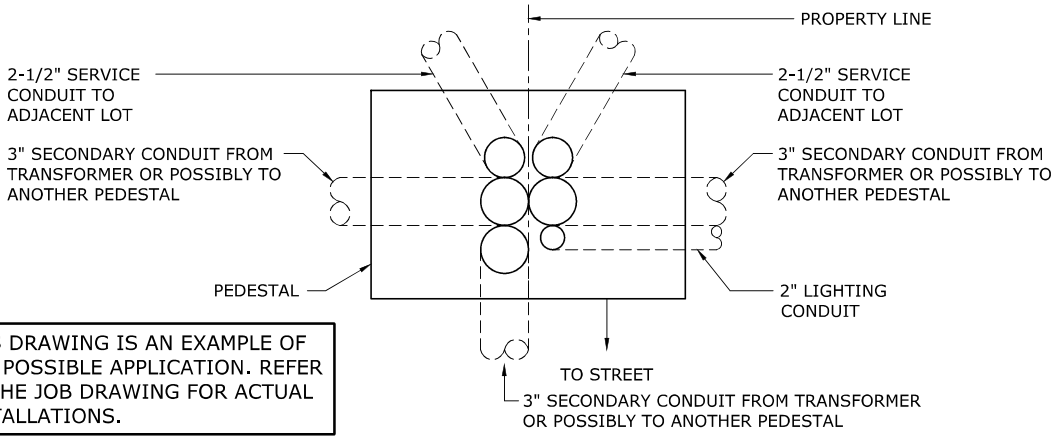
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REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

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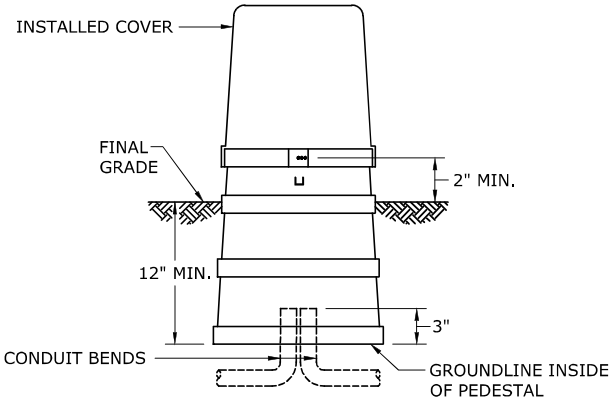
22.08-101J

POSITIONING CONDUIT IN ABOVE-GRADE PEDESTALS



THIS DRAWING IS AN EXAMPLE OF ONE POSSIBLE APPLICATION. REFER TO THE JOB DRAWING FOR ACTUAL INSTALLATIONS.

- SERVICE CONDUIT WILL BE 2-1/2" SCHEDULE 40 PVC OR SDR 13.5 HDPE. SECONDARY CONDUIT WILL BE 3" SCHEDULE 40 PVC OR SDR 13.5 HDPE.
- A MAXIMUM OF FOUR (4) CONDUIT BENDS MAY BE INSTALLED IN THE SMALL PEDESTAL, SIX (6) CONDUIT BENDS MAY BE INSTALLED IN THE MEDIUM PEDESTAL, AND EIGHT (8) CONDUIT BENDS MAY BE INSTALLED IN THE LARGE PEDESTAL. FOR ALL APPLICATIONS, THE TOP OF THE BENDS MUST BE BANDED TOGETHER, POSITIONED IN THE CENTER OF THE PEDESTAL AND ORIENTED AS SHOWN IN THE ABOVE DRAWINGS.
- PLACE TWO (2), FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH BEND AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- EXTEND CONDUITS THREE (3) INCHES ABOVE THE GROUNDLINE INSIDE THE PEDESTAL BASE. SEE DRAWING BELOW.



- NO ABOVE-GROUND OBSTRUCTION SHALL BE PLACED WITHIN 3 FEET OF A PEDESTAL.
- SOIL BENEATH THE PEDESTAL BASE SHALL BE COMPACTED TO THE FIRMNESS OF UNDISTURBED EARTH AND SHALL BE FREE OF ROOTS AND OTHER ORGANIC MATERIALS.
- INSTALL PLUGS IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUITS. DO **NOT** GLUE THE PLUGS ONTO THE CONDUIT.

CONDUIT POSITIONING IN SWITCHGEAR

- THERE ARE TOO MANY DIFFERENT TYPES AND CONFIGURATIONS OF PAD-MOUNTED SWITCHGEAR TO LIST IN THIS DOCUMENT. DUKE ENERGY WILL PROVIDE CONDUIT PLACEMENT INFORMATION FOR THE SPECIFIC SWITCHGEAR THAT IS TO BE INSTALLED WHEN IT IS REQUIRED. NOT ALL SUBDIVISIONS WILL REQUIRE SWITCHGEAR.
- THERE SHALL BE NO ABOVE-GROUND OBSTRUCTIONS WITHIN TEN (10) FEET OF THE FRONT AND BACK OF THE SWITCHGEAR OR WITHIN THREE (3) FEET OF EACH SIDE. IF THE SWITCHGEAR HAS A CONTROL CABINET, FIVE (5) FEET OF SPACE MUST BE PROVIDED ON THE SIDE WHERE THE CABINET IS LOCATED.
- THE GROUND UNDER THE PAD SHALL BE LEVEL AND THOROUGHLY COMPACTED.
- POSITION AND ORIENT ALL CONDUIT BENDS AS DIRECTED BY DUKE ENERGY. PLACE THREE (3), FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90° BEND AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER, AND PLACE THEM AGAINST THE BEND.
- EXTEND CONDUITS SIX (6) INCHES ABOVE THE LEVEL OF THE SOIL IN THE BOTTOM OF THE PIT PAD.
- INSTALL PLUGS IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUITS. DO **NOT** GLUE THE PLUGS ONTO THE CONDUIT.

DUKE ENERGY.

REVISED	BY	CHK'D	APPR.
3			
2	9/2/22	FLETCHER	EANES	GRAHAM
1	10/1/21	FLETCHER	EANES	GRAHAM
0	4/30/21	FLETCHER	EANES	GRAHAM

CUSTOMER GUIDE FOR INSTALLING CONDUIT

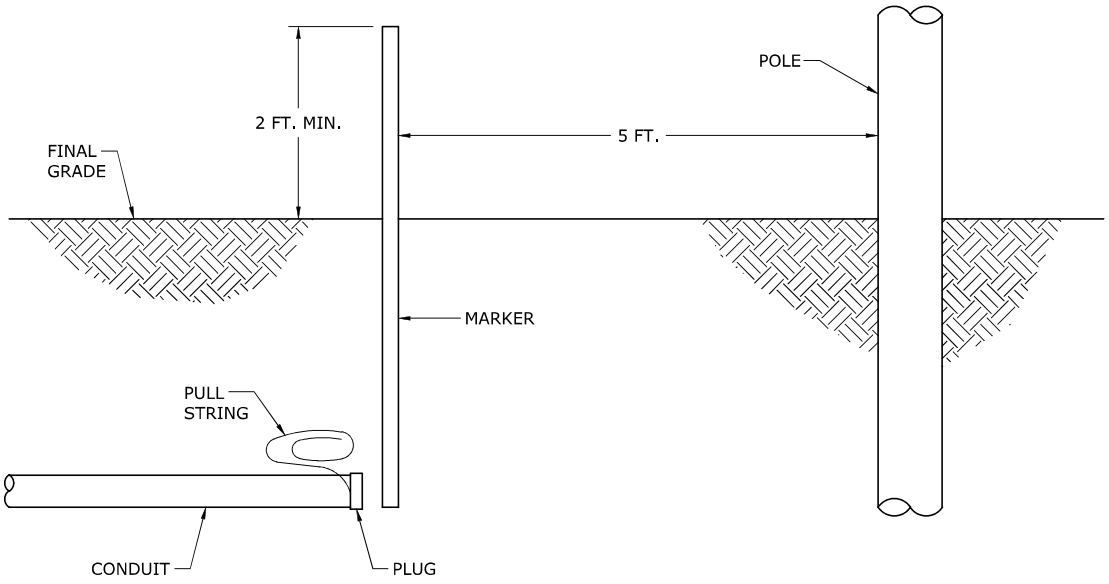
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22.08-101K

CONDUIT POSITIONING AT RISERS

- DUKE ENERGY WILL STAKE THE EXACT LOCATION OF THE POLE RISER.
- STOP THE CONDUIT FIVE (5) FEET FROM THE POLE.
- A MINIMUM OF FIVE (5) FEET OF PULL STRING MUST EXTEND OUT OF THE CONDUIT AND BE PLACED IN A COIL AT THE END OF THE CONDUIT.
- PLACE A PLUG ON THE END OF THE CONDUIT BUT DO NOT CEMENT THIS PLUG TO THE BEND.
- PLACE A MARKER (A PIECE OF CONDUIT FOR EXAMPLE) AT THE END OF THE CONDUIT THAT WILL EXTEND ABOVE FINAL GRADE A MINIMUM OF TWO (2) FEET.

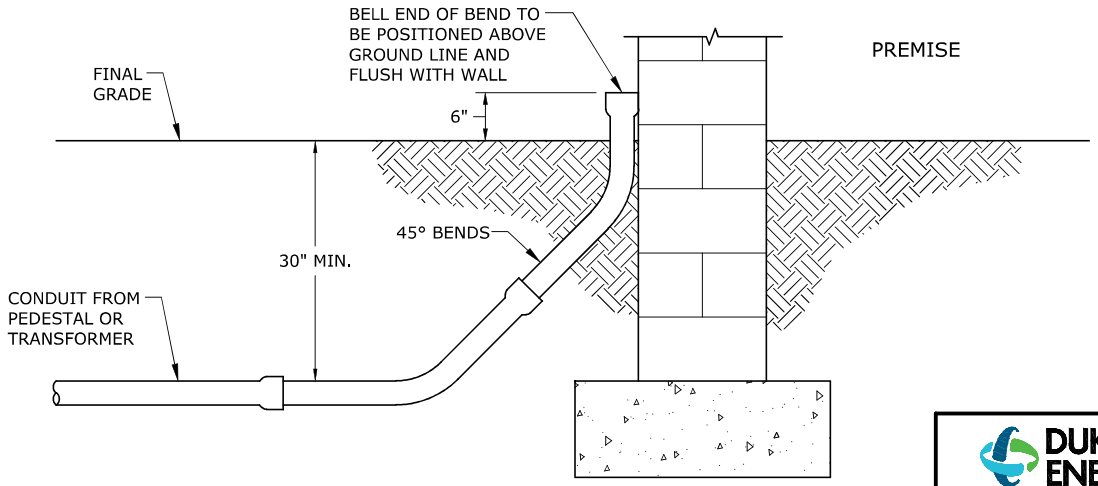
RISER POLE INSTALLATION



CONDUIT POSITIONING AT PREMISE RISERS

- THE TOP OF THE CONDUIT BEND MUST BE IN CONTACT WITH THE PREMISE.
- EXTEND CONDUIT SIX (6) INCHES ABOVE FINAL GRADE OF THE SOIL.
- THE PULL STRING MUST EXTEND A MINIMUM OF FOUR (4) FEET OUTSIDE OF THE CONDUIT.
- INSTALL A PLUG ON THE CONDUIT TO KEEP DIRT, RAIN, ETC. OUT OF THE CONDUIT. DO NOT GLUE THE PLUG ONTO THE CONDUIT.

PREMISE SERVICE RISER



3				
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1				
0	4/30/21	FLETCHER	EANES	GRAHAM
REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

DUKE ENERGY®

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22.08-101L

CONDUIT POSITIONING IN PULLBOXES

PULLBOXES ARE BELOW-GRADE ENCLOSURES USED TO FACILITATE THE INSTALLATION OF CABLE IN CONDUIT SYSTEMS.

DUKE ENERGY WILL:

A. PROVIDE AND INSTALL ALL REQUIRED PULLBOXES.
B. STAKE THE LOCATION WHERE ALL PULLBOXES ARE TO BE INSTALLED.
C. PROVIDE THE DIMENSIONS OF ALL PULLBOXES.
D. IDENTIFY THE NUMBER, SIZE, LOCATION AND ORIENTATION OF ALL CONDUIT/BENDS ENTERING OR EXITING EACH PULLBOX.

1. NON-CONCRETE PULLBOXES
DUKE ENERGY USES SEVERAL SIZES OF NON-CONCRETE PULLBOXES AS LISTED IN THE TABLES BELOW. LARGER SIZES, SUCH AS 4' X 8', ARE OCCASIONALLY ORDERED FOR PRIMARY CABLE APPLICATIONS. DUKE ENERGY WILL PROVIDE AND INSTALL ALL NON-CONCRETE PULLBOXES. THE CUSTOMER WILL TERMINATE THE CONDUIT SYSTEM AS REQUIRED BELOW SO DUKE ENERGY WILL BE ABLE TO INSTALL THESE PULLBOXES.

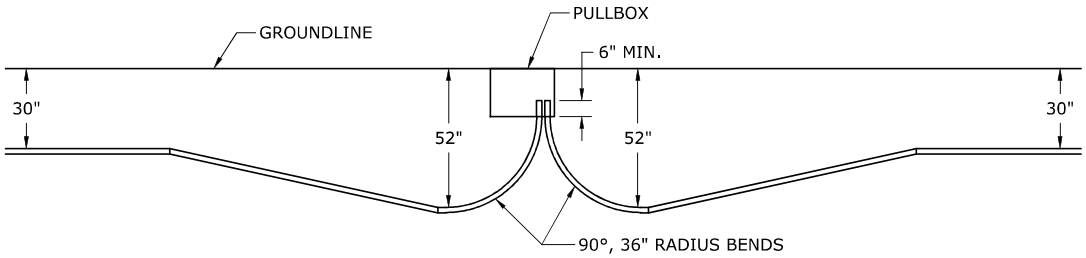
DUKE ENERGY CAROLINAS NON-CONCRETE PULLBOXES		
WIDTH (W)	LENGTH (L)	DEPTH (D)
11" ROUND	-	18"
13"	24"	18"
17"	30"	18"
24"	36"	18"
30"	60"	30"

DUKE ENERGY PROGRESS NON-CONCRETE PULLBOXES		
WIDTH (W)	LENGTH (L)	DEPTH (D)
11" ROUND	-	18"
13"	23"	15"
30"	48"	18"

- DUKE ENERGY WILL STAKE THE LOCATION OF EACH PULLBOX, IDENTIFY THE PULLBOX SIZE THAT WILL BE USED, AND PROVIDE THE NUMBER, SIZE, POSITION AND ORIENTATION OF EACH BEND THAT WILL BE INSTALLED IN THE PULLBOX.

- EXCAVATE AN AREA APPROXIMATELY TEN (10) INCHES GREATER THAN THE OUTSIDE LENGTH AND WIDTH OF THE PULLBOX BEING INSTALLED AND TO THE DEPTH OF THE PULLBOX. THE GROUND UNDER THE PULLBOX SHALL BE PARALLEL TO THE GROUNDLINE OUTSIDE THE PULLBOX AND THOROUGHLY COMPACTED.

- SLOPE THE DEPTH OF EACH CONDUIT CONTAINING SECONDARY/SERVICE CABLE THAT WILL ENTER OR LEAVE THE PULLBOX FROM THE NORMAL BURIAL DEPTH OF 30" TO A DEPTH OF 52" TO ALLOW BENDS TO BE PROPERLY POSITIONED BELOW THE PULLBOX. THIS SLOPE SHOULD BEGIN ABOUT TEN (10) FEET AWAY FROM THE PULLBOX. THE CONDUIT DOES NOT HAVE TO BE SLOPED WHEN INSTALLING PRIMARY CABLE IN THE 30" X 60" X 30" PULLBOX.



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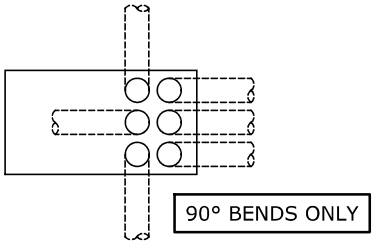
CUSTOMER GUIDE FOR INSTALLING CONDUIT

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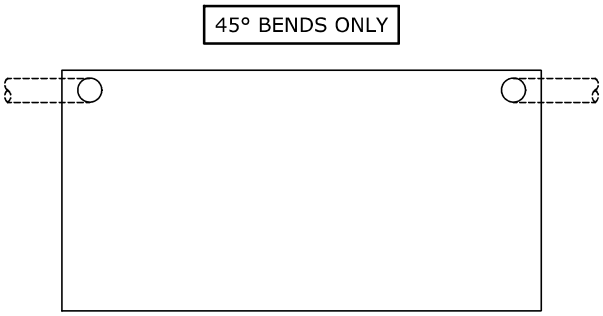
- INSTALL THE CONDUIT AND ALL REQUIRED BENDS WITH THE BENDS POSITIONED AND ORIENTED AS DESCRIBED BY THE DUKE ENERGY DESIGNER. THE TOP OF ALL BENDS MUST EXTEND SIX (6) INCHES ABOVE THE GROUNDLINE INSIDE THE PULLBOX. BENDS FOR SECONDARY/SERVICE CABLE WILL ALL BE POSITIONED ON ONE END OF THE PULLBOX. BENDS FOR PRIAMRY CABLE WILL BE POSITIONED ON OPPOSITE ENDS OF ONE SIDE OF THE PULLOBOX. 90° BENDS WILL BE USED FOR SECONDARY/SERVICE CABLES AND 45° BENDS WILL BE USED FOR PRIMARY CABLE.

POSITION OF BENDS FOR
SECONDARY/SERVICE CABLES



PLAN VIEW

BEND POSITION FOR
PRIMARY CABLES
30" X 60" PULLBOX ONLY



PLAN VIEW

THESE DRAWINGS ARE EXAMPLES OF ONE POSSIBLE APPLICATION.
REFER TO THE JOB DRAWING FOR ACTUAL INSTALLATIONS.

- WHEN MULTIPLE BENDS ARE POSITIONED TOGETHER, THEIR TOPS MUST BE FIRMLY BANDED TOGETHER IN THE PROPER CONFIGURATION.
- THE TOP OF EACH BEND IN THE PULLBOX MUST BE COLOR CODED AS DESCRIBED ON DWG. 22.08-101F.
- PLACE TWO, FORTY (40) POUND BAGS OF CONCRETE AGAINST EACH 90° BEND CONTAINING SECONDARY/ SERVICE CABLE AND THREE, FORTY (40) POUND BAGS AGAINST EACH 90° BEND CONTAINING PRIMARY CABLE AS SHOWN ON DWG. 22.08-101F TO PREVENT MOVEMENT DURING CABLE PULLING. DO NOT OPEN THE BAGS, JUST MAKE THREE CUTS ACROSS THE FRONT OF THE BAG TO ALLOW MOISTURE TO ENTER.
- A SHORT PIECE OF CONDUIT, LONG ENOUGH TO REACH ONE (1) FOOT ABOVE GROUND, MUST BE ATTACHED TO EACH BEND IN THE PULLBOX. THESE PIECES OF CONDUIT MUST NOT BE CEMENTED TO THE BENDS. THE PULL STRING FOR EACH CONDUIT SEGMENT (TRANSFORMER TO PEDESTAL, PEDESTAL TO SERVICE RISER, ETC.) MUST PASS THROUGH THESE CONDUIT PIECES AND EXTEND A MINIMUM OF 36" BEYOND THEIR END. INSTALL A PLUG IN EACH CONDUIT TO KEEP SAND, RAIN, ETC. OUT OF THE CONDUIT. DO NOT CEMENT THESE PLUGS INTO THE CONDUIT.
- FILL THE HOLE WITH SOIL TO PREVENT THIS FROM BEING A SAFETY HAZARD. DUKE ENERGY WILL REMOVE THE SOIL WHEN THE PULLBOX IS INSTALLED.

DUKE ENERGY.

3				
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1	10/1/21	FLETCHER	EANES	GRAHAM
0	4/30/21	FLETCHER	EANES	GRAHAM
REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

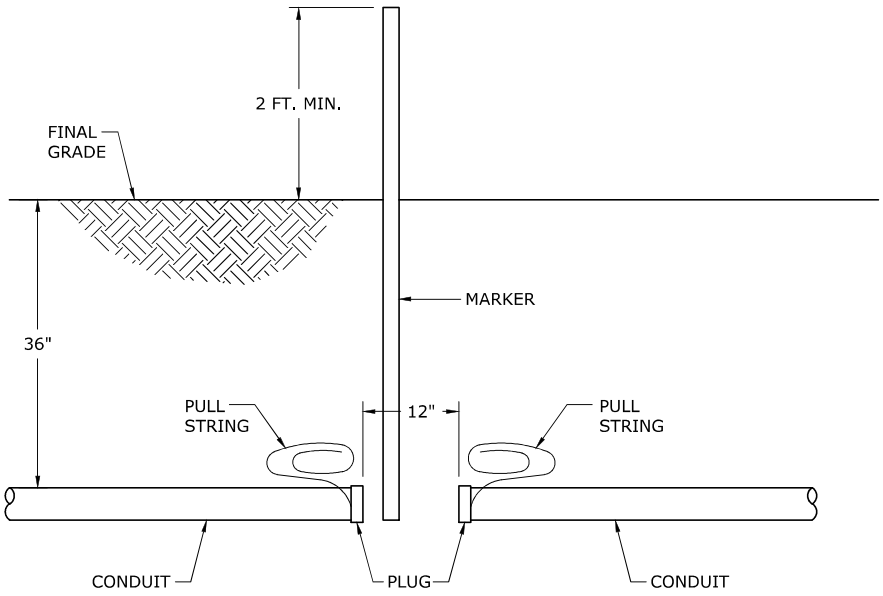
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22.08-101N

1. LARGE CONCRETE PULLBOXES

DUKE ENERGY USES A 56" X 96" X 44" CONCRETE PULLBOX.

- DUKE ENERGY WILL STAKE THE EXACT LOCATION OF THE PULLBOX.
- CREATE A ONE (1) FOOT GAP IN THE CONDUIT IN THE CENTER OF THE PULLBOX LOCATION AS SHOWN BELOW.
- A MINIMUM OF FIVE (5) FEET OF PULL STRING MUST EXTEND OUT OF THE CONDUIT AND BE PLACED IN A COIL AT THE END OF THE CONDUIT.
- PLACE A PLUG ON THE END OF THE CONDUIT BUT DO NOT CEMENT THIS PLUG TO THE CONDUIT.
- PLACE A MARKER (A PIECE OF CONDUIT FOR EXAMPLE) AT THE GAP BETWEEN THE ENDS OF THE CONDUIT THAT WILL EXTEND A MINIMUM OF TWO (2) FEET ABOVE GRADE.



3				
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0	4/30/21	FLETCHER	EANES	GRAHAM
REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

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X		X	

22.08-101O

CLEARANCES

SEPARATION MUST BE MAINTAINED BETWEEN CONDUITS INSTALLED FOR DUKE ENERGY AND OTHER CABLES, PIPES OR STRUCTURES AS SHOWN IN THE FOLLOWING TABLE AND DRAWINGS.

PRIMARY OR SECONDARY CABLES IN A CONDUIT SYSTEM			
PARALLELING	HORIZONTAL SEPARATION (IN)	CROSSING	VERTICAL SEPARATION (IN) (SEE NOTE 2)
COMMUNICATION LINES	12	COMMUNICATION LINES	12
WATER LINES	36	WATER LINES	12
SEWER LINES	36	SEWER LINES	12
FUEL LINES	36	FUEL LINES	12
STEAM LINES	60	STEAM LINES	36
CUSTOMER-OWNED CABLES	36	CUSTOMER-OWNED CABLES	12
IN-GROUND SWIMMING POOL	60	IN-GROUND SWIMMING POOL	N/A

NOTES:

1. THE HORIZONTAL AND VERTICAL SEPARATION SHOULD BE ADEQUATE TO PERMIT ACCESS AND MAINTENANCE OF EITHER FACILITY TO LIMIT DAMAGE TO THE OTHER. THE DISTANCES SHOWN IN THE TABLE ABOVE HAVE BEEN FOUND TO MEET THESE CRITERIA.
2. VERTICAL SEPARATION MUST BE SUFFICIENT TO LIMIT THE LIKELIHOOD OF DETRIMENTAL LOAD BEING TRANSFERRED TO EITHER OF THE UTILITIES OR STRUCTURES INVOLVED. THE DISTANCES SHOWN IN THE ABOVE TABLE HAVE BEEN FOUND TO MEET THESE CRITERIA.
3. CONTACT DUKE ENERGY WHEN DIMENSIONAL VARIANCES ARE REQUIRED.

DUKE ENERGY.

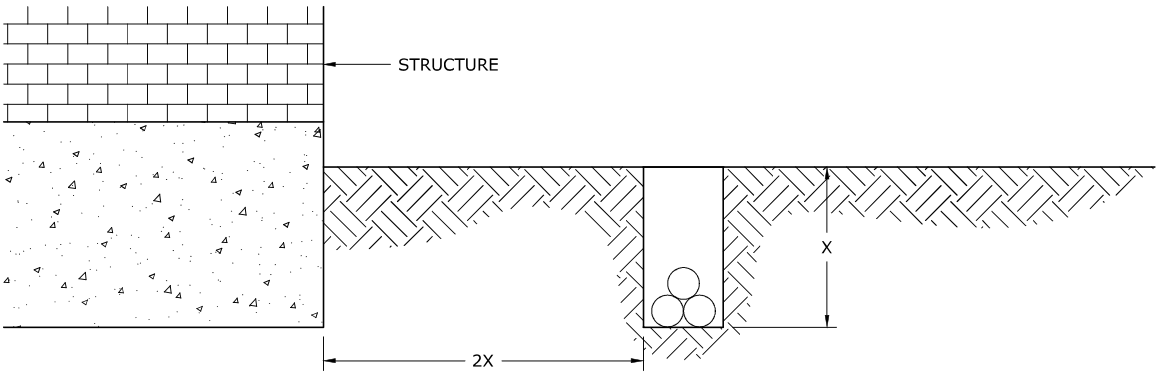
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REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

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22.08-101P

INSTALLING UNDERGROUND CABLES PARALLEL TO STRUCTURES



NOTES:

1. WHEN INSTALLING UNDERGROUND CABLE PARALLEL TO EXISTING STRUCTURES, OR THOSE THAT ARE UNDER CONSTRUCTION, IT IS NECESSARY TO MAINTAIN ADEQUATE CLEARANCE FROM THOSE STRUCTURES. THIS CLEARANCE IS NECESSARY TO MAINTAIN THE INTEGRITY OF THE SOIL, AND THE SUPPORT PROVIDED BY THE SOIL, UNDER THE FOUNDATION OF THE STRUCTURE.

2. UNDERGROUND FACILITIES INSTALLED PARALLEL TO A STRUCTURE SHOULD BE LOCATED AT LEAST TWICE AS FAR AWAY FROM THE STRUCTURE AS THE DEPTH OF THE TRENCH THAT IS DUG. FOR EXAMPLE, IF A TRENCH IS TO BE TWO (2) FEET DEEP, THEN THE TRENCH MUST BE LOCATED AT LEAST FOUR (4) FEET AWAY FROM THE STRUCTURE.

3. THIS REQUIREMENT DOES NOT APPLY TO CABLE THAT IS NOT INSTALLED PARALLEL TO A STRUCTURE.

4. ON INSTALLATIONS WHERE THE CABLE CANNOT BE INSTALLED TWICE AS FAR FROM THE FOUNDATION AS THE CABLE IS DEEP, THE SOIL MUST BE COMPACTED THROUGHOUT THE ENTIRE TRENCH DEPTH TO 100% OF THE ORIGINAL SOIL DENSITY IN ALL AREAS WHERE ADEQUATE SEPARATION CANNOT BE OBTAINED FROM THE FOUNDATION.

DUKE ENERGY.

3				
2				
1				
0	7/31/20	FLETCHER	EANES	GRAHAM
REVISED		BY	CHK'D	APPR.

CUSTOMER GUIDE FOR INSTALLING CONDUIT

DEC	DEM	DEP	DEF
X		X	

22.08-101Q

13.20 MEASUREMENT AND PAYMENT

The electrical conduit will be measured and paid as the actual number of linear feet of electrical conduit, installed and accepted. Measurement will be to the nearest whole foot and include required turn up and stub up lengths.

Payment will be made under:

Pay Item	**Pay Unit**
2” MUP Lighting Conduit, Type BD	Linear Foot



DocuSigned by:
Sarah Kirkpatrick
7ACCC8DB119E46C...
08/26/2026

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PROJECT SPECIAL PROVISIONS
Utility Construction

HINDE ENGINEERING
License No. C-2639
401 Harrison Oaks Blvd.
Suite 220
Cary, NC 27513
(919) 653-0001

NORTH CAROLINA PROFESSIONAL SEAL 23041 ENGINEER COREY D. BOUSQUET
DocuSigned by: Corey D. Bousquet, P.E.
BE23F928878C49A...
7/9/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Where brand names and model numbers are specified in these Special Provisions or in the plans, the cited examples are used only to denote the quality standard of product desired and do not restrict bidders to a specific brand, make, or manufacturer. They are provided to set forth the general style, type, character, and quality of the product desired. Equivalent products will be acceptable.

The utility owners are the Metropolitan Sewer District and City of Asheville. The contact person for Metropolitan Sewer District is Samual Gettleman and he can be reached by phone at 828-225-8270 and the contact person for the City of Asheville is Chad Pierce and he can be reached by phone at 828-646-1281.

The provisions contained within these Utilities Construction Project Special Provisions modify the *Standard Specifications* only for materials used and work performed constructing water or sewer facilities owned by Metropolitan Sewer District and the City of Asheville.

Revise the 2024 *Standard Specifications* as follows:

Page 15-1 and 15-2, Article 1500-5 RELATION OF WATER MAINS TO NON-POTABLE WATER LINES AND OTHER UTILITIES, lines 39-42 and lines 1-5, replace the article with the following:

Lay water mains at least 10 feet laterally from existing or proposed sanitary sewers or reclaimed water distribution lines. If local conditions or barriers prevent a 10-foot separation, lay the water main with at least 18 inches vertical separation above the top of the sanitary sewer or reclaimed water distribution pipe either in a separate trench or in the same trench on a bench of undisturbed earth.

For storm drain pipe or other utilities, lay the water main with at least 12 inches separation from the outside of the water main and the outside of the other facility.

One full length of water pipe at the point of crossing shall be located so that both joints will be as far from the sanitary sewer or reclaimed water distribution pipe as possible. If practicable, the water main shall be located above the sewer or reclaimed water distribution line.

SUBMITTALS AND RECORDS
(9-5-23)

Revise the 2024 *Standard Specifications* as follows:

Page 15-2, Article 1500-7 SUBMITTALS AND RECORDS, lines 25-30, replace with the following:

Provide As-built PDF plans generated from electronic CAD files, not scanned facsimiles of paper plan sheets. Provide 2 hard copies in full-size sheets and PDF formatted files to the utility owners and Engineer.

City of Asheville (COA) and Metropolitan Sewer District (MSD) As-Built Plans Requirements:

The As-built plans must be certified, signed, dated, and sealed by a registered NC Professional Engineer. The text "As-Built Record Drawing" must be clearly marked on each page.

Digital As-built Checklist:

- ❑ One (1) copy of a digital electronic file in AUTOCAD.DWG format in NAD 83 (version 2013 or the latest employed by the COA or MSD).
- ❑ The digital submittal must match the paper copy with no xrefs or blocks.
- ❑ The water and sewer lines and related features shall be on one isolatable CAD layer. The keyword "water" or "sewer" shall be included in the name of the CAD layer.
- ❑ The plans shall include notations of the size and type material installed, coordinates of utility controls and horizontal and vertical locations of the water and sewer piping, steel encasements (start and end), valves, bends, tees, reducers, manholes and clean-outs.
- ❑ Labels, texts, call-outs, etc. shall be on a separate CAD layer.
- ❑ Contact COA or MSD Engineering Staff for links to upload digital as-built to shared folder.

Page 15-11, Article 1520-3 Gravity Sanitary Sewer

Revise the 2024 Standard Specifications as follows:

Bypass Pumping Required to Install Sewer Line

The design, installation, type of portable storage tanks (where required) and operation of the bypass pumping system shall be the Contractor's responsibility.

Bypass Pumping

1). Bypass pumping arrangements shall consist of necessary pumps at the diversion manhole. The primary group pumps and secondary group (redundant) pumps shall be sized to:

a. Accommodate maximum flow through the approaching pipelines entering the manholes where the pump suction piping will be installed. The maximum volume flow calculations shall be provided by the contractor and review and approved by Metropolitan Sewerage District.

b. Pumps shall run continuously without disruption or suspension of flow to the discharge manhole or portable storage tanks. This requires that each pump be designed for the total dynamic head conditions of the pump system (includes discharge piping and fittings.). The pump sizes for the redundant pumps shall be the same as the primary pumps. The redundant equipment shall be staged and configured in a fashion so that the redundant pumps operate automatically in the event of a failure of the primary system.

2). Overflows from bypass operations will not be permitted to enter any streams or bodies of water. The Contractor will be solely responsible for any legal actions taken by the state regulatory agencies if such overflows occur.

3). Bypass pumping equipment shall include pumps, piping, engines, and related equipment necessary to divert the sewage flow around the section in which work is to be performed. In addition, the Contractor shall maintain at the same location and in operable condition, duplicate equipment to be used in case there is equipment failure. In the event of failure of any component of the primary or secondary system, the Contractor shall promptly repair or replace the failed equipment to the satisfaction of the Resident Engineer.

4). Engine driven equipment for bypass pumping equipment shall have "critical grade mufflers." If equipment is operated between the hours of 8:00 PM and 6:00AM, additional sound attenuation enclosure is required. The enclosure shall be portable to allow the enclosure to be moved when bypass pumping equipment is moved. These conditions are subject to any other additional stipulations that may be required by the City of Asheville sound ordinances.

5). Continuous (24 hours/day) monitoring is required for all bypass pumping operations. Continuous manning of the operation by an individual that is trained and able to respond in the

event of equipment failure. In those cases where continuous manning is not feasible/practical then arrangements will be made to continuously monitor the operations remotely. This remote monitoring will require that maintenance/repair personnel can be notified and respond on site within 45 minutes. The Resident Engineer and the Metropolitan Sewerage District will be immediately contacted by telephone anytime an overflow condition may occur.

6). The Contractor shall submit to the Resident Engineer a detailed plan and description outlining all provisions and precautions to be taken by the Contractor regarding handling of existing wastewater flows. This plan must be specific and complete, including flow calculations, pump sizing calculations, method of continuous monitoring of pumps (telemetry or manned), schedule for entire duration of bypass pumping operations, contact name and telephone numbers of responsible personnel where a person can be reached and not an answering machine. No bypass pumping shall begin until all requirements have been reviewed and approved by the Resident Engineer and the Metropolitan Sewerage District.

7). The plan shall include but not be limited to the details of the following:

a. Staging areas for the pumps and portable storage tanks (where required).

.

b. Sewer plug method to be used.

c. Number, size, material, locations, and method of installation of suction piping.

d. Bypass pump sizes, capacity, number of each size to be on site, and power requirements.

e. Calculations of static lift, friction loss, stand-by power, and flow velocity.

g. Downstream discharge or portable storage tanks plan.

h. Method of noise control for each pump.

i. Temporary pipe supports and anchoring required.

j. Heavy equipment needed for installation of pumps and piping.

k. Stand-by/back-up pump set for the bypass application.

l. Fueling of pump sets on demand.

9.) The Contractor shall provide a spill or accidental discharge plan showing the materials and equipment on site for containment/remediation.

10.) The Contractor shall provide a plan to disassemble the bypass pumping assembly. Bypass pumps and equipment shall be flushed prior to disassembly with fresh water.

11.) Following inspection of the bypass pumping system the Contractor shall demonstrate the bypass pumping system is in good working condition and is sufficiently sized to successfully handle the flows by performing a test run for a period of 24 hours prior to beginning replacement of sanitary sewer. The pumps shall be sized to handle the maximum flow rate.

All materials, equipment, labor, power, and maintenance, etc. to install and operate the bypass pumping system for the purpose of diverting the existing sewer flow around the work area is considered incidental to the Sanitary Gravity Sewer Pay Items.

Page 15-11, Article 1520-3 GRAVITY SANITARY SEWER, Testing lines 35-40,
Page 15-12, Article 1520-3 GRAVITY SANITARY SEWER, Testing lines 1-26, replace with the following:

Leakage and Infiltration:

(a) All pipe and manhole joints shall be watertight. Any leaks into the sewer shall be repaired or corrected as directed by the Engineer. The MSD reserves the right to TV any section of the sewer system to locate point sources of infiltration, either in the pipe or inside manholes. When directed by the Engineer, any desired section shall be isolated and tested separately.

(b) No sooner than 10 days following completion of backfill, the contractor along with the Engineer, will be required to determine the level of the ground water table. If the ground water table is above the top of the pipe, the sewer line shall be tested for infiltration. If ground water table is less than 2 feet above the top of the pipe, the sewer line shall be low pressure air tested. Each test shall be performed as follows:

(1) Infiltration

The infiltration into each section of the sewer shall be measured in wet weather by the temporary installation of suitable metal or wooden weirs as authorized by the Engineer. These weirs shall be furnished, installed and removed by the contractor. Infiltration test limits shall be applied to single reaches of pipe, up to one mile in length, of the same diameter. For pipes 8 inches through 15 inches in diameter, infiltration into the sewer system (including manholes) shall not exceed 50 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours, and in no case shall it exceed 3,000 gallons per mile per 24 hours. For all pipe sizes larger than 15 inches in diameter, infiltration into the sewer system (including manholes) shall not exceed 100 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours, and in no case shall it exceed 3,000 gallons per mile per 24 hours.

(2) Air Testing of Gravity Sewers

The Contractor shall conduct low pressure air tests on all completed sections of gravity sewer. Air tests for PVC, DIP, and VCP lines will be performed in

accordance with ASTM C828. Air test results will be used to evaluate materials and construction methods on the sewer line sections, and successful air tests shall be mandatory for the acceptance of the sewers 30 inches in diameter and smaller.

a) The Contractor shall furnish an air compressor of the necessary capacity along with all necessary plugs, valves, pressure gages, air hoses, connections, and other equipment necessary to conduct the air tests. Plugs in sewers 18 inches in size and larger shall be connected by steel cable for thrust reaction.

b) Compressor capacity shall be sufficient to pressurize the sewer main to 4 psig within a time equal to or less than the required test time. The following equation may be used to ensure compliance with this requirement:

$$C = \frac{0.17 \times D^2 \times L}{T} + Q$$

Where: C = Required Compressor Capacity (cfm)
T = Required Test Time (min) L = Length of Test Section (feet)
D = Pipe Internal Diameter (feet) Q = Allowable Air Loss Rate (cfm)

c) The following allowable air loss rates will be used for all pipe tests:

Pipe Size	Q (cfm)	Pipe Size	Q (cfm)
4"	2.0	15"	4.0
6"	2.0	18"	5.0
8"	2.0	21"	5.5
10"	2.5	24"	6.0
12"	3.0		

d) The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 4 psig. When a stable condition has been reached, the pressure shall be bled back to 3.5 psig. At 3.5 psig, the time and pressure shall be observed and recorded. If groundwater is present at the sewer, the height of groundwater above the top of the pipe shall be added to the above air pressure readings (height of water in feet X 0.433 = air pressure in psig). A minimum of 5 readings will be required for each test.

e) If the time for the air pressure to decrease from 3.5 psig to 2.5 psig is equal to or greater than that shown in the following table, the pipe shall be presumed to be free from defects. When these times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated and the cause must be determined and corrected. After repairs have been made, the sewer sections shall be

retested. This process shall be repeated until all sewer sections pass the air test.

Minimum Test Times for Pipe

Pipe-Size →	4"	6"	8"	10"	12"	15"	18"	21"	24"
25	0:04	0:10	0:17	0:22	0:26	0:31	0:36	0:44	0:53
50	0:09	0:20	0:35	0:44	0:53	1:02	1:12	1:29	1:47
75	0:13	0:30	0:53	1:06	1:20	1:34	1:48	2:14	2:40
100	0:17	0:40	1:11	1:29	1:47	2:05	2:24	2:58	3:33
125	0:22	0:50	1:29	1:51	2:13	2:36	3:00	3:43	4:27
150	0:26	1:00	1:47	2:13	2:40	3:07	3:36	4:27	5:20
175	0:31	1:10	2:04	2:35	3:07	3:39	4:12	5:12	6:14
200	0:35	1:20	2:22	2:58	3:33	4:10	4:48	5:57	7:07
225	0:40	1:30	2:40	3:20	4:00	4:41	5:24	6:41	8:00
250	0:44	1:40	2:58	3:42	4:27	5:13	6:00	7:26	8:54
275	0:49	1:50	3:16	4:05	4:53	5:44	6:36	8:10	9:47
300	0:53	2:00	3:33	4:27	5:20	6:15	7:12	8:55	10:41
325	0:58	2:10	3:51	4:49	5:47	6:47	7:48	9:40	11:34
350	1:02	2:20	4:09	4:11	6:14	7:18	8:25	10:24	12:28
375	1:06	2:30	4:27	5:34	6:40	7:49	9:01	11:09	13:21
400	1:11	2:40	4:45	5:56	7:07	8:21	9:37	11:54	14:14
425	1:15	2:50	5:02	6:18	7:34	8:52	10:13	12:38	15:08
450	1:20	3:00	5:20	6:40	8:00	9:23	10:49	13:23	16:01
475	1:24	3:10	5:38	7:03	8:27	9:54	11:25	14:07	16:55
500	1:29	3:20	5:56	7:25	8:54	10:26	12:01	14:52	17:48
525	1:33	3:30	6:14	7:47	9:21	10:57	12:37	15:37	18:42
550	1:38	3:40	6:31	8:09	9:47	11:28	13:13	16:21	19:35
575	1:42	3:50	6:49	8:32	10:14	11:60	13:49	17:06	20:28
600	1:47	4:00	7:07	8:54	10:41	12:31	14:25	17:51	21:22

LENGTH OF PIPE TESTED

(g) For testing a sewer system with one or more installed service lateral pipes, an effective pipe length shall be added to the total sewer main pipe length. The equation used to calculate Effective Pipe Length is as follows:

$$L_e = \frac{d^2 \times l}{D^2}$$

Where: Le = Effective Pipe Length (added to Total Test Length)
d = Diameter of Service Lateral Pipe (inches)
l = Length of Sewer Lateral (feet)
D = Diameter of Sewer Main Pipe being tested (inches)

DUCTILE IRON PIPE AND FITTINGS

Revise the 2024 *Standard Specifications* as follows:

Page 10-63; Article 1036-5, DUCTILE IRON PIPE AND FITTINGS
add the following after Line 12:

Mechanical joint restraints shall be designed for the intended application. Restraint devices shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating equal to or greater than the host pope. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM.

SLEEVES, COUPLINGS AND MISCELLANEOUS

Revise the 2024 *Standard Specifications* as follows:

Page 10-63; Article 1036-8, Section B - SLEEVES, COUPLINGS AND MISCELLANEOUS
add the following after Line 2:

Revise the 2024 *Standard Specifications* as follows:

(Use MJ Long Body Solid Sleeve Couplings)

MJ Solid Sleeve Couplings shall be used to connect ductile iron piping (DIP) to PVC, CIP, or DIP, as shown on the plans. Solid sleeves shall be ductile iron and conform to the requirements of ANSI A21.10 (AWWA C110).

Page 15-14, Article 1525-3 Construction Methods

Metropolitan Sewerage District does not allow doghouse manholes.

FLEXIBLE COUPLING

Materials:
Couplings shall be high impact polymide (nylon) with stainless steel compression bands and click-lock clamping system conforming to AISI 304. The gasket shall be injection molded EPDM rubber. Stainless steel clamps are corrosion-resistant and rustproof.

Construction Methods:
Flexible couplings shall be installed in accordance with the applicable utility provisions herein, as shown on the utility plans, and/or as directed by the Engineer.

Install the high impact polymide (nylon) couplings to join plain ends of gravity sanitary sewer pipe when transitioning from DI pipe to Clay pipe.

The couplings shall provide a watertight connection.

Measurement and Payment:
The quantity of flexible couplings installed and accepted, will be measured and paid for at the contract unit price per each for __*6*__*" Flexible Coupling.* All labor, excavation, and incidentals necessary to complete the work as required are incidental to *Flexible Coupling*.

Pay Item	**Pay Unit**
6" Flexible Coupling	Each

UTILITY VAULT

Materials:
The vault shall be precast concrete and shall meet the requirements of Section 1077 of the Standard Specifications. The vault shall meet requirements for AASHTO H-20 loading. Plans shall be submitted as required by Section 1077 with all calculations and drawings signed by a Professional Engineer registered in the State of North Carolina. The vault shall be designed to allow for its relocation in the future. The vault shall be provided with a double access door. The access door shall be aluminum with anchor flange, hinge, drain channel, and neoprene gasket. The hinge pins shall be stainless steel. The door leaf shall be ¼ "thick diamond plate. Doors shall open to 90^ and lock automatically in this position. The doors shall be equipped with a cylinder lock or bolt lock. The vault and access doors shall be approved by the Engineer and be placed as shown on the utility plans or as directed by the Engineer.

Construction Methods:
Utility vault shall be installed in accordance with the applicable utility provisions herein, as shown on the utility plans, and/or as directed by the Engineer.

Measurement and Payment:
The quantity of utility vaults installed and accepted, will be measured and paid for at the contract unit price per each for *Utility Vault.* All labor, excavation, and incidentals necessary to complete the work as required are incidental to *Utility Vault*.

Pay Item	Pay Unit
Utility Vault	Each

ABANDON UTILITY VAULT

Materials:
Fill abandoned utility vault with approved materials.

Construction Methods:
Abandon utility vaults in the construction limits by removing the top of the vault to an elevation of 2 feet below the roadway subgrade filling the remaining vault with approved materials.

Plug connecting pipes.

Removed vault doors become the property of the Contractor for proper disposal.

Measurement and Payment:
The quantity of abandon utility vaults filled with acceptable materials, will be measured and paid for at the contract unit price per each for *Abandon Utility Vault.* All labor, excavation, and incidentals necessary to complete the work as required are incidental to *Abandon Utility Vault*.

Pay Item	Pay Unit
Abandon Utility Vault	Each

PROJECT SPECIAL PROVISIONS
Utilities by Others

Technical Services of North Carolina, Inc.
5438 Wade Park Blvd, Suite 200
Raleigh, NC 27607
I-2513AC
August 13, 2026

General:
The following utility companies have facilities that will conflict with the construction of this project:

A. Power Distribution – Duke Energy
B. CATV – Charter
C. Telecom – AT&T
D. Telecom – ERC Broadband
E. Telecom – AT&T Long Distance
F. Natural Gas – Enbridge 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.

UbO relocations will be constructed in separate segments:
- **Segment ICT 6** (sheets UO-4, UO-5) includes -L-, -Y2-, -RP23-.
- **Segment ICT 7** (sheets UO-10, UO-13) includes -Y3, -Y3A-, -Y3B-.

The Contractor's attention is directed to Article 105-8 of the *Standard Specifications*.

Utilities Requiring Adjustment:
Utility relocations are shown on the Utilities by Others Plans.

A. Power Distribution – Duke Energy
Contact: Delwin Rosa @ 864-813-1355 delwin.rosa@duke-energy.com
288 Fairforest Way, Greenville, SC 29607

PROJECT SPECIAL PROVISIONS
Utilities by Others

1. Duke Energy will install the proposed poles after the Contractor has completed installation of Sewer Line #2, as shown on Sheet UO-4 and Sheet UO-5, and described elsewhere in this Proposal. Duke Energy requires thirty (30) calendar days of notice by Resident Engineer and thirty (30) calendar days to complete the relocation of their lines to the proposed poles: The Contractor shall not begin construction along -Y2RPC- until two (2) weeks after AT&T completes their relocation to the proposed poles, which allows Duke Energy to remove their existing poles.
2. Duke Energy will install the proposed poles shown on Sheet UO-10 and Sheet UO-13, after the Contractor has completed removal of -DET04-, as described in the Phasing on Sheet TMP-3B. Duke Energy requires thirty (30) calendar days of notice by the Resident Engineer and forty-five (45) calendar days to complete the relocation of their lines to the proposed poles. The Contractor shall cease construction activities, except for the maintenance of erosion control devices, along -Y3- Sta 26+50 to 31+00, and -Y3B- until two (2) weeks after Charter completes their relocation to the proposed poles, which allows Duke Energy to remove the temporary poles shown on Sheet UO-10.

B. CATV – Charter
Contact: Jacob Wilbanks @ 828-424-8257
jacob.wilbanks@charter.com
1670 Hendersonville Rd, Asheville, NC 28803

1. Charter will relocate their lines to Duke Energy's proposed poles, as shown on Sheet UO-10 and Sheet UO-13, after the Contractor has completed removal of -DET04- and after Duke Energy completes their relocation to the proposed poles. Charter requires thirty (30) calendar days of notice by the Resident Engineer and forty-five (45) calendar days to complete the relocation of their lines to the proposed poles.

C. Telecom – AT&T
Contact: Paul Stubblefield @ 864-580-3218
pstubblefield@sourceonecorp.com
100 Corporate Dr, Suite 1, Spartanburg, SC 29303

1. AT&T will relocate their lines to Duke Energy's proposed poles after the Contractor has completed installation of Sewer Line #2, as shown on Sheet UO-4 and Sheet UO-5, and described elsewhere in this Proposal, and after Duke Energy and ERC Broadband complete their relocations to the proposed poles. AT&T requires thirty (30) calendar days of notice by the Resident Engineer and AT&T requires one hundred eighty (180) calendar days to

complete the relocation of their lines to the proposed poles. Notify AT&T when Duke is scheduled to begin work.

D. Telecom – ERC Broadband
Contact: Lewis Lance @ 828-231-5919
llance@ercbroadband.com
151 Patton Ave, Asheville, NC 28801

1. ERC Broadband will relocate their lines to Duke Energy's proposed poles after the Contractor has completed installation of Sewer Line #2, as shown on Sheet UO-4 and Sheet UO-5, and described elsewhere in this Proposal, and after Duke Energy completes their relocation to the proposed poles. ERC Broadband requires thirty (30) calendar days of notice by the Resident Engineer and ERC Broadband requires ten (10) weeks to complete the relocation of their lines to the proposed poles.

E. Telecom – AT&T Long Distance
Contact: Trina Ivey @ 678-641-5522
ki2863@att.com
3450 Riverwood Pkwy, Atlanta, GA 30339

F. Natural Gas – Enbridge Gas
Contact: Joseph Lauffenburger @ 612-254-5324
lauffenj@enbridge.com
800 Gaston Rd, Gastonia, NC 28056

Docusign Envelope ID: 71F25AC3-6E91-82DE-8219-A028791ABC2D

PROJECT SPECIAL PROVISIONS

HYDRAULICS

FILTRATION BASIN (SPECIAL)	HYD-1.1 - HYD-1.4
TRASH RACKS	HYD-2.1 - HYD-2.2
WELL GRADED CLASS II RIP RAP MIXED WITH CLASS B RIP RAP	HYD-3.1
PIPE REHABILITATION (SPECIAL)	HYD-4.1 - HYD-4.9
SEALED STORM DRAINAGE SYSTEM WITHIN WALLED ROADWAY SECTIONS	HYD-5.1 - HYD-5.9
SPECIAL DRAINAGE STRUCTURES	HYD-6.1 - HYD-6.2

Docusign Envelope ID: 71F25AC3-6E91-82DE-8219-A028791ABC2D

FILTRATION BASIN: **(SPECIAL)**

(05/01/2026)

MEDIA HDPE PIPE (INCLUDES CLEANOUTS & FITTINGS)

Description

All proposed HDPE pipe shall be installed per the manufacturer's specifications necessary to sustain H-20 live-load bearing capacity, in accordance with Section 1032-7 of the *Standard Specifications,* and installed per AASHTO standards. The Contractor shall be cognizant of heavier construction traffic crossing the corrugated plastic pipes that are covered with either paved or unpaved material (heavier construction traffic may surpass the H-20 capacity).

For all sections of perforated pipe that are proposed, the perforation size and perforation configuration shall be approved by the Engineer prior to installation.

HDPE pipe, perforated HDPE pipe, and HDPE fittings may be used in place of or in combination with HDPE materials (this substitution only applies 6" HDPE and 6" perforated HDPE). All proposed PVC materials shall be installed per the manufacturer's specifications necessary to sustain H-20 live-load bearing capacity and per AASHTO standards.

Payment will be made under:

Pay Item	**Pay Unit**
6" HDPE Nonperforated	Linear Foot
6" HDPE Perforated	Linear Foot
6" Cleanout	Each
6" Cleanout Cap (Threaded)	Each
6" HDPE 45-Degree Bend	Each
6" X 6" X 6" HDPE Tee	Each

ENGINEERED SOIL MEDIA:

Description

This work shall consist of furnishing and installing the Engineered Soil Media (ESM) in the filtration basin as shown on the plans and as directed by the Engineer.

All engineered soil media within the proposed filtration basin shall be installed in accordance with and meet the specifications outlined on plan sheet 2D-7 at locations shown on plan sheet 6. A representative sample of the Engineered Soil Media mixture shall be provided and approved by NCDOT prior to installation.

Docusign Envelope ID: 71F25AC3-6E91-82DE-8219-A028791ABC2D

Do not deliver or place soils in frozen, wet, or muddy conditions. Material should be at or near optimum compaction moisture content as determined by AASHTO 99 (ASTM D 698). Do not place materials in an excessively moist condition.

The soil media mixture percentage as outlined on plan sheet 2D-7 shall be a percent by weight in accordance with test methods AASHTO 88 and T194. The Phosphorus Index measurement for the soil media shall be provided and approved by NCDOT prior to installation.

Materials

The engineered soil mix shall consist of the following blend:

Recycled Expanded Slate Fines: 80%
Approved Compost Organic Component: 20%

Mechanically mix 1 part compost with 4 parts of the expanded slate fines until a uniform distribution of the components is achieved. The slate aggregate fines and organic component consist of the following:

Recycled Expanded Slate Fines

The recycled expanded slate aggregate fines shall conform to the following screening operation:

Sieve Size	**% Retained**
#4	4 – 8%
#8	28 – 38%
#16	46 – 58%
#30	63 – 75%
#50	74 – 84%
#100	82 – 90%
Fine Material	2.79 – 3.53% passing #100

Organic Component:

The compost or organic component shall conform to the following specifications:

1. Humus material shall have an ash content of no less than 8% and no more than 40%.
2. The pH of the organic matter shall be between 5.5 and 8.5.
3. The salt content shall be less than 10 millimho/cm at 25 degrees C, (Ece<10) on a saturated paste extract.
4. Types of acceptable composted products can be derived from yard wastes, low in salts, low in phosphorus (P205 below 1% wet wt. basis), free from weed seeds, free of pathogens and other deleterious materials.
5. Composted pine park products are conditionally acceptable (stable humus must be present).
6. Sludge-based materials are not acceptable including municipal sewage sludge bio-solids.
7. The organic amendment must have a Carbon/Nitrogen ration of <25:1.
8. The compost shall be aerobic without malodorous presence of decomposition product

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9. From 75 -100% organic amendment particles shall pass the 4.0 mm sieve size.
10. From 45 - 65% moisture measured via wet-weight basis.
11. Free of stones, debris, and plant material.
12. Organic content must be above 50% on a dry weight basis.
13. Metals and contaminants must meet or exceed US EPA Standard 40.

Placement and Compaction of the Engineered Soil Media

The ESM shall be placed and graded using low ground-contact pressure equipment or by excavators and/or backhoes operating on the ground adjacent to the filtration facility. The ESM shall be placed in horizontal layers not to exceed 12" for the entire area of the filtration facility. The ESM shall be compacted by saturating the entire area of the filtration facility after each lift of ESM is placed until water flows from the underdrain. Water for saturation shall be applied by spraying or sprinkling. Saturation of each lift shall be performed in the presence of the NCDOT. An appropriate sediment control device shall be used to treat any sediment-laden water discharged from the underdrain. If the Media becomes contaminated during the construction of the facility, the contaminated material shall be removed and replaced with uncontaminated material at no additional cost to NCDOT. Final grading of the Media shall be performed after a 24-hour settling period. Final elevations shall be within 2 inches of elevations shown on the Construction Drawings.

Payment will be made under:

Pay Item	**Pay Unit**
Engineered Soil Media	Cubic Yards

WASHED NO. 57 STONE

Description

Furnish and place washed no. 57 stone as shown in the plans and as directed. Stone shall be thoroughly washed with clear water and permitted to dry prior to placement. The washed stone shall be free of clay, loam, dust, similar adherent materials nor organic materials unless otherwise permitted by the Engineer in writing.

Materials

Refer to Division 10, Section 1005 & 1014-2 of the *2024 Standard Specifications.*

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Pay Item	Pay Unit
Washed coarse aggregate (Std. Size No. 57)	Tons

POLYPROPYLENE NONWOVEN GEOTEXTILE FABRIC

Description

Polypropylene nonwoven fabric shall conform to the requirements of Section 1056 of the Standard Specifications for Type 1 Geotextile.

Payment will be made under:

Pay Item	Pay Unit
Geotextile for Drainage	Square Yard

FESCUE/BLUEGRASS BLEND SOD

Description

Fescue/bluegrass blend sod materials and installation shall be in accordance with Section 1664 of the Standard Specifications. The sod soil layer shall be sand based and contain minimal clay content in order to facilitate infiltration. The Fescue/bluegrass sod should be cut at ½ depth. The sod material shall be approved by the Engineer prior to installation.

Payment will be made under:

Pay Item	Pay Unit
Fescue/Bluegrass Blend Sod	Square Yard

NORTH CAROLINA PROFESSIONAL SEAL 047680 ENGINEER MATTHEW KEMP

Signed by:
Matt Kemp
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TRASH RACK (RISER)

Description

The work consists of the fabrication and installation of a trash rack in accordance with the details in the plans on sheet 2D-5. The trash rack shall be constructed of aluminum or galvanized steel and fully welded.

Materials

Materials and fabrication methods for the trash rack shall conform to the requirements of Sections 1074 and 1076 of the *2024 Standard Specifications.*

Construction Methods

The trash rack shall be anchored to the proposed concrete structure by using an approved anchor bolt in accordance with Section 420 of the *2024 Standard Specifications.*

Measurement and Payment

Trash Rack (riser) will be measured and paid for as each for the actual number of trash racks that have been incorporated into the completed and accepted work. Such prices and payment will be full compensation for all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Trash Rack (riser)	Each

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TRASH RACK (ORIFICE)

Description

The work consists of the fabrication and installation of a trash rack in accordance with the details in the plans on sheet 2D-5. The trash racks are used to prevent floating debris from clogging Stormwater Control Measure outlets and downstream drainage pipes. Top-mounted (orifice) trash racks are bolted on the rims of precast outlet structures to treat overflow discharges.

Materials

Dimensions of the trash rack and hardware shall be in accordance with the Contract Plans.

The trash rack shall be removable according to the Contract Plans using spring pins or cotter keys and washers that temporarily anchor the rack to steel plate hinges that are fastened to the sides of the outlet structure.

All hardware shall be compatible with trash rack material of either galvanized steel or aluminum in accordance with Section 1074 and 1076 of the *2024 Standard Specifications*.

Construction Methods

- All joints shall be fulling welded around joint with a minimum of a ¼" bead.
- If bolts are anchored in concrete, refer to Section 420 on the *2024 Standard Specifications*

Measurement and Payment

Trash Rack (orifice) will be measured and paid for as each for the actual number of trash racks that have been incorporated into the completed and accepted work. Such prices and payment will be full compensation for all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Trash Rack (orifice)	Each

NORTH CAROLINA PROFESSIONAL SEAL 047680 ENGINEER MATTHEW KEMP

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WELL GRADED CLASS II RIP RAP MIXED WITH CLASS B RIP RAP: **(SPECIAL)**
(05/01/2026)

Description

Contractor to install well-graded rip rap composed of NCDOT Class II rip rap blended with Class B rip rap to minimize voids and enhance stability as shown in the plans and as directed.

Materials

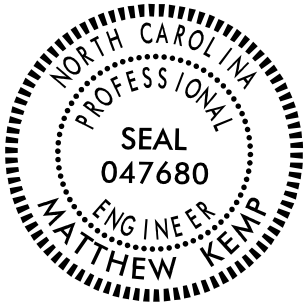
Class II and Class B rip rap shall meet NCDOT Section 1042 requirements. Provide geotextile shown in the plans in accordance with the *2024 Standard Specifications.*

Construction

Prepare the subgrade in accordance with Section 876. Place geotextile in accordance with Section 1056 prior to placing rip rap. Place Class II first to establish nominal thickness of 24 inches. Place/work in Class B rip rap on top of the Class II rip rap to minimize voids.

Payment will be made under:

Pay Item	Pay Unit
Class II Rip Rap	Tons
Class B Rip Rap	Tons
Geotextile For Drainage	Square Yards



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PIPE REHABILITATION: **(SPECIAL)**
(05/01/2026)

I. DESCRIPTION

This work shall consist of the rehabilitation of existing storm water pipes, or culverts by the method or methods specified at the designated locations described in the Contract.

Pipe liner systems used for rehabilitation shall be from the NCDOT Approved Products List and may be subject to limitations for use as specified herein, by site-specific limitations for those locations listed in the Contract, or limitations as shown on the NCDOT Approved Products List for the specific liner system. The Contractor shall consult the Contract to determine the method or methods that are permitted at each rehabilitation location.

Liners provided per this special provisions shall be designed per the *NCDOT Manual for Pipe Rehabilitation*.

The Contractor shall provide contract submittals as called for herein to the Engineer a minimum of 10 days prior to start of installation.

Designated Locations and Allowable Methods

Site	Latitude (decimal degrees)	Longitude (decimal degrees)	County	Route	Allowable Liner Categories	Notes
1	35.5684	-82.5915	Buncombe	I-26/I-240	Category A	283' of Prop. Lining for Exist. 72" CMP
2	35.5606	-82.6043	Buncombe	I-26/I-240	Category A	188' of Prop. Lining for Exist. 48" CMP

II. MATERIALS

Category A – Cured-In-Place Pipe (CIPP) liners are lining an existing culvert by either pulling or inverting a resin-impregnated fabric tube and curing the tube in place. When CIPP liners are specified, the liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Must list cure method (e.g., UV, steam, hot water, etc.).
- Must list typical, minimum, maximum application thicknesses.
- Calculated minimum thickness of liner
- Designation of air or water inversion or pull-in-place method
- Maximum pressure to ensure liner does not sustain damage

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- Maximum and minimum cure temperatures
- Ambient temperature range allowable during installation
- Post cure temperature
- Temperature cure profile.
- Sample of temperature and pressure log to be used for monitoring the curing process
- Certification on manufacturer's letterhead indicating that the contractor is approved by the fabric tube and resin manufacturer to perform CIPP installation work.
- Manufacturer moisture limitations (e.g. installation in the dry, humidity restrictions, etc.).
- Material safety data sheets for all hazardous chemicals that will be used on the job site including resin, catalyst, cleaners, and repair agents. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Must provide and comply with specification for installation, and provide NCDOT Type 1 or Type 4 Certificates of compliance with material specifications as applicable to the below, or equivalent as approved by the Engineer:
    - ASTM D5813
    - ASTM F1216 for inverted CIPP
    - ASTM F1743 for pulled-in-place CIPP
    - ASTM F2019 for pulled-in-place GRP CIPP
    - ASTM F2599 for sectional inverted CIPP (applies to pipe sections, not full length)

- Long Term Modulus of Elasticity for calculations = 150,000 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Long Term Modulus of Elasticity extrapolated from ASTM D2990, 10000-hour test. Design value of Long Term Modulus of Elasticity may be no greater than 50% of Initial Modulus of Elasticity. Tested value must be greater than or equal to value used in design equations.

- Initial Modulus of Elasticity for calculations = 300,000 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Initial Modulus of Elasticity based on ASTM D790. Tested value must be greater than or equal to value used in design equations.

- Long Term Flexural Strength = 2250 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Long Term Flexural Strength extrapolated from ASTM D2990, 10000-hour test. Tested value must be greater than or equal to value used in design equation.

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III. CONSTRUCTION

Pre-Installation Inspection – The Contractor shall perform a pre-installation video inspection of pipe using NASSCO certified personnel. The camera shall be situated at the centerline of the pipe and shall be mounted on a rubber tired or tracked pipe rover that allows for a 360-degree inspection. Inspection equipment shall be capable of measuring protrusions and obstructions of ½ inch or greater. Provide a pipe profile, on which deflections that may affect the installation of the liner are located and noted. The inspection shall be performed in the presence of the Engineer, unless waived by the Engineer. Dewater the host pipe to the satisfaction of the Engineer, and in accordance with NCDOT Best Management Practices for Construction and Maintenance Activities. A thorough culvert inspection is required to determine the number of existing "pipe to pipe" connections and the extent, if any, of obstruction removal and voids. The inspection shall be performed by experienced personnel trained in locating breaks, obstacles, voids and service connections. Video inspections shall be clearly labeled on the media with the time, date, and location of the pipe inspected. A copy of the video inspection shall be furnished to the Engineer at least 10 days prior to the start of rehabilitative construction. In the event the Contractor's inspection shows the method of rehabilitation the Contractor has selected is no longer viable at that location as verified by the Engineer, the Contractor shall select another allowable method, if specified, from those designated in the Contract.

Pipe Clean-out - The Contractor shall clear the existing pipe(s) designated for rehabilitation of any debris, sediment, protrusions greater than ½ inch in height, and any other potential obstructions prior to the start of rehabilitation efforts. The Contractor shall then thoroughly clean and prepare the host pipe prior to the liner installation. Cleaning shall conform to the recommendations of the liner manufacturer, and any additional requirements of this special provision. In the absence of manufacturer recommendations, the Contractor shall submit his/her proposed method for cleaning and preparing the host pipe for the Engineer's review and acceptance at least 10 working days prior to beginning the work at that location.

Grouting Host Pipe - The Contractor shall perform grouting work described in the contract, prior to pipe liner installation to correct existing deficiencies, such as voids.

Inlet & Outlet Sealing – All pipe liner installations shall be sealed to the host pipe at the terminal ends of the liner to prevent flow between the liner and host pipe.

De-Watering – All pipe liners and grout shall be installed in dry conditions. The Contractor shall de-water by diverting, pumping, or bypassing any water flow through an existing pipe or drainage system prior to and during the lining process. The method of de-watering is to be determined by the contractor but must be approved by the Engineer prior to implementing.

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Disposal Plan – The Contractor shall submit a Disposal Plan to the Engineer a minimum of 10 days prior to installation. The Disposal Plan shall indicate how by-products and waste are to be contained, captured, transported offsite, and disposed of in accordance with project permits and local, state and federal regulations. It shall be the Contractor's responsibility to report and take appropriate corrective actions to remediate any water quality alteration resulting from lining operations in accordance with project permits and applicable local, state or federal regulations. The cost for such remediation shall be at the Contractor's expense.

Category A – Cured-In-Place Pipe liner method. The Cured-In-Place Pipe liner system shall be fabricated and installed in such a manner as to result in a maintained full contact tight fit to the internal circumference of the host pipe for its entire length. The installation shall adhere to the cure times and temperatures stipulated in the manufacturer's recommended installation and cure specifications and the finished product shall be free of de-lamination, bubbling, rippling or other signs of installation failure.

Install per specification or standard practice for installation (ASTM F1216 inverted CIPP, or F1743 pulled in-place CIPP, or F2019 pulled-in-place GRP CIPP, or F2599 sectional inverted CIPP for example).

Pulled-in-place liner installation must be accomplished without significant liner twisting or stretching the liner greater than 1% of its original length during installation. At no time shall the pulling force, as measured by a contractor-provided dynamometer or load cell, exceed that established by the liner manufacturer. For liner lengths greater than 100 feet, protect the pipe liner end using a device that uniformly distributes the applied load around the perimeter of the liner.

Curing for styrene-based, epoxy-based, and vinyl ester-based CIPP may be accomplished by water, steam or ultraviolet light and shall be in accordance with the liner manufacturer's recommendations.

Installation and curing requirements of pipe sections shall be in accordance with the manufacturer's recommendations for the specific product, as applicable. The Contractor shall furnish installation and curing requirements for the various flexible liners including individual components of the system, tube type (reinforced or non-reinforced), manufacturer name and type of resin including catalyst, volume of resin required to achieve proper impregnation and curing. All components of the systems shall be as recommended by the manufacturer for the specific system used, and all components shall include lot numbers and expiration dates.

The Contractor shall place an impermeable barrier immediately upstream and downstream of the host pipe, prior to liner insertion, to capture any possible raw resin spillage during installation and shall dispose of any materials in accordance with the submitted disposal plan.

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Reconnect the existing storm drain lateral connections immediately after the liner has been cured in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes.

The Contractor shall monitor temperature via a minimum of three thermocouples on the outer surface (interface between the host pipe and liner) of the liner (one each at the upstream and downstream ends and one approximately mid-length of the host pipe). The Contractor shall monitor pressure during inversion and curing and maintain pressure between minimum and maximum allowable pressures as provided by the manufacturer. The Contractor shall automatically log cure time-temperature and time-pressure data at 30 second intervals with a data logger and provide such information in a format acceptable to the Engineer.

Submit the tape and log of recorded temperatures and pressure to the Engineer within 48 hours after completing the resin-curing process.

The Contractor shall thoroughly rinse the cured lined pipe with clean water prior to re-introducing flow. The Contractor shall capture all cure water and/or steam condensate and rinse water and dispose of, in accordance with the submitted disposal plan.

Within 21 days of completing the resin curing at a given culvert location, submit the test results from a ISO 17025 lab suitable to the Engineer. The report must be signed by a representative of the independent testing lab. The report must include:

- Flexural strength and flexural modulus test results for field samples.
- Thickness measurements for the liner using prepared core samples.
- Description of the defects in the tested samples in terms of the effect on CIPP performance.

Make cured samples from the identical materials (tube, resin and catalyst) to be used for the CIPP. Identify each sample by date, contract number, drainage system number of the corresponding culvert, thickness, name of resin, and name of catalyst.

The samples must be 6 by 16 inches in size: Comply with the following sampling procedures unless UV cured:

- Place 3 aluminum-plate clamped molds, each containing a flat plate sample, inside the downtube when heated circulated water is used, and in the silencer when steam is used during the resin curing period
- Seal each flat plate sample in a heavy-duty plastic envelope inside the mold
- Remove the 3 cured flat plate samples after draining all of the moisture from the cured CIPP

If UV cured, comply with field sampling procedures under ASTM F2019, Section 7: Recommended Inspection Practices.

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Test the samples for flexural properties under ASTM D790, ASTM D5813, ASTM F1216, ASTM F1743, or ASTM F2019. Verify that physical properties of the field samples comply with the minimum values under:

- ASTM F1216, Table 1 (modified values), for heat cured polyester, vinyl ester, and epoxy resins. The flexural strength must be at least 5,000 psi. The flexural modulus must be at least 300,000 psi.
- ASTM F2019, Table 1, for UV cured CIPP. The flexural strength must be at least 6,500 psi. The flexural modulus must be at least 725,000 psi. Comply with sampling and testing procedures under ASTM F2019, Section 7: Recommended Inspection Practices.

Take core samples in the presence of the Engineer. Comply with the following core sample requirements:

- Take 2 samples. Take the samples at least 1 foot from each end of the culvert at a location near the top of the culvert. Samples must be at least 2 inches in diameter.
- If culvert material is corrugated metal, obtain samples at the corrugation crests.

Prepare the core samples by separating the CIPP material from the culvert material. If heat cured, remove the film from the inner lining or preliner. If UV cured, remove the film from the inner and outer foil. Measure the thickness of the liner at 3 spots on each sample. If the culvert material is corrugated metal, measure the thickness at 3 spots that are along a line corresponding to the corrugation crests. Calculate the thickness as an average of at least 6 measurements.

If UV cured, comply with sampling and testing procedures under ASTM F2019, Section 7: Recommended Inspection Practices. If the culvert material is corrugated metal, measure the thickness at 3 spots that are along a line corresponding to the corrugation crests. Calculate the thickness as an average of at least 6 measurements.

All voids from core samples are to be filled with Type 1 epoxy resin as specified in NCDOT Standard Specifications for Roads and Structures, Section 1081.

CIPP may be rejected if any of:

- Actual temperature and curing time and schedule do not comply with those shown in the authorized work plan
- Pressure deviates more than 1 psi from the required pressure
- At any time during installation the manufacturer's required minimum cool-down time or maximum cool-down rate is violated
- There are defects including:
    - Concentrated ridges, including folds and wrinkles exceeding 8 percent of the CIPP diameter
    - Dry spots
    - Lifts

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  - Holes
  - Tears
  - Soft spots
  - Blisters OR Bubbles
  - Delaminations
  - Gaps in the length of the CIPP
  - Gaps or a loose fit between the exterior of the CIPP and the culvert
- Test results indicate one of the following:
  - If heat cured, 2 of the 3 flat plate samples do not have any of the following:
    - the specified modulus of elasticity
    - the specified flexural strength
    - either the specified modulus of elasticity or the specified flexural strength.
  - If UV cured, 2 of the 3 cured samples do not have any of the following:
    - the specified modulus of elasticity
    - the specified flexural strength
    - either the specified modulus of elasticity or the specified flexural strength
- The liner thickness is less than the greater of either one of the following:
  - Specified thickness
  - Calculated minimum thickness shown in your authorized work plan
- Materials and installation methods are not those shown in your authorized installation plan
- Defects are excessive or unrepairable
- CIPP is not continuous or does not fit tightly for the full length of the culvert

If UV cured, and post installation inspections reveal signs of incomplete curing (dripping resin, etc.), the Contractor will trim liner obscuring uncured liner, re-wet, and re-cure with UV.

Post Installation Inspection – In addition to the inspection performed by the Department, the Contractor shall perform two post-installation video inspections using NASSCO certified personnel. The first inspection shall take place between 90 and 100 calendar days after completion of installation for each culvert or system to a single outfall. The second inspection shall take place 30 calendar days prior to the end of the liner warranty period (5 years, secured by construction bond). The camera shall be situated at the centerline of the pipe and shall be mounted on a rubber tired or tracked pipe rover that allows for a 360-degree inspection. Inspection equipment shall be capable of measuring protrusions and obstructions of ½ inch or greater. The inspection shall be performed in the presence of the Engineer. Dewater the host pipe to the satisfaction of the Engineer. Video inspections shall be clearly labeled on the media with the time, date, and location of the pipe inspected. A copy of the video inspection shall be furnished to the Engineer prior to acceptance of the work.

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The finished liner may be rejected if not continuous over its entire length and free from visual defects such as foreign inclusions, joint separation, cracks, insufficient liner thickness, material loss, roughness, deformation, dry spots, pinholes, insufficient bonding to host pipe, delamination, or other material or installation deficiencies as described herein.

Remedies for rejection of liner - In the event the first post inspection of the installation reveals defects in localized areas of the liner pipe (comprising less than 20 percent of the pipe length) the localized defects shall be repaired as specified by the manufacturer. Where defects occur on 20 percent or more of the pipe length the defects shall be repaired, however, the Contractor will not be allowed to continue with his methodology of installation and/or the liner system used until he/she can demonstrate to the Engineer that he/she has remedied his/her operations to a sufficient level of quality as determined by the engineer. All such remedial efforts shall be at the Contractor's expense. Further failure(s) to perform a proper installation may result in the disallowance of the use of that liner system and an adjustment in the cost or non-payment of the failed installations depending on the severity of the failure.

In the event the first post installation inspection is not conducted until all or most of the locations in the Contract permitting this methodology have been performed, and the inspection reveals defects on 20 percent or more of the host pipe's length, then an adjustment in the cost or non-payment of the failed installations may be made by the Engineer depending on the severity of the failure.

In the event the second post inspection of the installation reveals defects, the Department may execute the option to call the construction bond to reimburse the Department for repairs or corrections, or to act as an adjustment in the cost, or both.

MEASUREMENT AND PAYMENT

Pre Installation Inspection will be measured and paid for as the actual number of linear feet of pipe inspected, including mobilization of equipment, and production of records. Linear footage is not increased for multiple passes of inspection equipment through a length of pipe.

Pipe Rehabilitation will be measured and paid for as the actual number of linear feet of pipe for the Size, and Method that has been incorporated into the completed and accepted work. Note: At locations shown in the Contract where multiple methods are permitted, the Contractor may select any of the methods specified, however, if only one method is specified, this will be the only method permitted at that location. This price shall include post installation inspection, cleaning and preparation of the host pipe, furnishing and installing the liner, lateral reconnection, coupling and expansion devices, annular cement grout, design (if necessary) and shop drawing preparation, furnishing and installing liner and all components of the liner system, capturing any discharges or releases during installation or curing operations, furnishing any documentation or fees required for effluent or condensate disposal, all testing and sampling including furnishing

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reports and pre and post installation video inspections, waste disposal costs, excavation, sheeting, shoring, disposing of surplus and unsuitable material; backfilling and backfill material; compaction, restoring existing surfaces, and clearing debris and obstructions.

De-Watering will be measured and paid as the actual number of water diversions or bypasses required to complete Pipe Rehabilitation work. Each instance of De-Watering paid includes De-Watering for pre inspection, installation, post inspections, and remediation (if necessary). All materials, equipment, labor, or other resources required to de-watering a site shall be incidental to the unit cost for De-watering.

Payment will be made under:

Pay Item	**Pay Unit**
Pre Installation Inspection	Linear Foot
(Size) Pipe Rehabilitation CIPP Liner	Linear Foot
De-Watering	Each

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NORTH CAROLINA PROFESSIONAL SEAL 039102 ENGINEER BRANDON T. BARHAM

Signed by:
Brandon Barham
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SEALED STORM DRAINAGE SYSTEM WITHIN WALLED ROADWAY SECTIONS **(SPECIAL)**
(04/27/2026)

Furnish and install sealed storm drainage network to include the following structures and pipes (Also, refer to the Drainage Summary Sheet provided in construction drawing):

- Structures:
  - 6005
  - 6006
  - 6007
  - 6008
  - 6009
  - 6013
  - 6014
  - 6022
  - 6023
  - 6025
  - 6031
  - 6032
  - 6033
  - 6046
  - 6052
  - 6053
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- 0835
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- 0843
- 0909
- 0910
- 1001
- 1002
- 1003
- 1004

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- 1005
- 1006
- 1010
- 1011
- 1014
- 1028
- 1029
- T121
- T122
- T123
- T124
- T125

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Pipes:

- 6005 to 6006
- 6006 to 6007
- 6006 to T124
- 6007 to 6008
- 6008 to 6009
- 6013 to 6014
- 6022 to 6023
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- 6032 to 6033
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- 6064 to 6006
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- 6070 to 6124
- 6099 to 6200
- 6108 to 6109
- 6131 to 6132
- 6157 to 6156
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- 6201 to 6202
- 6202 to 6212
- 6203 to 6209
- 6206 to 6275
- 6209 to 6211
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- 6211 to 6201
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- 6256 to 6402
- 6257 to 6403
- 6258 to 6257
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- 6262 to 6263
- 6263 to 6405
- 6264 to 6265
- 6269 to 6270
- 6270 to 6262
- 6271 to 6263
- 6275 to 6217
- 6401 to 6232
- 6402 to 6276
- 6403 to 6256

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- 6405 to 6264
- 6406 to 6262
- 7004 to 7008
- 7005 to 7019
- 7007 to 7097
- 7008 to 7106
- 7012 to 7098
- 7013 to 7012
- 7019 to 7106
- 7020 to 7105
- 7025 to 7115
- 7026 to 7130
- 7027 to 7025
- 7028 to 7027
- 7029 to 7026
- 7030 to 7028
- 7031 to 7030
- 7032 to 7029
- 7034 to 7032
- 7050 to 7051
- 7052 to 7140
- 7053 to 7052
- 7055 to 7116
- 7056 to 7057
- 7057 to 7055
- 7062 to 7063
- 7063 to 7064
- 7066 to 7057
- 7098 to 7007
- 7105 to 7109
- 7106 to 7107
- 7109 to 7008
- 7110 to 7004
- 7111 to 7004
- 7115 to 7012
- 7140 to 7050
- 7141 to 6271
- 0819 to 0820
- 0820 to 0843
- 0822 to 0823
- 0823 to 0819
- 0826 to 0827
- 0827 to 0850
- 0830 to 0831
- 0831 to 0832
- 0832 to 0826
- 0835 to 0830
- 0836 to 0832
- 0909 to 0910
- 1001 to 1004
- 1002 to 1003
- 1003 to 1004
- 1005 to 1006
- 1006 to 1028
- 1010 to 1011
- 1011 to 1014
- 1028 to 1029
- 6157 to T121
- T121 to T122
- T122 to T123
- T123 to T125
- T124 to T125
- T125 to T126

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Description

A Special Sealed Drainage System within a walled roadway section has been designated on the plans as "SEALED XP" or "SEALED PP" and in the Drainage Summary Sheet as "Sealed Pipe System" or "Sealed Cross Pipe (Sealed XP)". The work includes construction of watertight joints and connections between pipe sections and between pipes and drainage structures; and shall meet the requirements of this special provision. The extents of the Special Sealed Drainage System shall be adhered to as shown on the plans and drainage summary sheets, or as directed by the Engineer.

"SEALED XP" are storm drainage pipes under all travel lanes and gore areas within wall zone. Welded Steel Pipe or Sealed Reinforced Concrete Pipe may be used. "Sealed PP" are storm drainage pipes parallel to retaining wall within wall or outside of volatile organic compound areas. Polypropylene Pipes may be used. Welded steel pipes or Sealed Reinforced Concrete Pipes may be used, if necessary, due to overriding conditions such as continuation of pipe partially located under travel lanes.

Materials

Refer to the *2024 Standard Specifications.*

Welded steel pipe shall be Grade B, meet the requirements of Section 1032-5 of the *Standard Specifications* and have a minimum wall thickness of 0.5". Welded steel pipe installed under this provision and in a trench shall be installed in accordance with Section 300 of the *Standard Specifications*. Welded steel pipe installed using trenchless methods shall be installed in accordance with Section 330 of the *Standard Specifications*.

Reinforced Concrete Pipe shall meet the requirements of Section 1032-6(B) of the *Standard Specifications*. Reinforced Concrete pipe installed under this provision and in a trench shall be installed in accordance with Section 300 of the *Standard Specifications*. Reinforced concrete pipe used as sealed RCP shall have joints conforming to ASTM C990 and joints wrapped according to ASTM C877.

High Density Polyethylene or Polypropylene pipe shall conform to Standard Specifications 1032-7 or 1032-4 and have watertight connections that comply with ASTM D3212.

Drainage Structures shall be precast concrete conforming to ASTM C913 for rectangular boxes and AASHTO M199 for round manholes. Joints between sections shall meet or exceed ASTM C443.

Connection of pipe to drainage structure shall be by a flexible, resilient connector meeting or exceeding ASTM C923; or utilize a reinforced concrete pipe-to-drainage structure collar, doweled into the drainage structure, as detailed in plans.

The Contractor shall submit to NCDOT Hydraulics Unit catalog cuts and/or shop drawings for materials proposed to be used on the project. Allow 40 days for the review of each submittal.

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Materials which have not been approved shall not be delivered to the project. Eight (8) copies of each catalog cut and/or drawing shall be submitted, and each shall show the material description, brand name, stock number, size, rating, manufacturing specification and the use for which it is intended.

The NCDOT Geotechnical Unit shall approve all backfill material.

Construction Methods

Installation of the sealed drainage system pipe and drainage structures shall meet the requirements of Section 300 and Section 1505 of the *Standard Specifications*.

At all pipe connections to drainage structures, pipes shall extend a minimum of six inches beyond the internal wall of the drainage structure.

All materials shall be carefully examined for defects before placing, and any defective materials shall be replaced. As the work progresses, the interior of the pipe shall be cleared of all foreign materials. Obtain approval by the Engineer prior to any cleaning or flushing activities. Any pipeline or drainage structure that contains silt, sedimentation, or other foreign material shall be flushed or otherwise cleaned out of the line and drainage structures.

Trenches shall be kept free from water until backfilled, and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work.

If significant settlement is expected, all proposed storm drainage pipe within the wall zone should be installed after predetermined settlement waiting period is achieved. This effort should be coordinated with the NCDOT Geotechnical Unit.

Sealed Drainage Inspection

An independent contractor not affiliated with the construction contractor shall perform a post-construction inspection of all pipes and storm drain networks governed by this section within 90 days of completion of installation. Inspections shall be performed by NASSCO certified personnel using a Closed-Circuit Television Video (CCTV) steerable pipe crawler/rover that is tethered to a cable reel. Other types of equipment should only be used with prior agreement of the Engineer. Equipment must be capable of capturing 360-degree views from within the pipe or storm drain system and all required data and measurements. Documentation of each inspection shall be provided to NCDOT for review and acceptance. At a minimum, the documentation shall include a video inspection and a corresponding report. The camera must be centered in the pipe during video inspections and must show the entire circumference of the pipe. Video inspections should provide accurate distance measurements of features in the pipe or network, and footage measurements shall be displayed and documented in the video. Video should be continuously metered. A maximum video size of 1.5GB is recommended. Acceptable file formats are .avi, .mkv, mp4, mpeg, .mpg, or .wmv with .mp4 being the preferred format.

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The inspection report shall identify the following:

- Structural integrity of each pipe joint connector, including welded steel pipe joints, and each pipe connection to a drainage structure including, but not limited to, joint or connector damage, failure, separation, and offsets.
- Length between the end of the pipe and the internal wall of the drainage structure at each pipe connection to a drainage structure
- Longitudinal, transverse, circumferential, and multidirectional cracking or deflection
- Seepage and infiltration into the pipe
- Pipe or connection failures including, but not limited to, differential settlement, material deformation, and puncture holes.
- The location of each item noted as measured from the outlet of the pipe.

Prior to inspection, pipes should be clean enough to ensure all defects, features and observations are seen and logged. Any pipe cleanout required prior to inspections governed by this guidance shall be considered incidental and will not be paid for as extra work. The contractor shall get approval from the Engineer prior to performing any necessary cleanout.

Measurement and Payment

Trenching, excavation, and backfilling for Special Sealed Drainage System will be considered as included in the contract price for the applicable pay item and no separate measurement will be made; Therefore, such work as shoring, sheeting, and dewatering of the excavation will also be considered as incidental to the contract price for the applicable pay item and no separate measurement will be made.

Welded Steel, High Density Polyethylene, Polypropylene and Reinforced Concrete Pipe for the sealed drainage system will be measured and paid at the contract unit price per linear foot. The quantity of sealed drainage system lines of the various sizes, which has been incorporated into the completed and accepted work, will be measured from end to end by the linear foot in place with no deduction for length through drainage structures. Where two different sizes enter or exit a drainage structure, each size will be measured to the center of the drainage structure. Unless otherwise shown on the plans, branch connections, elbows, or other fixtures will be included in the length measurement.

Foundation conditioning material will be paid for as stated in Section 300-9 of the Standard Specifications.

Concrete Collars to be constructed of Class B concrete will be paid for by the cubic yard.

Resilient Connector will be measured and paid for in units of each that has been incorporated into the completed work.

Installation documentation and video inspection conforming to the *Sealed Drainage Inspection* section above, shall be considered incidental.

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Such prices and payments will be full compensation for all work covered by these special provisions, including, but not limited to materials, labor, equipment, backfilling, compaction, testing, pumping, pipe connectors, gaskets, non-shrink cement grout, and incidentals necessary to complete the work as required. No separate measurement or payment will be made for sealed drainage system inspection as described in this special provision as the cost of such work shall be included in contract price bid per linear foot for the various pipe utilized in the sealed drainage system.

Payment will be made under:

Pay Items	**Pay Units**
Resilient Connector	Each
Concrete Collar	Cubic Yard
__" Sealed Polypropylene Pipe	Linear Foot
__" Sealed XP	Linear Foot

NORTH CAROLINA PROFESSIONAL SEAL 047680 ENGINEER MATTHEW KEMP

Signed by:
Matt Kemp
FF48C80875B443C...
9/4/2026

NORTH CAROLINA PROFESSIONAL SEAL 039102 ENGINEER BRANDON T. BARHAM

Signed by:
Brandon Barham
421317066DC44BF...
9/4/2026

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TRAFFIC BEARING CONTRACTOR DESIGNED MASONRY DRAINAGE STRUCTURES (SPECIAL)

GENERAL

The work covered by this special provision applies to traffic bearing contractor-designed (non-standard) drainage structures as noted in the contract plans. Where noted in the plans that a masonry drainage structure is identified as traffic bearing and contractor designed, the special drainage structure detail provided in the plans is a schematic, and requires the Contractor to submit a working drawing.

SUBMITTALS

When a masonry drainage structure is identified to be Contractor Designed, the Contractor shall be responsible for the design of the Non-Standard Structures which are subject to review, comments, and approval. Designs shall conform to the AASHTO *LRFD Bridge Design Specifications*, latest edition. Submit two sets of detailed plans for review. Include all details in the submittal, including the size and spacing of the required reinforcement necessary, concrete strength and class, dimensions, bedding materials to build the Non-Standard Structure. Where required by the plans, use precast concrete. A North Carolina Registered Professional Engineer shall seal the submittal, which includes plans and design calculations. **The submittal must show the proposed openings (top and sides) and reinforcing for pipe connections, structure openings, and precast holes for steps, if necessary.**

Concrete for the structure shall be minimum Class AA for all traffic bearing contractor-designed masonry drainage structures, as per the Standard Specification Section 1000. Fill concrete indicated on the plans shall be class A or B as described in Section 1000 *Portland Cement Concrete Production and Delivery* of the NCDOT Standard Specifications.

Materials shall be as shown on the plans or described in Article 838-2 and 840-2 *Materials* of the NCDOT Standard Specifications.

All submittals shall be made a minimum of two weeks prior to construction or placing an order for materials for review by the Engineer.

Working drawings submittals shall conform to the “Submittal of Working Drawings” special provision or as directed by the Engineer.

For all Traffic Bearing Contractor Designed Masonry Drainage Structures, the Contractor shall submit the manufacturer’s certification and shop drawings for the Non-Standard Structures and those products to be used in the installation.

CONSTRUCTION METHODS AND MATERIALS

Construction of the contractor designed masonry drainage structures is not explicitly covered by this provision and shall be in accordance with Section 420 *Concrete Structures*, Section 425

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Fabricating and Placing Reinforcement, and Section 1040 *Masonry* of the NCDOT Standard Specifications.

Where foundation material is found to be of poor supporting value or rock, undercut and provide foundation conditioning material. Unless otherwise specified within the plans, Install 6" bedding #57 stone beneath all structures.

Use cast in place concrete or precast concrete construction as shown on the plans, except where required to be precast.

Methods shall be as described in Article 838-3 and 840-3 *Construction Methods* of the NCDOT Standard Specifications.

MEASUREMENT AND PAYMENT

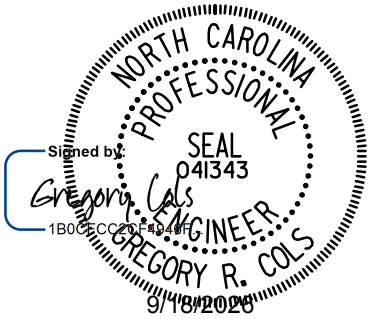
TB Contractor Designed Masonry Drainage Structures shall be full payment for the contractor's design of each traffic bearing drainage structure, including preparation, submittal, and any resubmittals of the PE-sealed working drawings, identified in the plans. Such plans, upon acceptance, will become the basis of construction for such structures. No fabrication, materials, or construction will be paid under this pay item.

Payment for elements of work required to construct the contractor-designed masonry drainage structures in accordance with the specifications contractor's working drawings shall be made separately under the *Masonry Drainage Structures* (each) and *Masonry Drainage Structures* (linear foot) pay items, including, but not limited to furnishing labor, materials, excavation, stone bedding; hauling; disposal of materials; transporting and placing concrete, precast units, mortar, grout, reinforcing steel, hardware, castings and miscellaneous metal; fabrication, welding, and galvanizing to construct cast in place concrete or precast concrete walls, weepholes, catch basins, junction boxes, spring boxes, manholes, concrete aprons and non-standard drainage structures, with all necessary steps, and other hardware, and connection of the structure.

Frames and Grates shall be paid separately.

Payment will be made under:

TB Contractor Designed Masonry Drainage Structures.....Each



Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:

(4-30-2019)(Rev. 1-21-2025)

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit issued by the North Carolina Department of Environmental Quality Division of Energy, Mineral, and Land Resources. Temporary or permanent ground cover stabilization shall occur within the following time frames from the last land-disturbing activity:

- Stabilize perimeter dikes, swales, ditches, and perimeter slopes within 7 calendar days.
- Stabilize high quality water (HQW) zones within 7 calendar days.
- Stabilize slopes steeper than 3:1 within 7 calendar days.
    - If slopes are 10 feet or less in length and are not steeper than 2:1, 14 calendar days are allowed.
- Stabilize slopes 3:1 to 4:1 within 14 calendar days.
    - 7 calendar days for slopes greater than 50 feet in length and with slopes steeper than 4:1.
    - 7 calendar days for perimeter dikes, swales, ditches, perimeter slopes, and HQW Zones.
- Stabilize areas with slopes flatter than 4:1 within 14 calendar days.
    - 7 calendar days for perimeter dikes, swales, ditches, perimeter slopes, and HQW Zones.

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING: (WestEd)

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	Kalahari	Serengeti
2nd Millennium	Essential	Kitty Hawk 2000	Shelby
3rd Millennium	Evergreen 2	Legitimate	Shenandoah III
Avenger	Faith	Lexington	Shenandoah Elite
Bar Fa	Falcon IV	LifeGuard	Sheridan
Barlexas	Falson NG	LSD	Sidewinder
Barlexas II	Falcon V	Magellan	Signia
Barrera	Fat Cat	Masterpiece	Silver Hawk
Barrington	Fesnova	Millennium SRP	Skyline
Barrobusto	Fidelity	Monet	Solara
Barvado	Finelawn Elite	Mustang 4	Southern Choice II
Biltmore	Finelawn Xpress	Naturally Green	Speedway
Bingo	Finesse II	Ninja 2	Spyder LS
Bizem	Firebird	Ol' Glory	Sunset Gold
Black Tail	Firecracker LS	Padre	Taccoa
Blackwatch	Firenza	Patagonia	Tahoe II
Blade Runner II	Five Point	Pedigree	Talladega
Bonsai	Focus	Picasso	Tanzania
Braveheart	Forte	Piedmont	Temple
Bravo	Garrison	Plantation	Terrano
Bullseye	Gazelle II	Proseeds 5301	Thor
Cannavaro	GLX Aced	Prospect	Thunderstruck
Catalyst	Gold Medallion	Quest	Titanium LS
Cayenne	Grande 3	RainDance	Titan LTD
Cezanne RZ	Greenbrooks	Raptor II	Tracer
Chipper	Greenkeeper	Rebel IV	Traverse SRP
Cochise IV	Gremlin	Rebel Exeda	Trio
Constitution	Greystone	Rebel Sentry	Tulsa Time
Corgi	Guardian 21	Regenerate	Turbo
Corona	Guardian 41	Regiment II	Turbo RZ
Coyote	Hemi	Rembrandt	Tuxedo
Cumberland	Honky Tonk	Rendition	Ultimate
Darlington	Hot Rod	Reunion	Umbrella
DaVinci	Hunter	Rhambler 2 SRP	Van Gogh

Desire	Inferno	Riverside	Venture
Diablo	Integrity	RNP	Watchdog
Dominion	Jaguar 3	Rocket	Wolfpack II
Dynamic	Jamboree	Saltillo	Xtremegreen
Dynasty	Justice	Scorpion	

Approved Kentucky Bluegrass Cultivars:

4-Season	Blue Coat	Granite	Prosperity
Alexa II	Blue Note	Hampton	Quantum Leap
America	Blue Velvet	Harmonie	Rambo
Apollo	Boomerang	Impact	Rhapsody
Aramintha	Cabernet	Jackrabbit	Rhythm
Arcadia	Champagne	Jefferson	Royce
Aries	Champlain	Juliet	Rubicon
Armada	Chicago II	Keeneland	Rugby II
Arrow	Corsair	Langara	Rush
Arrowhead	Courtyard	Legend	Shariz
Aura	Dauntless	Liberator	Showcase
Avid	Delight	Lunar	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mazama	Sonoma
Bandera	Eagleton	Mercury	Sorbonne
Barduke	Emblem	Merlot	Starburst
Barnique	Empire	Midnight	Sudden Impact
Baron	Envicta	Midnight II	Thermal Blue
Baroness	Everest	Moon Shadow	Total Eclipse
Barrister	Everglade	Mystere	Touche
Barvette HGT	Excursion	Nu Destiny	Tsunami
Bedazzled	Freedom II	NuChicago	Valor
Belissimo	Freedon III	NuGlade	Washington
Bewitched	Front Page	Oasis	Zedor
Beyond	Futurity	Odyssey	Zinfandel
Blackjack	Gaelic	Perfection	
Bluebank	Ginney II	Pinot	
Blueberry	Gladstone	Princeton 105	

Approved Hard Fescue Cultivars:

Aurora Gold	Firefly	Nordic	Rhino
Azay Blue	Gladiator	Oxford	Scaldis II
Beacon	Granite	Predator	Spartan II
Berkshire	Heron	Quatro	Stonehenge
Beudin	Jetty	Reliant II	Sword
Blueray	Minimus	Reliant IV	Warwick
Chariot	Miser	Rescue 911	
Eureka II	Nancock	Resolute	

On cut and fill slopes 2:1 or steeper add 20# Sericea Lespedeza and 15# Crown Vetch January 1 - December 31.

The Crown Vetch Seed should be double inoculated if applied with a hand seeder. Four times the normal rate of inoculant should be used if applied with a hydroseeder. If a fertilizer-seed slurry is used, the required limestone should also be included to prevent fertilizer acidity from killing the inoculant bacteria. Caution should be used to keep the inoculant below 80° F to prevent harm to the bacteria. The rates and grades of fertilizer and limestone shall be the same as specified for *Seeding and Mulching*.

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.

LAWN TYPE APPEARANCE:

All areas adjacent to lawns must be hand finished as directed to give a lawn type appearance. Remove all trash, debris, and stones ¾" and larger in diameter or other obstructions that could interfere with providing a smooth lawn type appearance. These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

CONSTRUCTION MATERIALS MANAGEMENT

(3-19-19) (rev. 04-27-20)

Description

The requirements set forth shall be adhered to in order to meet the applicable materials handling requirements of the NCG010000 permit. Structural controls installed to manage construction materials stored or used on site shall be shown on the E&SC Plan. Requirements for handling materials on construction sites shall be as follows:

Polyacrylamides (PAMS) and Flocculants

Polyacrylamides (PAMS) and flocculants shall be stored in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures designed to protect adjacent surface waters. PAMS or other flocculants used shall be selected from the NC DWR List of Approved PAMS/Flocculants The concentration of PAMS and other flocculants used shall not exceed those specified in the NC DWR List of Approved PAMS/Flocculants and in accordance with the manufacturer's instructions. The NC DWR List of Approved PAMS/Flocculants is available at:

https://files.nc.gov/ncdeq/Water+Quality/Environmental+Sciences/ATU/PAM8_30_18.pdf

Equipment Fluids

Fuels, lubricants, coolants, and hydraulic fluids, and other petroleum products shall be handled and disposed of in a manner so as not to enter surface or ground waters and in accordance with applicable state and federal regulations. Equipment used on the site must be operated and maintained properly to prevent discharge of fluids. Equipment, vehicle, and other wash waters shall not be discharged into E&SC basins or other E&SC devices. Alternative controls should be provided such that there is no discharge of soaps, solvents, or detergents.

Waste Materials

Construction materials and land clearing waste shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (15A NCAC 13B). Areas dedicated for managing construction material and land clearing waste shall be at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. Paint and other liquid construction material waste shall not be dumped into storm drains. Paint and other

liquid construction waste washouts should be located at least 50 feet away from storm drain inlets unless there is no alternative. Other options are to install lined washouts or use portable, removable bags or bins. Hazardous or toxic waste shall be managed in accordance with the federal Resource Conservation and Recovery Act (RCRA) and NC Hazardous Waste Rules at 15A NCAC, Subchapter 13A. Litter and sanitary waste shall be managed in a manner to prevent it from entering jurisdictional waters and shall be disposed of offsite.

Herbicide, Pesticide, and Rodenticides

Herbicide, pesticide, and rodenticides shall be stored and applied in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, North Carolina Pesticide Law of 1971 and labeling restrictions.

Concrete Materials

Concrete materials onsite, including excess concrete, must be controlled and managed to avoid contact with surface waters, wetlands or buffers. No concrete or cement slurry shall be discharged from the site. (Note that discharges from onsite concrete plants require coverage under a separate NPDES permit – NCG140000.) Concrete wash water shall be managed in accordance with the *Concrete Washout Structure* provision. Concrete slurry shall be managed and disposed of in accordance with *NCDOT DGS and HOS DCAR Distribution of Class A Residuals Statewide* (Permit No. WQ0035749). Any hardened concrete residue will be disposed of, or recycled on site, in accordance with state solid waste regulations.

Earthen Material Stock Piles

Earthen material stock piles shall be located at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available.

Measurement and Payment

Conditions set within the *Construction Materials Management* provision are incidental to the project for which no direct compensation will be made.

WASTE AND BORROW SOURCES:
(2-16-11) (Rev. 3-17-22)

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

All offsite Staging Areas, Borrow and Waste sites shall be in accordance with "Borrow and Waste Site Reclamation Procedures for Contracted Projects" located at:

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/Contract%20Reclamation%20Procedures.pdf

All forms and documents referenced in the "Borrow and Waste Site Reclamation Procedures for Contracted Projects" shall be included with the reclamation plans for offsite staging areas, and borrow and waste sites.

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:

(Rev. 12-23-25)

Description

Install, maintain and remove 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. Construct temporary earth berms in accordance with Section 1620 and Section 230 of the *Standard Specifications*, the plans and this special provision.

Materials

Use materials meeting the requirements of Article 1620-2 and Article 230-3 of the *Standard Specifications*.

Construction Methods

Install the temporary earth berms in accordance with Article 230-4 of the *Standard Specifications*, the details in the plans, at locations indicated in the plans, and as directed by the Engineer. 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.

Remove the temporary earth berms upon completion of the project or as directed by the Engineer. The earth material may 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* in accordance with Article 230-5 of the *Standard Specifications* or included in the lump sum price for *Grading* in accordance with Article 226-3 of the *Standard Specifications*.

Stabilization of the temporary earth berms will be paid for as *Seed for Temporary Seeding* and *Fertilizer for Temporary Seeding* in accordance with Article 1620-4 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 the temporary earth berms.

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:
9-1-2011 (Rev. 8-20-24)

Description

This work consists of furnishing and placing permanent soil reinforcement mat (PSRM), of the type specified, over previously prepared areas at locations shown on the plans and as directed by the Engineer.

Materials

The product shall be a permanent soil reinforcement mat constructed of synthetic stabilized, non-biodegradable synthetic fibers processed to form a rigid permanent three-dimensional structure to promote soil stability in combination with vegetation under hydraulic stresses. Organic biodegradable fibers (such as straw, coir, excelsior or blends thereof) may also be incorporated into the PSRM, evenly distributed throughout the mat. PSRMs utilizing organic fibers shall have a bottom and top UV stabilized netting stitched together with UV stabilized thread to retain the organic fibers. All PSRMs shall meet the following minimum physical properties:

Property	**Test Method**	**Value**	**Unit**
Thickness	ASTM D6525	$\geq$0.25	in
Tensile Strength (MD)	ASTM D6818	225	lbs/ft
Tensile Strength (TD)	ASTM D6818	175	lbs/ft
Vegetation Establishment (Min)	ASTM D7322	250	%
UV Stability[1]	ASTM D4355	$\geq$80	%

[1]ASTM D4355 Tensile Strength and % strength retention of material after 1,000 hours of exposure.

PSRM shall also meet the minimum performance values by type as shown in the table below:

Property	Test Method	Type 1	Type 2	Type 3	Type 4	Type 5	Unit
Maximum Permissible Shear Stress (Unvegetated)	ASTM 6460	2.25	2.5	3.0	3.25	N/A	lb/ft^2
Maximum Permissible Shear Stress (Vegetated)	ASTM 6460	6.0	8.0	10.0	12.0	16.0	lb/ft^2
Maximum Allowable Velocity (Vegetated)	ASTM 6460	8.0	12	16.0	20.0	24.0	ft/s

Staples shall be used as anchors. Provide staples to meet Article 1060-8 of the *Standard Specifications*.

Construction Methods

All areas to be protected with the PSRM shall be brought to final grade and prepared 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. Preserve the required line, grade and cross section of the area covered. Unroll the PSRM in the direction of the flow of water and apply without stretching so that it will lie smoothly but loosely on the soil surface. Bury the up-channel or top of slope end of each piece of PSRM in a narrow trench at least 6 inches deep and tamp firmly. Where one roll of matting ends and a second-roll begins, overlap the end of the upper roll over the beginning of the second roll so there is a 6 inch overlap. Install staple checks 4 inches on center and every 30 feet longitudinally in the matting or as directed by the Engineer. Fold over and bury matting to the full depth of the trench, close and tamp firmly. Overlap matting at least 4 inches where 2 or more widths of matting are laid side by side.

Place staples across matting at ends, junctions and check trenches approximately 10 inches apart. Place staples along the outer edges and down the center of each strip of matting 3 feet apart. Place staples along all lapped edges 10 inches apart. Install product with netting and biodegradable fibers on the top side if present. Trenching and stapling shall fit individual cut or fill slope conditions and conform to manufacturer's installation recommendations for the type specified. Any conflict between the manufacturer's installation recommendations and this special provision will be resolved by the more stringent measures being required.

Apply all soil amendments and one-half of the seed in accordance with Section 1660 of the Standard Specifications of the types at the rates specified in the contract prior to installation of the PSRM. For PSRMs that do not contain biodegradable fibers, apply 3/4 inch to 1 inch loose, friable topsoil uniformly over the PSRM and gently work to incorporate into the structure of the PSRM completely filling the voids until the level of soil is at the top of the PSRM. Apply the remainder of the seed and gently work into the surface of the topsoil in-fill and mulch. For all other PSRMs,

apply 3/4 inch to 1 inch of loose, friable topsoil uniformly over the PSRM and gently work to create a suitable seed bed. Apply the remainder of the seed and gently work into the surface of the topsoil. At the sole discretion of the Engineer, topsoil may be omitted for PSRMs containing biodegradable fibers. All seed should be applied prior to installation of PSRM if topsoil is omitted and will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat, Type __ 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 of the specified type is installed and accepted. Overlaps will not be included in the measurement and will be considered as incidental to the work. Such price and payment shall be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply topsoil and install the PSRM.

Payment will be made under:

Pay Item	Pay Unit
Permanent Soil Reinforcement Mat, Type __	Square Yard

IMPERVIOUS DIKE:
(9-9-11)(Rev. 11-15-22)

Description

This work consists of furnishing, installing, maintaining, pumping and removing an *Impervious Dike* for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed by the Engineer.

Materials

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious geotextile.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Construction Methods

Where impervious dikes are shown on the plans and used to dewater or lower the water elevation, construct in accordance with Article 410-4 and 410-5.

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted by the Engineer. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, pumping and removal of the impervious dike.

Payment will be made under:

Pay Item	Pay Unit
Impervious Dike	Linear Foot

TEMPORARY PIPE FOR CULVERT CONSTRUCTION:

Description

This work consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction.

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passageway for the stream through the work-site. The minimum size requirements will be as stated on the erosion control plans.

Measurement and Payment

__" *Temporary Pipe* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Payment will be made under:

Pay Item	Pay Unit
__" Temporary Pipe	Linear Foot

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. See the Example of Pump Around Operation Detail Sheet in the Erosion Control plans.

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.

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, culverts and channels. 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, culverts and channels.

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.

CONCRETE WASHOUT:
(10-22-15)(Rev. 4-15-25)

Description

Concrete washouts are impermeable enclosures, above or below grade, to contain concrete wastewater and associated concrete mix from cleaning of ready-mix trucks, drums, pumps, tools or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids, so that this material does not migrate to surface waters or into the ground water. These enclosures are not intended for concrete waste not associated with washout operations.

Acceptable concrete washouts may include constructed earthen structures, above or below ground, or commercially available devices designed specifically to capture concrete wash water.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall consist of a minimum 10 mil thick polypropylene or polyethylene geomembrane.

Construction Methods

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed by the Engineer near the project entrance(s) or at location(s) of concrete operations. Structures shall be constructed a minimum of 50 feet from drainage conveyances or jurisdictional streams or wetlands. Alternate structure designs or plans for management of concrete washout may be submitted for review and approval by the Engineer. Include in the alternate plan the method used to retain, treat and dispose of the concrete washout wastewater generated within the project limits and in accordance with the minimum setback requirements.

Install temporary silt fence around the perimeter of the structure enclosure in accordance with the details and as directed by the Engineer if the structure is not located in an area where existing erosion and sedimentation control devices are capable of containing stormwater runoff.

Post a sign with the words “Concrete Washout” in close proximity of the concrete washout area, so it is clearly visible to site personnel. Install safety fence as directed by the Engineer for visibility to construction traffic.

Install prefabricated concrete washouts, designed specifically to capture concrete wash water, at locations of additional concrete pouring operations. Acceptable systems may include geotextile

lined containers, vinyl or plastic containers or roll-off containers, with or without filter bags with a minimum functional holding capacity of 36 cubic feet (1.33 cubic yards). Submit prefabricated concrete washout system for approval by the Engineer prior to installation. Place prefabricated concrete washout devices to a minimum 50 foot setback from drainage conveyances and jurisdictional streams and wetlands. If the minimum setback cannot be achieved, provide secondary containment to prevent accidental release of wastewater from reaching drainage conveyances or streams.

Prefabricated concrete washouts must be clearly and visibly labeled as such, either by the manufacturer on the product itself, or by a sign with the words "Concrete Washout" in close proximity of the concrete washout area so it is clearly visible to site personnel.

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity. Inspect concrete washout structures for damage to liner or structure to maintain functionality.

Maintain prefabricated concrete washout systems per manufacturer's recommendations. Inspect concrete washout structures for damage to linings or structure and repair or replace as necessary.

Remove the concrete washout structures and sign upon project completion. Grade the area to match the existing topography and permanently seed and mulch area. Dispose of prefabricated concrete washout structures according to state or local waste regulations.

Measurement and Payment

Concrete Washout Structure will be measured and paid per each enclosure installed in accordance with the details in the plans. If alternate plans or details are approved, those structures will also be paid for per each approved and installed structure. Such price and payment will be full compensation for all work including, but not limited to, furnishing all materials, labor, equipment, signage, slurry solidification and incidentals necessary to construct, maintain and remove *Concrete Washout Structure* and dispose of residual concrete washout wastewater and concrete solids.

Prefabricated Concrete Washout will be measured and paid per each system installed in accordance with the manufacturer's recommendations. Such price and payment will be full compensation for all work including, but not limited to, furnishing all materials, labor, equipment, signage, slurry solidification and incidentals necessary to install, maintain and remove *Prefabricated Concrete Washout*, and dispose of residual concrete washout wastewater and concrete solids.

Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

Safety Fence shall be measured and paid for as provided elsewhere in this contract.

No measurement will be made for over excavation or stockpiling or other items necessary to complete this work.

Payment will be made under:

Pay Item	Pay Unit
Concrete Washout Structure	Each
Prefabricated Concrete Washout	Each

LITTER REMOVAL (MOWING AREAS ONLY):
(07-19-22) (Rev 8-25-25)

Description

This work consists of the pickup, removal, and disposal of litter from roadsides within the construction project prior to mowing operations.

Construction Methods

Provide labor, equipment and materials necessary for the pickup and removal of litter from non-construction sources and the disposal of same into state approved landfills. The Contractor shall abide by all ordinances, laws and regulations regarding disposal of litter and recycling of eligible materials. Wastes generated from construction activities shall be managed as provided elsewhere in the contract. Litter items may consist of any item not considered normal to the right-of-way, including but not limited to, varied sizes of bottles, cans, paper, tires, tire pieces, lumber, vehicle parts, building supplies, metals, household furnishings, cardboard, plastics, ladders, brush and other items not considered normal to the right of way. Litter removal shall be performed in designated areas within five days prior to any mowing operations and as directed. Designated areas shall include vegetated medians and shoulders within the project limits including all interchange ramps and other areas to be mown. Designated areas may be omitted for litter removal by the Engineer due to safety concerns.

The Contractor shall provide adequate personnel and materials to collect and remove litter. The Contractor shall be responsible for locating and utilizing approved local landfills and recycling facilities. Refer to Section 107-25 of the *Standard Specifications* for potential hazardous materials. All collected litter shall be containerized immediately and kept off the traveled portions of the roadway, shoulders, and rights-of-way (including paved shoulders). All collected litter that is small enough to be placed in a bag shall be bagged immediately. All collected litter that is too large for a bag shall be placed into a vehicle. Extended storage or stockpiling of collected litter and recyclables will not be permitted.

The Contractor's personnel shall dispose of any litter in a landfill approved by North Carolina Division of Waste Management. The Contractor will not be allowed to use NCDOT accounts at the landfills/recycling centers nor be allowed to dispose of the litter in NCDOT trash containers on any NCDOT property.

The Contractor shall report online the number of bags of litter and any recycling on the NCDOT Litter Management Website on the date of the pickup at the following website:

https://apps.ncdot.gov/LM

An access code ('Pickup Key') for the online reporting portal may be obtained via emailing the Roadside Environmental Unit Litter Management Section at ncdot.clr@ncdot.gov. The Contractor shall request access to the litter removal reporting website prior to starting initial litter collection operations.

Measurement and Payment

The quantity of litter removal to be performed will be affected by the actual conditions that occur during construction of the project. The quantity of litter removal may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Manual Litter Removal will be measured and paid as the actual number of man hours each worker spends picking up litter. Such price and payment will be full compensation for all litter removal work covered by *Litter Removal*, including, but not limited to, furnishing all materials, labor, equipment, transport, reporting, and incidentals necessary to accomplish the work.

Litter Disposal will be measured and paid for by the actual number of tons of litter collected and properly disposed of at a state approved landfill. Such price and payment will be full compensation for all fees, labor, transport, and incidentals necessary to dispose of collected litter associated with *Litter Removal*.

All traffic control necessary to provide a safe work area for *Litter Removal* shall be paid for as specified elsewhere in the contract.

Payment will be made under:

Pay Item	Pay Unit
Manual Litter Removal	MHR
Litter Disposal	TON

FABRIC INSERT INLET PROTECTION

(1-1-24)

Description

Install, maintain, and remove Fabric Insert Inlet Protection, 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 by the Engineer.

Materials

Provide a fabric inlet protection device composed of a fitted woven polypropylene geotextile double sewn with nylon thread suspended sack. The Fabric Insert Inlet Protection shall be manufactured to fit the opening of the catch basin or drop inlet or shall have a deflector to direct runoff from the curb opening into the fabric sack. The Fabric Insert Inlet Protection shall have a rigid frame or support system to support the loaded weight of the product. The product shall have lifting loops for removing the device from the basin and will have dump straps attached at the bottom to facilitate the emptying of the device. The Fabric Insert Inlet Protection shall have an overflow system to allow stormwater to enter the inlet structure and avoid ponding on the roadway when the device reaches capacity.

The fitted filter assembly shall have the following physical properties:

Type 1 (High Flow):

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}

Type 2 (Low Flow):

Physical	Test Method	English
Grab Tensile	ASTM D-4632	315 x 300 lbs
Grab Elongation	ASTM D-4632	15 x 15 %
Minimum Puncture Strength	ASTM D-4833	125 lbs
Mullen Burst	ASTM D-3786	650 PSI
Minimum UV Resistance	ASTM D-4355	70 %.
Flow Rate	ASTM D-4491	40 gal/min/ft^2
Apparent Opening	ASTM D-4751	40 US Sieve
Permittivity	ASTM D-4491	0.55 sec^{-1}

Construction Methods

Strictly adhere to the manufacturer's installation instructions and recommendations. Maintenance shall include regular daily inspections and after each qualifying rain event. The Fabric Insert Inlet Protection shall be emptied, cleaned and placed back into the basin when it reaches 50% capacity or as directed by the Engineer.

Measurement and Payment

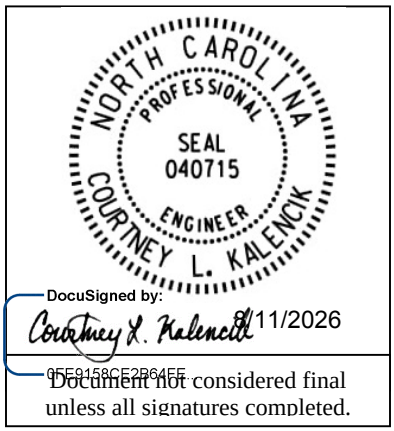
Fabric Insert Inlet Protection, Type __ will be measured and paid in units of each of the type specified, complete in place and accepted. Such payment shall be full compensation for furnishing and installing the *Fabric Insert Inlet Protection, Type* __ in accordance with this specification and for all required maintenance.

Fabric Insert Inlet Protection Cleanout will be measured and paid in units of each for the maintenance of the device, cleanout and disposal of accumulated sediments.

Payment will be made under:

Pay Item	**Pay Unit**
Fabric Insert Inlet Protection, Type __	Each
Fabric Insert Inlet Protection Cleanout	Each

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Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 24.3)

Prepared By: CK
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1. 2024 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2024 Standard Specifications are revised as follows:

1.1. ELECTRICAL JUNCTION BOXES (1091-5)

Page 10-209, revise paragraphs beginning on line 26 to read "Provide electrical junction boxes with covers of the type and size indicated by the contract or plans for the termination of conduits. Boxes and covers shall meet all requirements and specifications of ANSI/SCTE 77. Structural load tests shall meet the Tier 15 application type.

Page 10-209, line 28, revise title of section 1091-5(B) from “Polymer Concrete (PC) Junction Boxes” to “Polymer Concrete (PC), Composite, and Thermoplastic Junction Boxes”.

Page 10-209, revise paragraphs beginning on line 29 through line 41 to read “For PC junction boxes, use polymer concrete material made of an aggregate consisting of sand and gravel bound together with a polymer and reinforced with glass strands to fabricate box and cover components.

Provide junction boxes which have bolted covers and open bottoms. Provide vertical extensions of 6 inches to 12 inches as required by project provisions.

Provide the required logo on the cover. Provide at least two size 3/8 inch diameter hex head stainless steel cover bolts to match inserts in the box. Provide pull slot(s) with stainless steel pin(s). Bodies of junction boxes shall be a single piece.

Polymer concrete, composite, and thermoplastic junction boxes are not required to be listed electrical devices.”

1.2. TRAFFIC SIGNAL ACTIVATION (1700-4)

Page 17-4, revise paragraph beginning on line 42 through line 46 to read “Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in yellow-red flashing mode for up to 7 days or as directed by the Engineer. Yellow-red flashing mode differs from the red-red flashing mode shown in the signal plan. Yellow-red flash mode includes flashing the yellow signal indications on all main street through movements while flashing the red signal indications on all side street signal heads and any left turn heads on the main street. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without prior approval of the Engineer.”

1.3. PEDESTALS (1098-15)

Pages 10-226 through 10-230, revise section 1098-15 beginning on page 10-226 line 17 through page 10-230 line 10 to read “Furnish pedestal assemblies and their components that are pre-approved on the ITS & Signals QPL with foundations that conform to the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,* and the Interim Specifications as shown on the plans. Refer to *Roadway Standard Drawings* No. 1743 for structural design specifications for each type of pedestal.

(A) Pedestal Shaft

Furnish one piece pedestal shafts fabricated from either aluminum or galvanized steel pipe with a uniform pipe outer diameter of 4.5 inches and of the lengths specified for the type of pedestal shown on *Roadway Standard Drawing No.* 1743. Refer to Article 1743-2 for pedestal type descriptions.

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For Type I (pedestrian pushbutton pedestals) and Type II (normal-duty pedestals), furnish shafts constructed from schedule 40 extruded aluminum pipe that conforms to Aluminum Association Alloy 6061-T6 with a tensile strength of 30 ksi and a minimum wall thickness of 0.237 inch. Aluminum conduit will not develop the necessary strength required and is not allowed. Thread and deburr in accordance with American National Standard Pipe Threads, NPT (ANSI B2.1). Finish the exterior with a rough surface texture consisting of a uniform grain pattern that is perpendicular to the axis of the pipe along the full pipe length. Unless otherwise specified, do not use galvanized steel pipe for Type I and Type II pedestal shafts.

For Type III (heavy-duty pedestals), furnish schedule 120 galvanized steel pipe that conforms to ASTM A53. Provide an 11 inch square by 1 inch thick steel base plate with minimum yield strength of 36 ksi that conforms to ASTM A36. Fabricate the base plate with four equally spaced bolt holes on an 11 inch bolt circle. Orient the bolt holes in the corners of the plate. Size the holes to accommodate 1 inch diameter machine bolts. Weld the pedestal shaft to the center of the base plate using a socket connection. Provide circumferential fillet welds at the top and bottom of the base plate. Perform all welding in accordance with AWS Code on the plans. Hot-dip galvanize the pedestal shaft and base plate assembly after fabrication in accordance with ASTM A123. Unless otherwise specified, do not use aluminum pipe for Type III pedestal shafts.

(B) Transformer Bases

Furnish transformer bases for each type of pedestal shown on *Roadway Standard Drawings* No. 1743 fabricated from aluminum that meets Aluminum Association Alloy 356 or equivalent, and that are designed to break upon impact in accordance with AASHTO requirements. Pre-approved transformer base shape, size, and bolt circle dimensions may vary by product supplier, but are structurally qualified for use by each pedestal type. Compliance with manufacturer's installation instructions is crucial to ensure optimal performance when impacted.

Provide a 0.5 inch minimum diameter, coarse thread hole cast into transformer base located inside of base and oriented for easy access for use in grounding and bonding.
Provide an access opening for all transformer bases with an access door that is attached with a 1/4 inch x 3/4 inch long stainless steel vandal proof screw to secure access door.

For Type I (pedestrian pushbutton pedestals) and Type II (normal-duty pedestals), provide a threaded opening at the top of the base to receive a 4 inch NPT pipe shaft. Include a set screw prep and 3/8 inch-16 x 1 inch stainless steel set screw to secure the pedestal post to the pedestal base. Fabricate the bottom of the transformer base with four equally spaced holes or slots to secure the entire assembly to the concrete foundation.

For Type III (heavy-duty pedestals), provide square bases designed for bolt-on mounting of a Type III pedestal shaft. Fabricate the top of the transformer base with four equally spaced holes or slots for an 11 inch bolt circle to attach the pedestal shaft. Size the holes or slots to accommodate 1 inch diameter machine bolts. Fabricate the bottom of the transformer base with four equally spaced holes or slots for a 12 inch bolt circle to secure the entire assembly to the concrete foundation. Size the holes or slots to accommodate 1 inch diameter anchor bolts. Provide the following mounting hardware for heavy-duty pedestals:

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(1) Four 1 inch diameter by 3 1/2 inch long machine bolts (ASTM F593), with heavy hex nuts (ASTM A563 Grade DH, or A 194 Grade 2H), and thick flat washers, and lock washers (ASTM F436) per pedestal assembly. Galvanize in accordance with ASTM A153.

(2) Three heavy hex nuts (ASTM A563 Grade DH, or A194 Grade 2H), 2 thick flat washers, and one lock washer (ASTM F436) for each anchor bolt. Galvanize in accordance with ASTM A153.

(3) Six minimum slotted stainless steel shims of necessary thickness for leveling per pedestal assembly.

(C) Anchor Bolts

For each pedestal mounted on a concrete foundation, provide four anchor bolts in accordance with ASTM F1554, Grade 55, of the size and length specified in *Roadway Standard Drawings* No. 1743. Provide anchor bolts with coarse threads meeting the bolt/thread criteria specified by AISC. Provide threads for a minimum length of 4 inches on each end of the bolt. All thread anchor rods may be used. Ensure anchor bolts are hot-dipped galvanized in accordance with ASTM A153.

For each anchor bolt:

(1) Provide three heavy hex nuts; one at the top, and two at the bottom (embedded end) of the anchor bolt. Provide hex nuts with coarse threads that match the anchor bolt thread requirements above. Provide hex nuts that meet the requirements of ASTM A563 Grade DH, ASTM A194, Grade 2H or equivalent. Galvanize all heavy hex nuts in accordance with ASTM A153.

(2) Provide one standard size washer that meets the requirements of ASTM F436 for use between the two heavy hex nuts on the embedded end of the anchor bolt. Galvanize in accordance with ASTM A153.

(3) Provide one extra thick, oversized washer for use over the slotted opening of the pedestal base. Fabricate washer to meet the chemical, physical, and heat treating requirements of ASTM F436. Fabricate the washer to the diameter and thickness needed. Galvanize fabricated washer in accordance with ASTM A153. Heat treat to the same requirements as F436 (i.e. 26 to 45 HRC).

For a 3/4 inch diameter anchor bolt mounted in a 1 1/2 inch slotted opening, the dimensional requirements for an extra thick, oversized washer are as follows:

(a) The minimum Outside Diameter (OD) required is 2 3/4 inch.
(b) The hole Inside Diameter (ID) = Nominal Bolt Diameter + 1/16 inch = 0.812 inch.
(c) The minimum washer thickness required is 3/8 inch.

If anchor bolts less than 3/4 inch in diameter are proposed for use to anchor pedestal bases, provide a washer calculation to ensure the washer thickness is adequate. To account for any pedestal manufacturing differences, verify the actual slotted opening width of the pedestal base anchoring points, and include it in the calculation. Anchor bolts that are less than 1/2 inch in diameter may not be used as they are not structurally adequate to support the pedestal and may inhibit the performance of the breakaway base.

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The fabrication process for thick washers makes the washer slightly tapered (i.e. the top OD and the bottom OD are not the same). Install thick washers with the larger diameter face down against the pedestal base casting.

Do not use standard washers over the slotted opening of the pedestal base. Do not substitute or stack thin washers to achieve the required thickness specified or required.

In addition to the submittal requirements of Section 1098-1(B), provide Mill Certifications, Galvanization Certifications, and Heat Treating Certifications for all anchor bolts, fabricated washers, and structural hardware.

(D) Pedestal Cap

Furnish a 4 1/2 inch outside diameter slip fit domed pedestal top cap for each pedestal assembly designed to fit over the outside of the pedestal shaft. Fabricate the cap from aluminum that meets Aluminum Association Alloy 356. Ensure the cap provides 3 equally spaced stainless steel set screw fasteners to secure the cap to the pedestal shaft.

(E) Pole Flange Base for 4 1/2 Inch Pipe

As an alternative to using a frangible transformer base, furnish a flange base with cover for use with Type I pedestrian pushbutton pedestals only. Flange bases are non-breakaway supports that are to be used with a breakaway bolt system for AASHTO compliance for breakaway structures. Provide aluminum or steel flange bases with a minimum 7.5 inch diameter bolt circle. Ensure bases are either continuously welded to shafts or threaded to receive shafts. Each base should be designed to accommodate either three or four 1/2 inch bolts equally spaced on the bolt circle to receive breakaway anchors. Provide NPT threads on the internal opening of the flange base through the full length of the flange base with locking set screws at the top of the base to receive a 4 inch NPT pipe shaft.

Fabricate aluminum flange bases that meet Aluminum Association Alloy 356 requirements for architectural bases. Fabricate steel flange bases that meet ASTM A36.

Do not use flange bases for Type II or Type III pedestals.

(F) Breakaway Anchors

Use breakaway anchors installed in concrete pedestal foundations as an alternative to transformer bases. Furnish single or double neck omni-directional breakaway anchor bolt coupling systems for use with Type I (pedestrian pushbutton pedestals) only. Use with non-breakaway pole flange bases. Use 1/2 inch diameter bolts for pushbutton posts. Fabricate from steel with a minimum yield strength of 55 ksi. Galvanize in accordance with ASTM A153. Do not use breakaway anchors with Type II or III pedestals, or in conjunction with breakaway transformer bases.

(G) Foundation

Install concrete pedestal foundations of the type and size shown on *Roadway Standard Drawings* No. 1743.04 Furnish Class A minimum concrete that conforms to Article 1000-4.

Provide reinforcing steel that conforms to the applicable parts of Section 1070.

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(H) Screw-In Helical Foundation Anchor Assembly

Furnish and install screw-in helical foundation as an alternative to the standard reinforced concrete foundation specified in Section 1743, for supporting Type I and Type II Pedestals. Do not use for Type III Pedestals.

(1) Type I – Pedestrian Pushbutton Post:

Fabricate pipe assembly consisting of a 4 inch diameter x 56 inch long pipe, single helical blade and square fixed attachment plate. Furnish pipe in accordance with ASTM A53 ERW Grade B and include a 2 inch x 3 inch cable opening in the pipe at 18 inches below the attachment plate. Furnish steel attachment plate and helical blade in accordance with ASTM A36. Include four slotted mounting holes in the attachment plate to fit bolt circles ranging from 7 3/4 inches to 14 3/4 inches in diameter. Furnish additional 3/4 inch keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish four 3/4 inch 10NC x 3 inch square head anchor bolts to meet the requirements of ASTM F3125. Provide four 3/4 inch plain flat galvanized washers, four 3/16 inch thick galvanized plate washers and four 3/4 inch galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

(2) Type II – Normal-Duty Pedestal:

Fabricate pipe assembly consisting of a 6 inch diameter x 60 inch long, single helical blade, 1 1/4 inch diameter stinger rod and square fixed attachment plate. Furnish pipe in accordance with ASTM A53 ERW Grade B using schedule 40 wall thickness and include a 2 inch x 3 inch cable opening in the pipe at 18 inches below the attachment plate. Furnish steel attachment plate, helical blade and stinger rod in accordance with ASTM A36. Include four slotted mounting holes in the attachment plate to fit bolt circles ranging from 10 inches to 15 inches in diameter. Furnish additional 1 1/4 inch keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish four 1 inch 8NC x 4 inch galvanized Grade 5 square head anchor bolts. Provide four 1 inch plain flat galvanized washers and four 1 inch galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent."

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel.

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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 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:

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- Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
- Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
- Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

(Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,

3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

Ensure LED traffic signal modules meet the performance requirements for the minimum period of 15 years, provide a written warranty against defects in materials and workmanship for the modules for a period of 15 years after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt

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clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

For mast-arm mounting, provide rigid vehicle signal head mounting brackets and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the mast arms and to provide a means for vertically adjusting the vehicle signal heads to proper alignment. Fabricate the mounting assemblies from aluminum, and provide serrated rings made of aluminum. Provide stainless steel cable attachment assemblies to secure the brackets to the mast arms. Ensure all fastening hardware and fasteners are fabricated from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 15 years and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red circular	17	11
12-inch green circular	15	15

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module.

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Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red arrow	12	9
12-inch green arrow	11	11

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for "Pedestrian Traffic Control Signal Indications" and the following sections of the ITE standard for "Vehicle Traffic Control Signal Heads" in effect on the date of advertisement:

- Section 3.00 - "Physical and Mechanical Requirements"
- Section 4.01 - "Housing, Door, and Visor: General"
- Section 4.04 - "Housing, Door, and Visor: Materials and Fabrication"
- Section 7.00 - "Exterior Finish"

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long.

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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, and 12-inch displays which have the solid hand/walking man module as an overlay. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2024 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9
Countdown Indication	16	13

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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. Louvers:

Material, equipment, and hardware furnished under this section must be pre-approved on the Department's QPL by the date of installation.

Provide louvers made from sheet aluminum. Paint the louvers alkyd urea black synthetic baked enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

Ensure that the louvers have a 0-degree horizontal viewing angle. Provide a minimum of 5 vanes.

Provide geometrically programmed louvers that are made from aluminum with stainless steel hardware and designed to fit inside a 12" signal visor. Ensure geometrically programmed louvers are field adjustable to provide horizontal or vertical viewing control with a minimum of 6 different viewing angles. Provide a .050" aluminum full circle tunnel visor if the geometrically programmed louver is supplied with a visor.

3. CONTROLLERS WITH CABINETS

3.1. MATERIALS – TYPE 2070LX CONTROLLERS

Furnish model 2070LX controller units that conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010 and Errata 2 dated December 5, 2014) except as required herein.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide model 2070LX controllers with Linux kernel 2.6.18 or higher and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1C, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2E+, Field I/O Module (FI/O)
  - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is "off")
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4A, Power Supply Module, 10 AMP

The 2070-1C module's CPU shall be capable of executing all single and double precision floating point instructions directly within the CPU hardware.

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Provide all board support package (BSP), toolchain, libraries, and documentation to the state and to any specified applications software manufacturer when requested by the state to facilitate the porting, building, testing, and support the Department's application software.

3.2. MATERIALS – GENERAL CABINETS

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

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3.3. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 336S pole mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details. Provide 336S pole mounted cabinets that are 46" high with 40" high internal rack assemblies.

Furnish model 332 base mounted cabinets with auxiliary output files installed and configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40º F to +185º F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A

Occurrences (8x20µs waveform)……..10 minimum @ 20,000A

Maximum Clamp Voltage…….395VAC

Operating Current……..15 amps

Response Time……..< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (6 times, 8x20µs)

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(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:

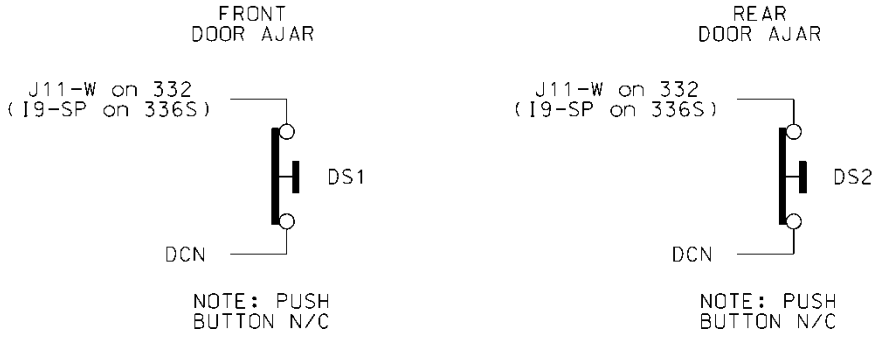
Peak Surge Current (Single pulse, 8x20µs)……..20,000A
Maximum Clamp Voltage…….350VAC
Response Time……..< 200 nanoseconds
Discharge Voltage……<200 Volts @ 1,000A
Insulation Resistance……≥100 MΩ

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.

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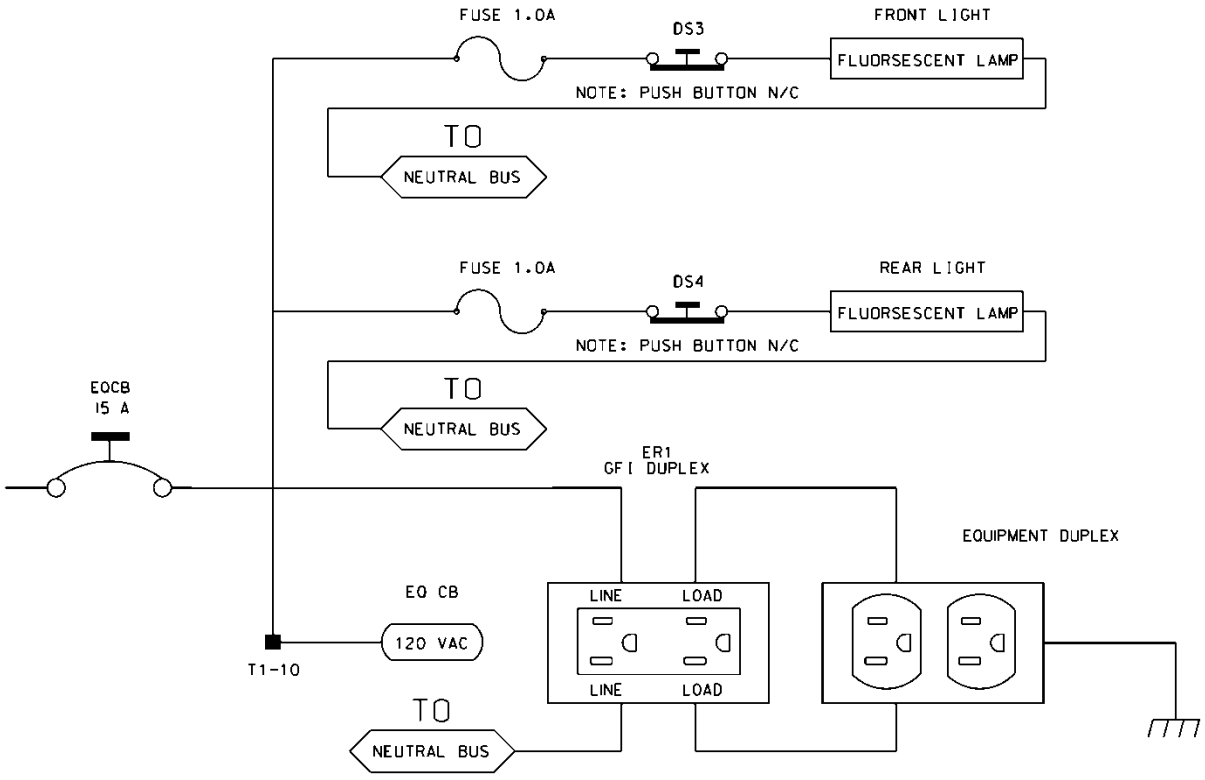
If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet 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).

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Furnish a police panel with a police panel door. For model 336S cabinets, mount the police panel on the rear 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.

Ensure the 336S cabinet Input File is wired as follows:

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336S Cabinet Port-Bit/C-1 Pin Assignment														
Slot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
C-1 (Spares)	59	60	61	62	63	64	65	66	75	76	77	78	79	80
Port	3-2	1-1	3-4	1-3	3-1	1-2	3-3	1-4	2-5	5-5	5-6	5-1	5-2	6-7
C-1	56	39	58	41	55	40	57	42	51	71	72	67	68	81
Port	2-1	1-5	2-3	1-7	2-2	1-6	2-4	1-8	2-6	5-7	5-8	5-3	5-4	6-8
C-1	47	43	49	45	48	44	50	46	52	73	74	69	70	82

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:

336S Cabinet		332 Cabinet	
Detector Call Switches	**Terminals**	**Detector Call Switches**	**Terminals**
Phase 1	I1-F	Phase 1	I1-W
Phase 2	I2-F	Phase 2	I4-W
Phase 3	I3-F	Phase 3	I5-W
Phase 4	I4-F	Phase 4	I8-W
Phase 5	I5-F	Phase 5	J1-W
Phase 6	I6-F	Phase 6	J4-W
Phase 7	I7-F	Phase 7	J5-W
Phase 8	I8-F	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

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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

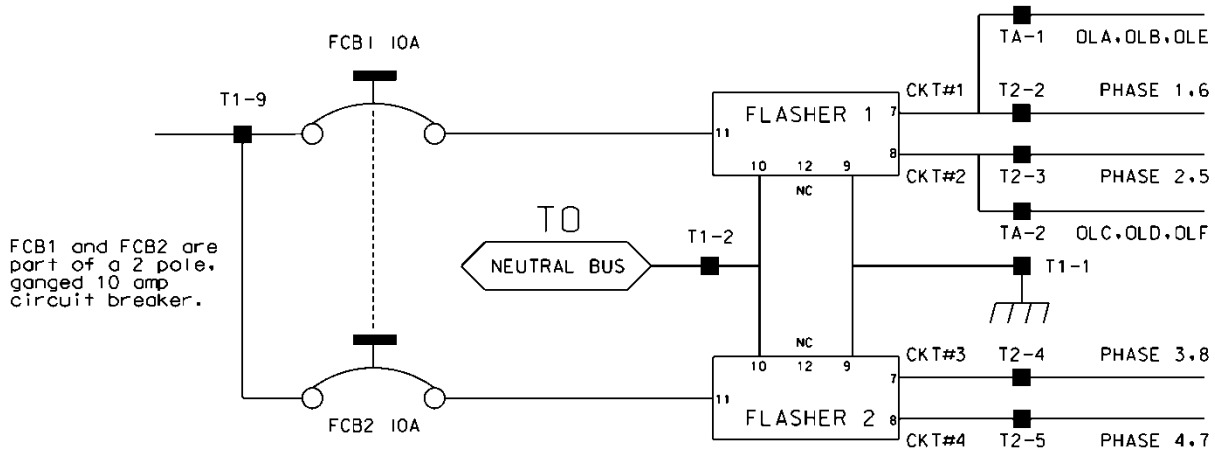
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Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of 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:

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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

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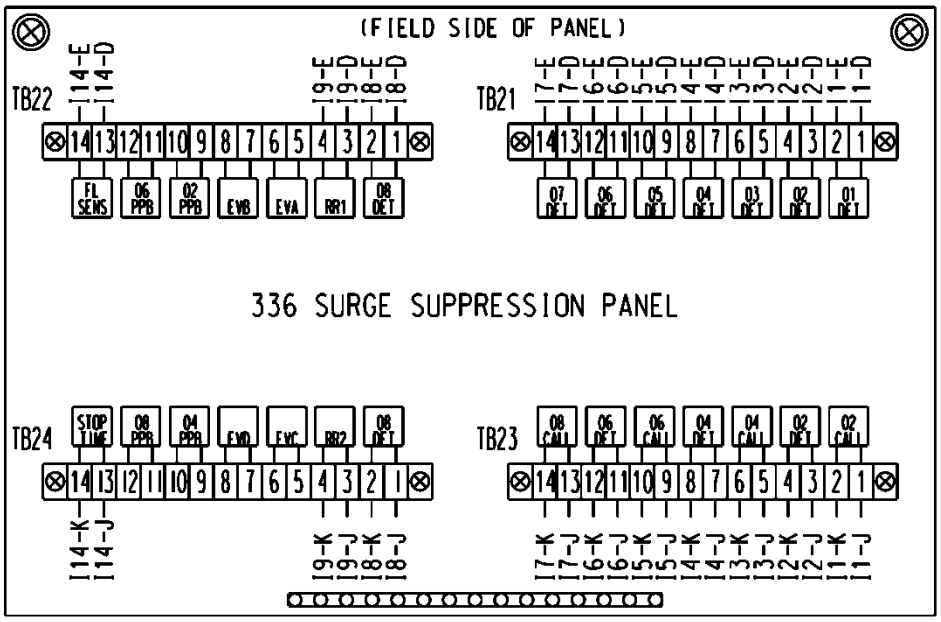
the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

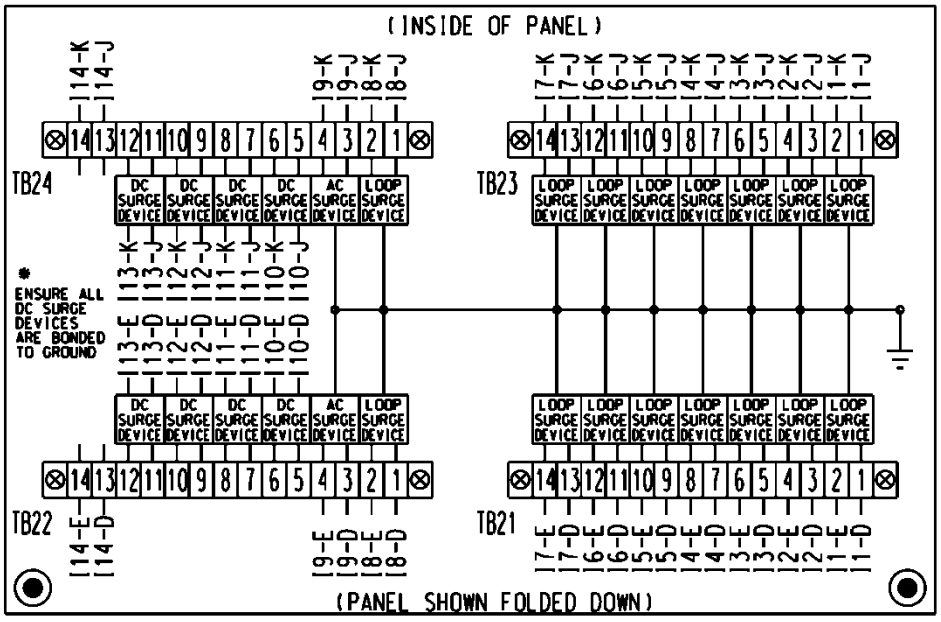
Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

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 pole mounted cabinets, mount surge protection devices for the AC+ interconnect inputs, inductive loop detector inputs, and low voltage DC inputs on a swing down panel assembly fabricated from sturdy aluminum. Attach the swing down panel to the bottom rear cabinet rack assembly using thumb screws. Ensure the swing down panel allows for easy removal of the input file without removing the surge protection panel assembly or its parts. Have the surge protection devices mounted horizontally on the panel and soldered to the feed through terminals of four 14 position terminal blocks with #8 screws mounted on the other side. Ensure the top row of terminals is connected to the upper slots and the bottom row of terminals is connected to the bottom slots. Provide a 15 position copper equipment ground bus attached to the field terminal side (outside) of the swing down panel for termination of loop lead-in shield grounds. Ensure that a Number 4 AWG green wire connects the surge protection panel assembly ground bus to the main cabinet equipment ground.

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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.

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Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070 controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070 controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)
- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

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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).

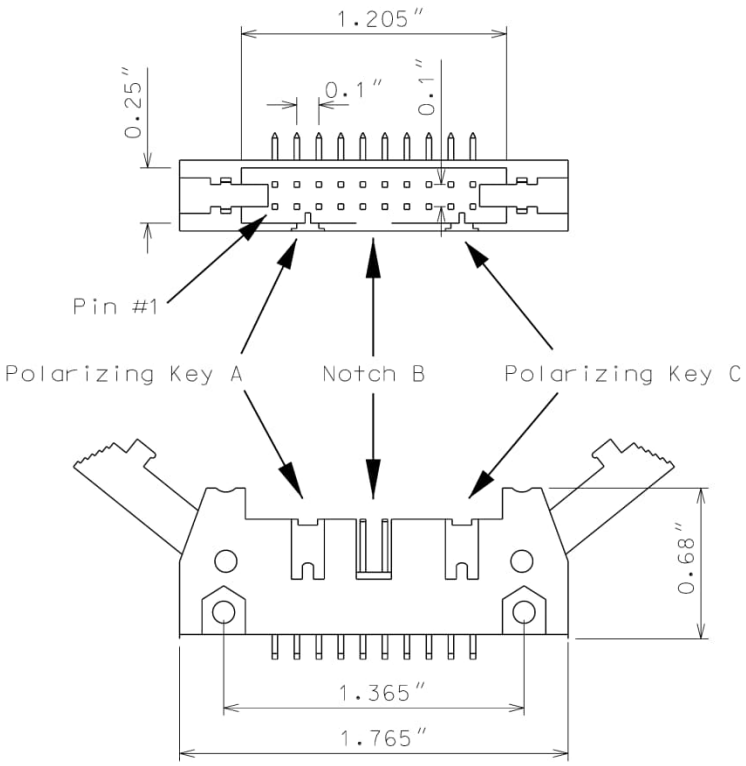
Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 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.

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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

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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

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for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.

3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as "on" at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 Hz ± 20% with a 50% duty cycle when the AC Line voltage falls below the "drop-out" level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the "restore" level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the "restore" level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 16 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 Hz ± 20% with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the "restore" level. If the watchdog input has not made 5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel pair for the following fault conditions: Conflict, Flash Rate Detection, Red Fail, Dual Indication, and Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

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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

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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

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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	-

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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

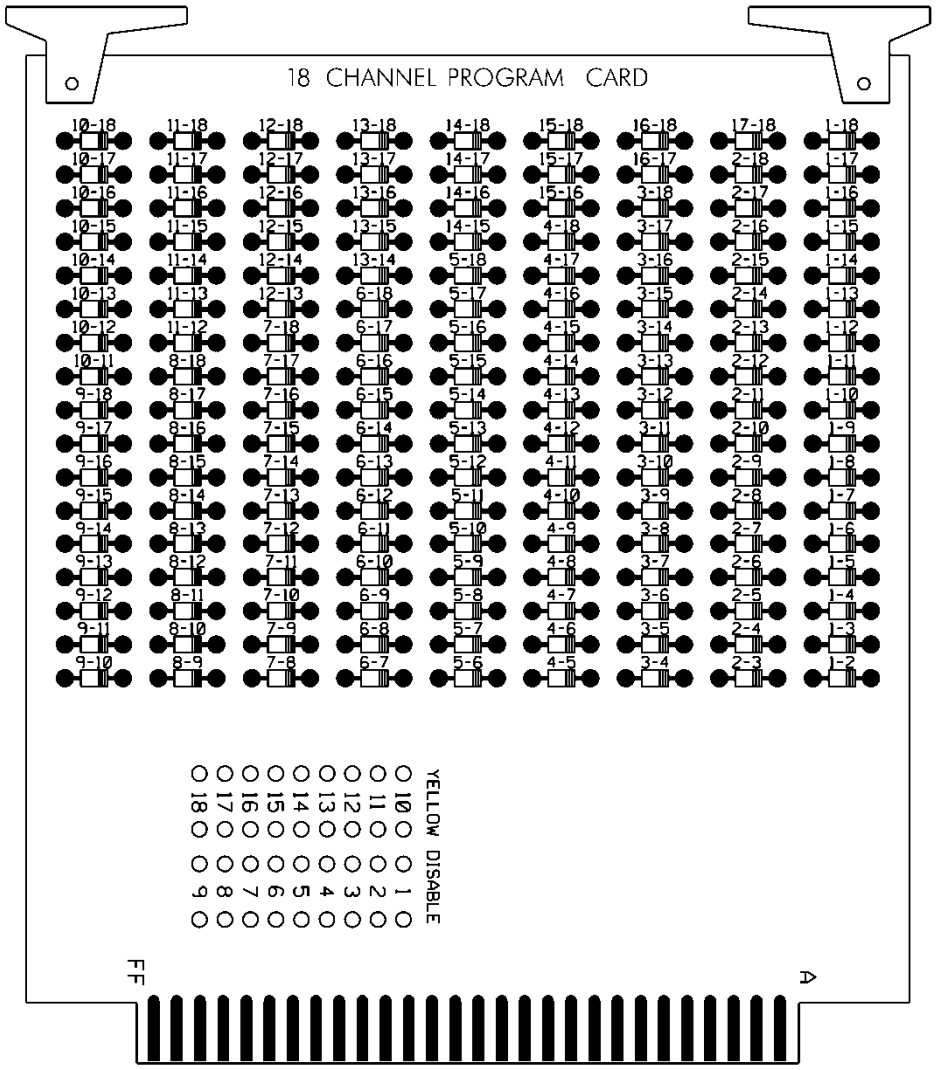
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CONFLICT PROGRAM CARD PIN ASSIGNMENTS

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

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3.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS

Furnish detector sensor units that comply with Chapter 5 Section 1, “General Requirements,” and Chapter 5 Section 2, “Model 222 & 224 Loop Detector Sensor Unit Requirements,” of the CALTRANS “Transportation Electrical Equipment Specifications” dated March 12, 2009 with Erratum 1.

4. VIDEO IMAGING LOOP EMULATOR DETECTOR SYSTEMS FOR TEMPORARY INSTALLATION

4.1. DESCRIPTION

Design, furnish, provide training, and install video imaging loop emulator detection systems with all necessary hardware for temporary traffic signals in accordance with the plans and specifications.

Unless otherwise specified in the contract, all loop emulator detection equipment will remain the property of the contractor.

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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

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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.

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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

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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 temporary 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

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Relocate Camera Sensor Unit ..... Each

5. NON-INTRUSIVE DETECTION SYSTEMS

5.1. DESCRIPTION

A. General

Design, furnish, provide training, and install non-intrusive detection systems **(Video, Microwave, or Lidar)** with all necessary hardware in accordance with the plans and specifications. Ensure the firmware and software furnished and installed as part of an Intelligent Transportation System (ITS) or traffic signal project are the most current and approved releases or versions, unless otherwise requested by the Department. Provide all equipment, materials, and work in accordance with all manufacturers' recommendations. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components.

Provide a non-intrusive detection system which provides advanced and presence detection. The non-intrusive detection system includes, but is not limited to, system sensor(s), including the detector housing (if applicable), mounting hardware, non-intrusive detection system processor, system management software, cabling between the detector and the cabinet, surge suppressors, terminations, output expansion modules which mount in the traffic signal controller cabinet input files, vertical conduit, weather heads and related equipment. The non-intrusive detection system processor shall have the ability to communicate with Transportation Management Center (TMC) computers for remote access.

5.2. MATERIALS

A. General

Material and equipment furnished under this specification must be pre-approved on the Department's QPL by the date of installation. Miscellaneous hardware such as cables and mounting hardware do not need to be pre-approved.

Furnish non-intrusive detection 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. Provide software compatible with the latest NCDOT-approved version of Microsoft Windows to provide remote detection monitoring.

Ensure that software furnished is licensed for use by the Department and by any other agency responsible for maintaining or operating the system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

Design and furnish non-intrusive detection systems that detect vehicles by processing system inputs and provide detection outputs in real time.

Furnish all required sensor units, detection system processor units, software packages, cabling, poles, mast arms, harnesses, 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

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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 detection sensor unit locations for review and acceptance before installation. Provide mounting height and location requirements for detection sensor units on the design based on the site survey. Design non-intrusive detection systems with all necessary hardware. Do not design for the installation of poles in medians.

Obtain the Engineer's approval before furnishing the non-intrusive detection systems. The contractor is responsible for the final design of non-intrusive 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 all associated equipment manuals and documentation.

Use a non-intrusive sensor that is compatible with the detection system processor and meets the following technical and functional requirements:

1. Requirements

1.1 Detector Sensor

- For Microwave and Lidar Detectors: Provide a detector for side-fire, forward-fire, overhead, or other appropriate configuration. Ensure the detector will detect vehicles in sunny, cloudy, rainy, snowy, and foggy weather conditions. Microwave detection systems shall be FCC-certified and have authorization to operate within the frequency range established and approved by the FCC. Ensure Lidar detection systems meet all applicable laser safety regulations and FCC requirements. Detectors shall be capable of extending at minimum 200 feet from the sensor origin. Ensure the detector is provided with water-tight housing offering NEMA 4X protection.
- For Video Detection System: Furnish and install a video camera sensor that is compatible with intersection applications. Send a video signal or thermal video image from the video camera sensor to the processor for real-time vehicle detection. Utilize high-sensitivity optics in the video camera sensor or thermal imaging to compensate for variations in lighting conditions, including blooming at night caused by headlights, rain and ice glare, and sun position shadowing. Include a heater at the front of the enclosure, or alternate method, to prevent the formation of ice and condensation in cold weather. Ensure that the heater does not interfere with the operation of the video camera sensor electronics, or cause interference with the video signal, where applicable.
- Signal to Noise Ratio shall be greater than 50 dB.
- For Video Detection System: The digital video standard should be compliant with MPEG4 or H.264. Digital video conforming to newer standards than this may be acceptable at the Engineer's discretion.
- Video Detection System shall have a minimum resolution of 1920x1080 pixels.
- For Electromagnetic interference, ensure compliance with FCC Part 15, Subpart B, Class A device requirements, which apply to the detection sensor and associated connected equipment in their installed condition.

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- Furnish power cable appropriately sized to meet the power requirements of the sensors. At a minimum, provide three-conductor 120 VAC field power cable. Size the power conductors from the power source to the detector input so that no more than a 3% voltage drop is experienced (NEC 210-19 a., FPN No. 4). Provide power from the cabinet power source through a surge suppressor and then to the detection sensor.
- If the sensors support Power-over-Ethernet, provide any external POE injectors that are required. Ensure the POE injectors meet the following minimum requirements:
  - 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 802.3bt (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.
- For Video Detection Systems: The video camera sensor shall be installed in a light-colored enclosure to limit solar heating. Meet NEMA 250 Type 4 enclosure standards for the enclosure and seal the enclosure to prevent sand, dirt, dust, salt, and water from entering. Affix a sun shield visor to the front of the enclosure which is sufficiently adjustable to divert water away from the video camera sensor lens and prevent direct sunlight from entering the iris when mounted in its installed location.
- All connections to the system sensor assembly shall be professionally sealed to manufacturer recommendations to ensure a waterproof connection.
- Where cables, power cables, and other cables are required between the sensor assembly and other components located in the controller cabinet, furnish surge protection in the controller cabinet.
- If furnishing cable, comply with manufacturer recommendations.
- Provide terminal blocks and tie points for cable.
- Environmental: Ensure that temperature and humidity limits of the sensor adhere to the latest published version of NEMA TS-2 requirements.
- Shock and Vibration: Ensure the sensor adheres to shock and vibration requirements of the latest published version of NEMA TS-2 and, where applicable, IEC 60068.

1.2 Detection System Processor

Furnish detection system processors that detect vehicles by processing system inputs and provide detection outputs in real time. The detection system processor shall accept inputs from the detectors installed at the intersection such that signals from one or more sensors can be processed in real time. If required, additional detection system processors should be provided to handle the number of detectors installed at the location. As a minimum, meet the following requirements for each non-intrusive detection system processor installation.

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- For Video Detection System: Provide an IP addressable processor module, which performs video image processing and MPEG4 or H.264 encoding.
- Provide a “fail-safe” mode whereby failure of one or more of the detector sensor units or power failure of the system will cause constant calls to be placed on the affected detection outputs.
- Provide compensation for minor movement of up to 2 percent of the field of view at 400 **feet** without falsely detecting vehicles.
- Include detection indicators on the front panel of the processor module for each channel of detection provided through that module to indicate detector output in real time when the system is operational.
- Include an RJ-45 Ethernet port connector on the system processor to enable communication from a programming device.
- Provide the ability to remotely monitor detectors and system.
- Ensure the system supports both NEMA TS-2 SDLC communications and wired I/O interface for integration into Caltrans Type 170 cabinets or NEMA TS-2 type cabinets.
- Provide a detection system processor that operates reliably in a typical roadside traffic cabinet environment.
- Environmental: Ensure that temperature and humidity limits of the system processor adhere to the latest published version of NEMA TS-2 requirements
- Shock and Vibration: Ensure the sensor adheres to shock and vibration requirements of the latest published version of NEMA TS-2 and, where applicable, IEC 60068.

Ensure processor modules that plug into a detector rack or input file meet the following requirements:

- Ensure the processor module completely fits within the loop detector slots of the traffic signal controller cabinet input file and that provides a standard relay closure detector input to the controller.
- Provide from one to four detector outputs through the processor module which communicate through the input file edge card connector.
- Use a module that is not wider than two standard input file slots.
- Provide power to the processor modules through the signal cabinet detector input file.

2. Functional Requirements for Non-intrusive Detection Systems

Provide the ability to program each detection call (input to the controller) with the following functions:

- Full Time Delay – Delay timer is active continuously,
- Extend – Call is extended for this amount of time after vehicle leaves detection area,

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- 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 must expire before another vehicle call can be received.

Ensure that Detection Systems provide advanced and presence detection. Verify that the system can, at a minimum, emulate the output of a pair of 6 ft. by 6 ft. in-pavement loops spaced 16 ft. apart.

Provide the capability to create detection zones of varying size and shape to allow the best coverage of the viewable roadway lanes and ramps. Provide the capability to save the detection zone format on the processor module card once drawn for a particular sensor image.

Ensure the system allows the user to edit previously defined detector configurations. Ensure the system user can use a laptop to reprogram, calibrate, adjust or alter any previously defined detector configurations in the field and reprogram any detector configurations over the network or from a remote location.

Ensure detection zones can be overlapped. Ensure the system can detect vehicles in multiple travel lanes.

Detect either approaching or receding vehicles in multiple lanes within the field of view (FOV) of each non-intrusive sensor. Provide the capability of detecting vehicles in at least 24 detection zones per non-intrusive sensor with the detection system. Allow the detection zones to be combined to form one output.

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 monitor or Department furnished laptop computer screen.

Verify that any traffic data collected by the system and the system configuration is stored within internal non-volatile memory within the non-intrusive detection system processor. Perform software updates through an Ethernet, serial, or USB port. Verify that data can be retrieved from the system either locally or via requests from computers at the central Transportation Management Center (TMC) over the communications network.

Ensure the detection system includes computer software, which enables the user to program, calibrate, operate, and view current status of all system features using a laptop computer, or network-connected workstation at the central TMC. Ensure individual vehicle actuations can be viewed while observing the systems input data.

Ensure the non-intrusive detection system configuration data can be uploaded and saved to a laptop or TMC workstation computer for later re-loading to the non-intrusive detection processor if necessary.

Verify that the detection system is IP-addressable and that all communication addresses are user programmable. Ensure the setup program assigns an IP address to the detection processor.

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Ensure the detection system processor front panel includes a visual display of the status of each input. Indicators shall display, at a minimum, the status of the detection system processor communications, the status of the detection system processor, the status of communications, and whether each sensor is actively detecting. The processor shall allow a remote user to gain remote access, collect data, control, and configure the system.

3. Accuracy Requirements for Non-intrusive Detection Systems

Provide a non-intrusive detection system that meets the below minimum accuracy requirements:

Parameter	Condition	Accuracy (System)	False Detection	Missed Detection
Presence Detection	Daytime	95% - 110%	10%	5%
Presence Detection	Nighttime	95% - 115%	15%	5%
Presence Detection	Adverse Weather	95% - 115%	15%	5%

Parameter	Condition	Accuracy (System)	False Detection	Missed Detection
Advanced Detection	Daytime	95% - 110%	10%	5%
Advanced Detection	Nighttime	95% - 115%	15%	5%
Advanced Detection	Adverse Weather	95% - 115%	15%	5%

Table 1a: Outlines the requirements for the average system accuracy.

Non-intrusive detection system averages shall consistently satisfy the system-level performance criteria defined in Table 1a with minimal variance from these parameters during the selected testing period(s). It is recognized that individual detector units may operate under variable field conditions that constrain strict adherence to these parameters. A tolerance band of ±20% in place of the specified values is therefore allowable for individual detectors as shown in Table 1b. Individual detectors shall consistently meet these parameters.

Parameter	Condition	Accuracy (Detector)	False Detection	Missed Detection
Presence Detection	Daytime	80% - 120%	20%	20%
Presence Detection	Nighttime	80% - 120%	20%	20%
Presence Detection	Adverse Weather	80% - 120%	20%	20%

Parameter	Condition	Accuracy (Detector)	False Detection	Missed Detection
Advanced Detection	Daytime	80% - 120%	20%	20%
Advanced Detection	Nighttime	80% - 120%	20%	20%
Advanced Detection	Adverse Weather	80% - 120%	20%	20%

Table 1b: Outlines the requirements for the accuracy of the individual detectors.

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4. Testing

Develop and submit plans for post installation testing to the Engineer for consideration and approval. Ensure the plans test all functional requirements and the accuracy requirements stipulated in the specifications. Further guidance and testing resources may be obtained by contacting the Product Qualification Engineer in the TSMO unit.

4.1 Post Installation Test Requirements

Utilize the following test procedures after the non-intrusive detection system has been installed in its entirety. Commence no post-installation testing until all non-intrusive detection systems in the project have been configured and/or calibrated to gather speed, volume, occupancy and/or presence detection. Including the accuracy testing requirements, at a minimum, provide the following on the test plan to be submitted and approved by the Engineer:

- Inspect all vehicle detection system field components to ensure proper installation and cable termination.
- Verify that field construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check power supply voltage and outputs and ensure device connections are as specified in the Plans and specifications.
- Verify that the installation of cables and connections between all detectors and field cabinets are as specified in the Plans and specifications.
- Demonstrate that each non-intrusive Detection System is fully operational and collecting the required data types at the specified interval.

5.3. CONSTRUCTION METHODS

A. Construction

1. Non-intrusive Detection System Installation Requirements

1.1 General Installation Requirements

Arrange and conduct site surveys with Department personnel, and the system manufacturer's representative as necessary, to determine proper detector sensor unit selection and placement. Provide the Department at least 3 working days' notice before conducting site surveys. The non-intrusive detection system's manufacturer shall provide support both remotely and on-site for all phases of the installation.

Before beginning work at locations requiring non-intrusive detection systems, furnish system software. Upon activation of detection zones, provide detector configuration files. Ensure that up-to-date detection configuration files are furnished

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for various detection zone configurations that may be required for construction phasing.

Place into operation non-intrusive detection systems. Configure non-intrusive detection systems to achieve required detection in designated zones. If requested, have a certified manufacturer's representative on site to supervise and assist with installation, set up, and testing of the system.

Install all non-intrusive detection sensors, non-intrusive detection system processors, output expansion modules, and associated enclosures and equipment per manufacturer recommendations. Make all necessary adjustments and modifications to the detection system prior to obtaining recommendation for system acceptance testing.

Installation, surge protection, and all cabling shall comply with manufacturer's recommendations, at a minimum, or as specified in the plans. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components and be fully protected from all surge potential. Connectors installed outside the cabinets and enclosures shall be manufacturer terminated and be corrosion resistant, weatherproof, and watertight. Use a UL listed cable that is ozone and UV resistant and weather resistant. Label cables with permanent cable labels at each end.

Relocate detector sensor units and reconfigure detection zones as necessary according to the plans for construction phases.

Furnish an as-built cabinet wiring diagram, identified by location, for each non-intrusive detection system cabinet. Include all wiring, cabling, connections, and detector mounting height. Furnish an operation manual with programming instructions and a maintenance manual. Place all documentation in a weatherproof holder in the cabinet. Provide an additional copy of the documentation to the Engineer.

1.2 Detector Sensor Installation

Adjust the detector sensor as recommended by the manufacturer, and as required to minimize vehicle occlusion. For Video detection systems, aim the camera so that no part of the horizon is in the video image to protect it from the effects of the sun.

1.3 Cabinet Equipment

Install all non-intrusive detection system equipment into a cabinet with the following equipment:

Wiring, Conductors and Terminal Blocks: Use stranded copper for all conductors, including those in jacketed cables, except for earth ground conductors, which may be solid copper. 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. Route detector control wiring, and 120 VAC power wiring separately. Terminate all wiring on a terminal block, strip, busbar, or device clamp or lug; do not splice any wiring.

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Label cables for detection system sensors. Number all terminal blocks, terminal strips, circuit breakers, and busbar breakers and have each item and each terminal position numbered and named according to function. Labels shall be weather and wear resistant.

Protect all copper wiring and cabling entering the cabinet housing by surge protection devices. Terminate all wiring between cabinet devices and the transient surge protection devices, except for the signal feed, on terminal strips. Use a minimum #16 AWG grounding wire for each surge protection device, or larger if recommended by the surge protection device manufacturer. Do not “daisy chain” with the grounding wires of other devices including other surge suppressors. Install grounding wires with the absolute minimum length possible between the surge protection device and the ground busbar. Label all surge protection devices on the mounting panel.

Furnish and install a surge suppressor for each signal line. The surge protection device shall have a surge current rating of 10 kA. For each cabinet housing, include surge protection devices for the detection system power lines installed on the terminal block.

All surge protection shall be furnished and installed by the Contractor to protect not only the cabinet processor, but the detector sensor itself from ground rise potential (i.e., surge up to the detector sensor).

B. Quality Acceptance/Testing

The acceptance testing of the vehicle detection systems shall consist of two phases: 1) post installation detection system testing, as outlined in these specifications and 2) burn-in period. Perform acceptance testing for all equipment, hardware, and work as provided under these specifications. Perform all testing in the presence of the Engineer. Submit all testing plans and documents to the Engineer during the submittal phase of the vehicle detection equipment.

1. Burn-in Period

1.1 General Requirements

Provide a 30-day burn-in period for all work and equipment included in the Contract and associated with the vehicle detection system. The burn-in period shall consist of the field operation of the specific vehicle detection system in a manner that is in full accordance with the requirements of the Plans and Specifications.

Conduct only one (1) burn-in period on the entire Contract for all vehicle detection devices. Burn-in tests of individual vehicle detection devices or groups of vehicle detection devices will not be acceptable. Commence with the burn-in period only after meeting all of the following requirements:

All work required in all Contract documents for the vehicle detection system project-wide has been completed and inspected by the Engineer.

Successfully complete the post-installation vehicle detection system testing.

Commence with the burn-in period upon written authorization by the Department to commence. Terminate the burn-in period 30 consecutive days thereafter unless an

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equipment malfunction occurs. Stop the burn-in period for the length of time any equipment is defective. After repairing the equipment so that it functions properly, resume the burn-in period at the point it was stopped.

Successful completion and acceptance of the burn-in period will be granted on the 31st day unless any equipment has malfunctioned. If any equipment has failed during the burn-in period, final acceptance will be withheld until all the equipment is functioning properly.

When one specific piece of equipment has malfunctioned more than three times during the 30-day burn-in period, replace that unit with a new unit at no cost to the Department. Multiple failures of detection devices in different locations shall be determined as a failure of the 30-day burn-in period. The Contractor shall investigate the detection system failure and shall give a full report to the Engineer. The Contractor shall replace the failed devices and shall restart the burn-in period at Day 1, once those devices have been replaced and retested.

1.2 Contractor Responsibilities

During the burn-in period, maintain all work under this Contract in accordance with the Plans and Specifications. Restore any work or equipment to proper operating condition within 8 hours after notification.

1.3 Department Responsibilities

Department responsibilities during the burn-in period will be as follows:

- Expeditious notification of Contractor upon failure or malfunction of equipment.

1.4 Burn-in Period Acceptance

The Department will make burn-in period acceptance after satisfactory completion of the required burn-in period and based on a comprehensive field inspection of the complete vehicle detection system in accordance with the Specifications. Upon burn-in period acceptance but prior to Final Acceptance of the entire Contract, the Contractor is responsible for all maintenance of the vehicle detection system(s) installed or renovated in accordance with the specifications.

C. Contractor Warranty and Maintenance

Equipment provided under this specification shall be warranted by the manufacturer to be free from defects in materials and workmanship for a minimum of three (3) years from burn-in period acceptance.

The manufacturer and supplier’s warranties shall be transferable to the agency or user that is responsible for maintenance and shall be continuous throughout their duration.

During the warranty period, the manufacturer shall repair or replace any faulty equipment without cost to the purchaser, NCDOT, or the maintaining agency for all incidentals to the repair or replacement, including but not limited to parts, labor, or shipping.

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The manufacturer shall be responsible for providing firmware or software updates associated with the non-intrusive detection system at no cost to NCDOT or the maintaining agency during the warranty period. Further, the manufacturer is also responsible for ensuring that any updates will not degrade the original functionality of the product warranted.

The manufacturer and/or supplier shall provide consultation to the Department or user that is responsible for maintenance as needed at no cost during the warranty period for operating questions or problems that arise.

D. Training

Provide at least eight (8) hours of training on the setup, configuration, operation, maintenance, and troubleshooting of the non-intrusive detection system. Setup, configuration, and operation training should last a minimum of three (3) hours and must include instructions for programming, hands on training in programming detection zone, adjusting, and calibrating the detection system. Operation and maintenance training should last a minimum of five (5) hours and must include instructions on troubleshooting, maintenance, and operation for all detection system components. 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 two sets of complete documentation necessary to maintain and operate the system. Do not perform training until installation of the detection systems is complete. Each class will have a maximum of ten (10) people. The contractor must provide a training notebook for each trainee and an electronic copy of the training to the Department.

5.4. MEASUREMENT AND PAYMENT

Actual number of Microwave Vehicle Detectors – Multiple Zone (Presence) furnished, installed, and accepted.

No measurement will be made of environmental enclosures, mounting assemblies and hardware, cables, connectors, interfaces, supplies, or other items necessary for proper operation of the non-intrusive detection system as these items will be considered incidental to furnishing and installing non-intrusive sensor assemblies.

Actual number of non-intrusive detection system processor units furnished, installed, and accepted.

No measurement will be made of power supplies, power and communication wiring, necessary housing and rack assemblies, or configuration software as these items will be considered incidental to furnishing and installing non-intrusive detection system processors.

Training for non-intrusive Detection is measured as a lump sum for all supplies, equipment, materials, handouts, travel, and subsistence necessary to conduct the training.

No measurement will be made of non-intrusive detection system support, adjustments or repositioning, power and detector cables, and trenching as these items will be considered incidental to furnishing and installing non-intrusive detection systems.

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Payment will be made under:

Microwave Vehicle Detector – Multiple Zones (Presence) ..... Each

Non-intrusive Detection System Processor .....Each

Training for Non-intrusive Detection .....Lump Sum

6. METAL POLE SUPPORTS

6.1. METAL POLES

A. General:

Furnish and install metal poles, grounding systems, and all necessary hardware. Work covered under this special provision includes requirements for design, fabrication, and installation of standard and custom/site-specific designed metal pole supports and associated foundations.

Comply with applicable sections of the *2024 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES,* hereinafter referred to as the *Standard Specifications.* Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 1st Edition, 2015 (hereinafter called 1st Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi-sided cross section with no less than six sides. The sides may be straight, convex, or concave.

For bid purposes, pole heights shown on plans are estimated from available data. Prior to furnishing metal poles, use field measurements and adjusted cross-sections to determine whether pole heights will meet required clearances. If pole heights do not meet required clearances, the Contractor should immediately notify the Engineer of the required revised pole heights.

Standard Drawings for Metal Poles are available that supplement these project special provisions. The drawings are located on the Department's website:

https://connect.ncdot.gov/resources/safety/Pages/TSMO-Design-Resources.aspx

Comply with article 1098-1(B) of the *Standard Specifications* for submittal requirements. Furnish shop drawings for approval. Provide copies of detailed shop drawings for each type of structure as summarized below. Ensure shop drawings include material specifications for each component. Ensure shop drawings identify welds by type and size on the detail drawing only, not in table format. **Do not release structures for fabrication until shop drawings have been approved by NCDOT**. Ensure shop drawings contain an itemized bill of materials for all structural components and associated connecting hardware.

Comply with article 1098-1(A) of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, signal or asset inventory number(s) and project number or work order number.

Summary of information required for metal pole review submittal:

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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).

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Shop drawings and foundation drawings may be submitted together or separately for approval. However, shop drawings must be approved before foundations can be reviewed. Foundation designs will be returned without review if the associated shop drawing has not been approved. Boring reports shall include the following: Engineer's summary, boring location maps, soil classification per AASHTO Classification System, hammer efficiency, and Metal Pole Standard Foundation Selection Form. Incomplete submittals will be returned without review. The Reviewer has the right to request additional analysis and copies of the calculations to expedite the approval process.

B. Materials:

Fabricate metal pole from coil or plate steel that meet the requirements of ASTM A 572 Gr 55 or ASTM A 595 Grade A tubes. For structural steel shapes, plates, and bars use, as a minimum, ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent. Provide pole shafts of round or near round (18 sides or more) cross-section, or multi-sided tubular cross-section with no less than six sides, having a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single-ply plate or coil. For anchor base fabrication, conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Use the submerged arc process, or other NCDOT previously approved process suitable for shafts, to continuously weld pole shafts along their entire length. Finish the longitudinal seam weld flush with the outside contour of the base metal. Ensure shaft has no circumferential welds except at the lower end joining the shaft to the pole base. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 1st Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications.* No field welding on any part of the pole will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel poles and all assembly components in accordance with section 1076-3 of the *Standard Specifications*. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Galvanize hardware in accordance with section 1076-4 of the *Standard Specifications.* Ensure threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing in accordance with section 1076-7 of the Standard *Specifications. Ensure* all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring the Designer/Fabricator specifies connecting hardware and/or materials that prevent a dissimilar metal corrosive reaction.

Ensure each anchor rod is 2-inch minimum diameter and 60-inch length. Provide 10-inch minimum thread projection at the top of the rod, and 8-inch minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials complying with SP09_R005, hereinafter referred to as *Foundations and Anchor Rod Assemblies for Metal Poles.*

Ensure anchor bolt hole diameters are ¼-inch larger than the anchor bolt diameters in the base plate.

Provide a circular anchor bolt lock plate securing the anchor bolts at the embedded end with two (2) washers and two (2) nuts. Provide a base plate template matching the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼-inch minimum thick steel with a minimum width of 4 inches. Hot-dip galvanizing is not required for both plates.

Provide four (4) heavy hex nuts and four (4) flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO

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M293 or equivalent material. Ensure anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

For each pole, provide a grounding lug with a ½-inch minimum thread diameter, coarse thread stud and nut that will accommodate #4 AWG ground wire. Ensure the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

Provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy stainless-steel chain that is long enough to permit cap to hang clear of the pole-top opening when cap is removed.

Where required by the plans, furnish couplings 42 inches above bottom of the pole base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1½-inch internally threaded half-couplings complying with the NEC, mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required hot-dip galvanizing. Provide a threaded plug in each mounting point. Ensure the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed slot that will accommodate a ½ "drive standard socket wrench.

Metal poles may be erected and fully loaded after concrete has attained a minimum allowable compressive strength of 3,000 psi.

Connect poles to grounding electrodes and bond them to the electrical service grounding electrodes.

When field drilling is necessary for wire or cable entrances into the pole, comply with the following requirements:

- Do not drill holes within 2 inches of any welds.
- Do not drill any holes larger than 3 inches in diameter without checking with the ITS & Signals Structure Engineers.
- Avoid drilling multiple holes along the same cross section of tube shafts.
- Install rubber grommets in all field drilled holes that wire, or cable will directly enter unless holes are drilled for installation of weather heads or couplings.
- Treat the inside of the drilled holes and repair all galvanized surfaces in accordance with Section 1076-7 of the latest edition of the *Standard Specification prior to installing grommets, caps, or plugs.*
- Cap or plug any existing field drilled holes that are no longer used with rubber, aluminum, or stainless-steel hole plugs.

When street lighting is installed on metal signal structures, isolate the conductors feeding the luminaires inside the pole shaft using liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or approved equivalent. All conductors supplying power for luminaires must run through an external disconnect prior to entrance into the structure. In accordance with the National Electrical Code (NEC) Article 230.2(E), provide identification of the electrical source provider for the luminaire feeder circuit with contact information on a permanent label located in the pole hand hole near the feeder circuit raceway.

Install a ¼-inch thick plate for a concrete foundation tag to include the following information: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation. Install galvanized wire mesh to cover gap between the base plate and top of foundation for debris and pest control. Refer to standard drawing M7 for further details.

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Immediately notify the Engineer of any structural deficiency that becomes apparent in any assembly, or member of any assembly, because of the design requirements imposed by these specifications, the plans, or the typical drawings.

C. Design:

Unless otherwise specified, design all metal pole support structures using the following 1st Edition AASHTO specifications:

- Use 700-Year MRI and 10-Year MRI wind pressure maps developed from 3-second gust speeds, as provided in Section 3.8.
- Ensure metal pole support structures include natural wind gust loading and truck-induced gust loading for fatigue design, as provided in Sections 11.7.1.2 and 11.7.1.3, respectively. Designs need not consider periodic galloping forces.
- Assume 11.2 mph natural wind gust speed in North Carolina. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) based on the yearly mean wind velocity of 11.2 mph.
- When selecting Fatigue Importance Factors, utilize Fatigue Importance Category II, as provided for in Table 11.6-1, unless otherwise specified.
- Calculate all forces using applicable equations from Section 5. The Maximum allowable force ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements. 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.

- All CCTV poles shall meet the compact section limits per section 5.7.2 along with Table 5.7.2-1. Minimum thickness of CCTV pole shafts shall be ¼-inch.
- All CCTV poles shall use full-penetration groove weld tube-to-transverse plate connection with backing ring. Refer to Metal Pole Standard Drawing Sheet M9 for details. Fillet-welded tube-to-transverse-plate connections are not permitted.

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.

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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. 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 1st Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications*, except

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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.

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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 1st Edition AASHTO. For all load combination limit states specified under Section 3 of 1st Edition AASHTO, restrict tip of fully loaded arm from going below arm attachment point with the pole.

E. CCTV Poles:

Refer to Metal Pole Standard Drawing Sheets M2, M3 and M9 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, M3 and M9.

Provide a 2-inch hole equipped with an associated coupling and weather head 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.

Comply with the following requirements for CCTV Pole Anchor Bolts and Base

Plates:

- Poles up to 40'-0" in length, provide a minimum of four (4) 2-inch diameter anchor bolts, and a minimum 2-inch-thick circular base plate. Provide anchor bolts of Grade 55 ksi, and base plate of Grade 50 ksi.
- Poles greater than 40'-0" and up to 100'-0" in length, provide a minimum of eight (8) 2-inch diameter anchor bolts, and a minimum 2-inch-thick circular base plate. Provide anchor bolts of Grade 55 ksi, and base plate of Grade 50 ksi.

Obtain the Structural Engineer's approval for deviations from these requirements, prior to shop drawing(s) submission.

F. Luminaire Arms:

Comply with the following for Steel Luminaire Arms:

- Furnish tapered tube or standard weight black steel pipe conforming to ASTM A 53-90a, Type E or Type S, Grade B or an approved equivalent.
- Provide welding conforming to Article 1072-18 of the Standard Specifications, except no field welding on any part of the will be permitted unless approved by a qualified Engineer.

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- Hot-dip galvanize the structure in accordance with AASHTO M 111 or an approved equivalent, once all fabricating, cutting, punching, and welding are completed.
- In accordance with National Electrical Code (NEC) Article 230.2(E), provide identification of the electrical source provider for the luminaire feeder circuit with contact information on a permanent label located in the pole hand hole near the feeder circuit raceway.

6.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 1st Edition, latest ACI-318 code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. Design methods based on engineering publications or research papers must have prior approval from NCDOT. The Department reserves the right to accept or reject any method used for the analysis.

Ensure deflection at top of foundation does not exceed 1 inch for worst-case (Service Limit State) lateral load.

Use LPILE Plus V6.0 or later for lateral analysis. Submit inputs, results and corresponding graphs with the design calculations.

Calculate skin friction using the α-method for cohesive soils and the β-method for cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the "α" and "β" methods can be found in *FHWA-NHI-10-016*.

Omit first 2.5 feet for cohesive soils when calculating skin friction.

Assume a hammer efficiency of 0.70 unless value is provided.

All CCTV pole drilled shafts shall be a minimum of 4'-0" diameter. Refer to Standard Drawing Nos. M7 and M8.

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

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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:

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest\ Boring\ Depth}}{Total\ Number\ of\ N\ values}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest\ Boring\ Depth})^2$$

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$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deeepest\ Boring\ Depth}$$

$$N_{STD\ DEV} = \sqrt{\left(\frac{(Total\ Number\ of\ N\ values\ \times Y) - Z^2}{(Total\ Number\ of\ N\ values) \times (Total\ Number\ of\ N\ values - 1)}\right)}$$

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:

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https://connect.ncdot.gov/resources/safety/Pages/TSMO-Design-Resources.aspx

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (Soil Test). Design drilled piers for side resistance in accordance with Section 10.8 of the *2014 AASHTO LRFD Bridge Design Specifications, 7th Edition*. Use computer software LPILE version-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use computer software gINT V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide a drilled pier foundation for each pole with a length and diameter resulting in horizontal lateral movement less than 1 inch at top of the pier, and horizontal rotational movement less than 1 inch at the edge of pier. Contact the Engineer for pole loading diagrams of standard poles used for non-standard foundation designs. Submit non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval before construction.

C. Drilled Pier Construction:

Construct drilled pier foundation and Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Standard Special Provision SP09-R005 located at:

https://connect.ncdot.gov/resources/Specifications/Pages/2024-Specifications-and-Special-Provisions.aspx

6.3. METAL POLE REMOVALS

A. Description:

Remove and dispose of existing metal support poles, and remove and dispose of existing foundations, associated anchor bolts, electrical wires and connections.

B. Construction Methods:

5. Foundations:

Remove and promptly dispose of the metal support pole foundations including reinforcing steel, electrical wires, and anchor bolts to a minimum depth of 2 feet below the finished ground elevation. At the Contractor’s option, remove the complete foundation.

6. Metal Poles:

Consult Division Traffic Services regarding ownership of poles. If the Division chooses to maintain these structures in their inventory for future use, permanently mark the pole with the signal inventory number, asset inventory number or some identifying information that identifies where the pole came from

Remove the metal support poles, and promptly transport the metal support poles from the project. Use methods to remove the metal support poles and attached equipment that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no additional cost to the Department.

Transport and properly dispose of the materials.

Backfill and compact disturbed areas to match the finished ground elevation. Seed unpaved areas.

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Use methods to remove the foundations that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no cost to the Department.

6.4. 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.”

6.5. MEASUREMENT AND PAYMENT

Actual number of metal poles with single mast arms furnished, installed, and accepted.

Actual number of metal poles with dual mast arms furnished, installed, and accepted.

Actual number of designs for mast arms with metal poles furnished and accepted.

Actual number of metal CCTV pole foundations removed and disposed.

Actual number of metal CCTV poles removed and disposed.

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 , CCTV support structures.

Payment will be made under:

Metal Pole with Single Mast Arm .....Each
Metal Pole with Dual Mast Arm.....Each
Mast Arm with Metal Pole Design .....Each
Metal Pole Foundation Removal .....Each
Metal Pole Removal.....Each
CCTV Metal Pole .....Each
Soil Test .....Each
Drilled Pier Foundation..... Cubic Yard

7. PROTECTIVE COATING FOR METAL POLES

7.1. General

This special provision is intended for use as an additional treatment to metal traffic signal structures installed in areas where maintaining an aesthetic appearance is important and specified in the project documents. The provision contains all of the requirements necessary to accomplish this additional treatment to galvanized steel traffic signal structures fabricated by a steel manufacturer using their local powder coating/paint facility and includes the material and shop certification requirements. The provision also contains pay items for protective coating treatment to aluminum signal and pedestrian pedestals that are Standard Specification items (See Section 1743 and associated Standard Drawings). These aluminum pedestals are on the Qualified Product List (QPL), and as such would not likely be powder coated at the same facility and thus not bound by the

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material certification requirements in this provision. In this case, the pedestal supplier should comply with Type 6 – Supplier's Certification as defined in Section 106-3 of the Standard Specification.

7.2.Description

Protective coating for metal poles is a supplemental durable color coating that is applied to galvanized steel and aluminum traffic signal structures. Powder Coating is the preferred supplemental protective coating process for coating galvanized steel and aluminum structures. However, for the purposes of this special provision, an Acrylic Primer and topcoat paint system is included as an acceptable alternative when protective color coating is required.

Provide protective coating over galvanization for all steel poles including all necessary hardware in accordance with the plans and specifications.

7.3. Materials

With the exception of aluminum components, furnish all metal poles with galvanic protection along with a tough and durable application of protective coating. Aluminum components shall have a durable powder coating application. Galvanization is not required for aluminum components.

Furnish pole caps that have a low gloss powder finish applied over a hot-dipped galvanized surface. Comply with the applicable provisions of Section 442-10 and 442-13 of the 2024 Standard Specifications.

Ensure the selected color for protective coating has been verified and approved by the Engineer prior to fabrication.

7.4. Facility Approval

The Department maintains an approved producer/supplier listing for various facility types associated with this work, which include powder applicator (PA), structural steel galvanizer (SSG), and structural steel shop coating facilities (SCF). A complete list of approved facilities can be found at the following weblink: https://apps.ncdot.gov/vendor/ApprovedProducts/Producer.aspx Approve the coating shop facility prior to the application of any coating process. Submit all new facility requests, procedures, and documents electronically to:

Materials and Test
1801 Blue Ridge Road
Raleigh, NC 27607
Attn: Manufactured Products Engineer

Powder Coating Shop Approval

A) Submit a quality control procedure that the company has established to ensure a quality and durable coating. The quality control procedure shall contain at a minimum the following:
   - Qualified / Certified personnel to manage the QC Program and to conduct Quality Control tests
   - Qualified / certified coaters
   - Source and type of powder
   - How the powder will be stored
   - Powder application facility (heated or unheated)

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- Surface pre-treatment
- Surface preparation including profile
- Application methods
- Curing conditions (conventional or infrared)
- Curing Temperature
- Adhesion & Holiday Detection
- Repair Procedure
- Storage and protection of coated items
- Shipping and handling (packing, protection, and wrapping)

B) Submit a powder certification from the manufacturer

C) Submit the following to the Chemical Testing Engineer a minimum of four weeks prior to coating application.

1. Two test panels of ASTM A36 steel, ¼ or greater in thickness measuring 8 inches by 11 inches using the proposed color of the final coat; a powder coated over galvanized test panel and a powder coated over un-galvanized test panel.
2. In addition, provide two (2) samples of the same or comparable material and thickness as production pieces. Ensure production piece replicas do not exceed twelve inches (12”) in length and width nor 50 pounds in weight.
3. Submit all test panels with inspection reports and records according to *Standard Specifications*, Section 442, Section 1072, Section 1076, and Section 1080.
4. Acceptance of the panels is determined by meeting the requirements of ASTM D-4541 of 800 psi for both galvanized and un-galvanized and production piece test panels.
5. Send all panels to:

   Materials and Tests Unit
   1801 Blue Ridge Road
   Raleigh, NC 27607
   Attn: Chemical Lab

7.5. POWDER COATING

A. Galvanizing

Galvanize steel products in accordance with Section 1076 of the Standard Specifications. Ensure the fabricator or designated representative(s) that is supplying the components to be galvanized communicates with the galvanizer to indicate that the galvanized pieces will be powder coated to avoid water or chromate quenching.

B. Surface Preparation

Comply with manufacturer’s recommended surface coating specifications, Steel Structure Painting Council (SSPC) specifications and applicable articles of Section 442 (Painting Steel Structures) of the Standard Specifications. Ensure that surface preparations and treatments are performed and meet the requirements of the above referenced specifications.

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Some pole components, specifically steel plates ¾ inches or more in thickness, may need blast cleaning prior to structure assembly to remove impurities and non-metallic foreign materials. Mechanically remove all weld flux after structure is assembled

Degrease and prepare steel structure for zinc coating after assembly using full immersion baths and pickling processes in heat controlled caustic and acid solutions. Rinse and clean structure to remove caustic or acid solutions by immersion in a circulating fresh water bath. Immerse structure in a heat controlled concentrated zinc ammonium chloride flux solution and air dry as a final prep before hot-dip galvanization.

Ensure that the surface preparation is no less than specified by the powder manufacturer's recommendations. Prepare all components to be coated in accordance with SSPC SP-2 (Hand Tool Cleaning) and/or SSPC SP-3 (Power Tool Cleaning). Remove all drainage spikes, high spots, protrusions or other surface defects using hand or power tools. Do not remove the galvanization below the limits set forth in AASHTO M111.

Remove grease, oils, moisture, scale, rust or any other foreign matter prior to powder coating to ensure ideal adhesion and coating performance. Prepare and coat the galvanized surface as soon as possible after the galvanization process.

C. Powder Coating Application and Curing

Prepare galvanized finish for powder coating by brush blasting in accordance with SSPC-SP7. Ensure all threaded components of the structure are protected from damage during blasting process.

Use thermosetting powder resin that meets 5A or 5B classifications of ASTM D3359. Apply powder coating electrostatically. Follow manufacturer's recommended preheating requirements. Ensure the topcoat finish is applied uniformly to all surfaces with a dry film thickness of between 3.0 to 5.0 mils. Cure the topcoat by heating the structure to manufacturer recommended temperatures at the duration required to ensure complete and uniform bond.

D. Quality Control

Ensure the applicator provides all test reports and documentation and inspects all coated material as outlined in the Standard Specifications, Section 442, Section 1072, Section 1076, and Section 1080. Ensure the quality control inspection is kept separate from the production functions.

E. Storage, Shipping, and Handling

Store all powder coated material inside or as directed by the Engineer.

Protect the product from incurring damage during all shipping, handling, and storing activities. Do not store the product directly on the ground or in areas where water may pool; the Engineer determines the effectiveness of all storage, shipping and handling methods.

F. Repair of Powder Coated Material

Repair all damage to the coating by the original method of application as outlined in the coating facility's repair procedure. Ensure all repair areas meet the original requirements for adhesion as stated in this Project Special Provision.

Photograph, document, and report all damages upon delivery to the project site prior to unloading. Provide documented damage notifications to the Engineer or to their authorized representative so the application firm can be notified. The Engineer has the authority to accept or reject the material as outlined in the Standard Specifications.

Submit to the Engineer a repair procedure for damaged coatings which occur during storage, transporting, handling and or installation. Utilize a liquid paint approved by the Department,

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compatible with the powder applied product. Ensure all repair areas demonstrate an adhesion rating of 400 psi in accordance with ASTM D-4541. Obtain Engineer's acceptance of the final finish.

7.6.ACRYLIC PRIMER AND TOPCOAT PAINT SYSTEM

A. Description

Follow NCDOT procedures for Powder Coating over Galvanizing. Provide an Acrylic Primer and topcoat when a substitute for powder coating is necessary.

Provide supplemental coating for all mast arms with metal signal poles and all necessary hardware for the signalized intersection in accordance with the Structural Steel Shop Coatings Program, NCDOT Standard specifications – sections 442 and 1080, as contained herein, and as shown on the plans. The Structural Steel Shop Coatings Program can be found at the following link: https://connect.ncdot.gov/resources/Materials/MaterialsResources/Structural%20Steel%20Shop%20Coatings%20Program.pdf

Ensure all painting work for new structures, except field touch-up and bolt painting is performed in the shop.

Coatings Shop Approval

Use only NCDOT approved shop coating facilities meeting the requirements outlined in the current edition of the Structural Steel Shop Coatings Program. This program is available on the Materials and Tests website. Structural Steel Shop Coatings Program.pdf (ncdot.gov)

Provide shop certification in accordance with the Structural Steel Shop Coatings Program (Shop facilities that are currently certified and in good standing with the American Institute Steel Construction (AISC) / Sophisticated Paint Endorsement (SPE) and/or the Society of Protective Coatings (SSPC) Qualification Procedure Three (QP-3).

B. Surface Preparation

Ensure all surface preparation is not less than that specified by the paint manufacturer's recommendations.

Clean galvanized surfaces to be painted with a 2,500-psi pressure washer. Allow surfaces to dry completely before beginning surface preparation.

Ensure all components to be coated are prepared in accordance with SSPC SP2 (Hand Tool Cleaning and or SSPC SP-3 (Power Tool Cleaning). Smooth high spots and rough edges, such as metal drip lines, of galvanized surfaces in accordance with ASTM D6386. Do not remove the galvanization below the limits set forth in AASHTO M111.

Perform abrasive sweep blasting in accordance with ASTM D6386. Refer to this section for a description of the abrasive blast material to be used. Use a material and technique capable of stripping action to remove corrosion products and to provide a rough surface profile while leaving base zinc layers intact.

Blow down all blasted surfaces with clean compressed air to provide a clean, dry surface.

Ensure all surfaces are free of visible zinc oxides or zinc hydroxides.

C. Materials

Use an approved/qualified waterborne paint meeting the requirements of NCDOT Standard specification section 1080. Do not apply paint until each batch has been tested by the Department. Provide color as specified in the contract documents.

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Ensure all paint used on this contract is produced by the same manufacturer.

D. Painting

Apply paint in accordance with the requirements of the Structural Steel Shop Coatings Program, Section 442 and Section 1080 of the *Standard Specifications* as modified herein.

System for Paint over Galvanize
Acrylic Primer and Topcoats

Coat	Material	Mils Dry/Wet Film Thickness	Mils Dry/Wet Film Thickness
		Minimum	Maximum
Primer	1080-9 White	3.0 DFT	5.0 DFT
Stripe	1080-9 *	4.0 WFT	7.0 WFT
Topcoat	1080-9 *	2.0 DFT	4.0 DFT
Total		5.0 DFT	9.0 DFT

***Ensure the selected color for protective coating has been verified and approved by the Engineer prior to fabrication.**

The time between blast and coating application shall be in accordance with ASTM D6386 time requirements. In no case shall the prepared surface extend beyond 8 hours.

Mask off and do not paint all data plates and faying surfaces prior to application.

Spray apply all coatings except for the stripe coat. Brush apply the stripe coat to all plate edges, welds, bolt holes and bolts prior to applying the finish coat.

E. Curing

Follow manufacturer recommendations.

F. Inspection

Quality Control shall conduct the required quality control tests as outlined in the Structural Steel Shop Coatings Program and report the minimum information required by the appropriate ASTM test methods. At a minimum, quality control forms shall be on company letterhead with logo that provides a daily inspection report form equivalent to the information required on the M&T-611 Form. The M&T-611 Form can be found in the Structural Steel Shop Coatings Program. Dry Film Thickness (DFT) measurements shall be obtained on all coating layers, including the galvanized layer and shall incorporate the use of a Type 2 gauge as defined in SSPC PA-2.

Ensure all material is of a uniform appearance free of runs, drips, and sags.

G. Handling

Do not handle, ship, or erect coated members until paint is thoroughly dry.

Protect all shipping and handling either from the coating facility to project site and or storage site to area(s) to construction location from incurring damage to product. Wood blocks and nylon slings are recommended for securing, loading, hoisting or storing members.

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H. Repair of Damaged Coating

Repair damage occurring to the galvanized portion of the coating during shipment or installation in accordance with Articles 1076-7 and 1080-7 of the *Standard Specifications*. Repair damage occurring to the painted portion of the coating during shipment or installation by applying 4.0-7.0 wet mils of topcoat with a brush or roller and feather or taper this to be level with the surrounding areas.

7.7. MEASUREMENT AND PAYMENT

Actual number of single mast arm poles with protective coating applied furnished, installed, and accepted.

Actual number of dual mast arm poles with protective coating applied furnished, installed, and accepted.

Actual number of signal TYPE I pedestals with protective coating applied furnished, installed, and accepted.

Actual number of signal TYPE II pedestals with protective coating applied furnished, installed, and accepted.

Payment will be made under:

Protective Coating for Single Mast Arm Pole (27038).....Each
Protective Coating for Dual Mast Arm Pole (27038).....Each
Protective Coating for TYPE I Pushbutton Post (27038).....Each
Protective Coating for TYPE II Signal Pedestal (27038).....Each

8. RECTANGULAR RAPID FLASHING BEACON SOLAR POWERED DISPLAY AND CONTROLLER ASSEMBLY

8.1. DESCRIPTION

Provide rectangular rapid flashing beacon (RRFB) that is solar powered and pedestrian activated. Ensure the RRFB consists of two rapidly flashing rectangular-shaped yellow indications, signs, solar panel, battery, controller assembly and all necessary hardware. Ensure multiple RRFB units at a given crosswalk are synchronized.

Ensure the RRFB meets the physical display and operational requirements provided in the 2023 MUTCD, 11th Edition, Chapter 4L.

8.2. MATERIALS

Comply with Section 1094 of the 2024 Standard Specifications for Roads and Structures for ground mounted sign supports. Unless otherwise shown on the plans, Three Pound Steel U-Channel Posts shall be used for mounting the rectangular rapid flashing beacon assembly.

Provide two rapid flashing yellow indications that are aligned horizontally in a single housing with a space between both indications of a minimum of 7” from inside edge of one indication to inside edge of the other indication. Ensure each indication is rectangular-shaped and has minimum dimensions of 5” wide by 2” high. Provide a Light Emitting Diode (LED) array for each indication. Provide Independent Laboratory Certification and test results for each indication facing motorists as evidence that the light intensity meets the Class 1 requirements for of the Society of Automotive

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Engineers (SAE) standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated November 2008. Provide an aluminum housing that can be attached to a 4.5" OD pedestal pole. Powder coat the housing with an 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. Ensure the housing does not project beyond the outside edges of a W11-2 or S1-1 sign. Ensure the two indications are installed into the housing assembly to face in the direction of the approaching vehicular traffic. When specified, provide two additional identical indications for the motorists in a similar constructed housing that can be attached on the opposite side of the pole.

Provide the two yellow indications facing motorists to flash in a rapidly alternating "wig-wag" flashing sequence (left light on, then right light on). Ensure 70 to 80 periods of flashing per minute with the left indication emitting two slow pulses of light and the right indication emitting four rapid pulses of light followed by a long pulse of light. Ensure the indications have approximately equal periods of rapid pulsing light emissions and dark operation. Ensure flash rates are not at frequencies between 5 and 30 flashes per second to avoid flash-induced seizures. Provide a flashing yellow LED indication on the end of the housing to provide notification of activation and operation of the device to pedestrians in the crosswalk.

During operation, ensure the RRFB remains dark until a pedestrian actuation occurs and then returns back dark at a programmed time after the pedestrian activation. Provide wireless communication equipment to ensure all RRFBs associated at a given crosswalk simultaneously start operation of their alternating rapid flashing indications when activated and cease operation simultaneously. Provide a means to prevent interference with other systems utilizing similar communications equipment.

Provide a 12VDC sealed gel, sealed lead acid, or absorption glass mat battery with sufficient capacity for 5 days of 3 hours of continuous operation with no additional charge from solar panel. Ensure the battery is located in a moisture and corrosion resistant enclosure. Provide a solar panel with a minimum array-to-load ratio of 1.2 and charging circuitry for the battery. Provide a solar sizing report that shows the system loss of load probability is 0% for the entire year for Raleigh, North Carolina. Provide mounting hardware to allow solar panel to be tilted at least 45 degrees from horizontal and panned 360 degrees.

Provide stainless steel fasteners for all items exposed to the weather. For fasteners protected from the weather, provide fasteners fabricated from stainless steel or other corrosion-resistant materials.

Ensure assemblies provide protection from environmental conditions and accidental contact equivalent to a NEMA 3R-rated enclosure. Ensure all components operate properly within the following limits unless otherwise noted:

- Humidity: 5% to 95%, non-condensing
- Ambient Temperature: -30.0°F to +165°F
- Shock - NEMA TS2-2003, Section 2.1.10
- Vibration - NEMA TS2-2003, Section 2.1.9

8.3. CONSTRUCTION METHODS

For each approach to the RRFB location, use two RRFB assemblies, installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway. On a divided highway, install the left-hand side assembly in the median, if practical, rather than on the

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far-left side of the highway. Each RRFB assembly shall consist of a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign, a RRFB, and W16-7p (downward diagonal arrow) plaque. Install the RRFB on the same support as the associated W11-2 (Pedestrian) or S1-1 (School) crossing warning sign and plaque. Do not install an RRFB independent of the crossing signs for the approach the RRFB faces.

Ensure that the outside edges of the RRFB indications, including any housings, do not project beyond the outside edges of the W11-2 or S1-1 sign. Locate the RRFB between the bottom of the crossing warning sign and the top of the supplemental W16-7p plaque, rather than 12 inches above or below the sign assembly.

If using pushbuttons to activate the RRFBs (versus passive detection), install the pushbutton assembly below the RRFB and W16-7p plaque. Mount the pushbutton at a minimum height of 3.5 feet but no higher than 4.0 feet above the adjacent pedestrian travel way. With pushbutton activation, mount a pedestrian instructional sign with legend “PUSH BUTTON TO TURN ON WARNING LIGHTS” adjacent to or integral with each pedestrian pushbutton.

Obtain flashing duration to be programmed into the RRFB from the Engineer.

8.4. MEASUREMENT AND PAYMENT

Actual number of rectangular rapid flashing beacon assemblies furnished, installed, and accepted.

No measurement will be made of rapidly flashing rectangular-shaped yellow indications, signs, solar panel, battery, controller assembly, mounting posts, and all necessary hardware as these items will be considered incidental to furnishing and installing rectangular rapid flashing beacon assemblies.

Payment will be made under:

Rectangular Rapid Flashing Beacon Assembly.....Each

9. JUNCTION BOXES (LIMITED ACCESS FACILITIES)

9.1. DESCRIPTION

Furnish and install junction boxes with covers, graded stone, and all necessary hardware in accordance with the plans and specifications.

Provide Electronic Marking Balls to aid in locating the junction

9.2. MATERIALS

(A) General

Refer to Division 8 and 10 of the 2024 *Standard Specifications for Roads and Structures*.

Item	Section
#57 or #67 Washed Stone	1005

Furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

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(B) Junction Box

Provide junction boxes with at least two size 3/8-inch diameter stainless steel hex head cover bolts to match inserts in the box. Ensure junction boxes are provided with open bottoms. Provide vertical extensions of 6 inches to 12 inches as required by project provisions.

Provide the required logo on the cover. Provide pull slot(s) with stainless steel pin(s).

Provide third party certification that the junction boxes and covers meet ANSI/SCTE 77 2013 and Tier 22 loading. Provide certification that testing methods are compliant with ANSI/SCTE 77 2013.

Provide standard size junction boxes and covers with minimum inside dimensions of 16" (l) x 10" (w) x 10" (d). Provide a cover embossed with the following wording “NCDOT Electrical”.

Provide oversized junction boxes and covers with minimum inside dimensions of 28" (l) x 15" (w) x 22" (d) for installing only fiber-optic communications cable.

Provide special oversized junction boxes and covers with minimum inside dimensions of 33" (l) x 22" (w) x 22" (d) where underground fiber-optic splice enclosures are to be installed or as directed by the plans.

Provide additional oversized junction boxes and covers as identified in the plans where underground fiber-optic splice enclosures and conduit requirements may require a junction box that is larger than what is listed above. Boxes of this nature can be supplied with a cover that is of a single or split cover design, but boxes with a split cover may be supplied with a center brace to support the cover/lid.

For oversized and special oversized junction boxes, provide a cover embossed with the following wording “NCDOT Fiber Optic”. Additionally, for junction boxes designated for fiber optic cable, furnish an access point/hatch on the lid to allow access to the tracer wire boding/isolation test switch that is located inside the junction box (See “Tracer Wire Bonding/Isolation Test Switch” requirements below).

For oversized and any special oversized junction boxes, provide junction boxes with mouse holes or knock-outs fabricated in the sides to accommodate conduit entrances. Boxes fabricated without mouse holes or knock-outs shall be approved by the manufacturer for field drilling conduit entrance holes. Consult the manufacturer to identify the amount of surface area that can be removed for field drilling conduit entrance holes without violating the boxes structural integrity. Upon request, provide written approval from the manufacturer stating their recommendations. **All conduits shall enter the junction boxes through the mouse holes/knock-outs.**

(C) Electronic Marker Ball

Furnish an electronic marking ball, with a minimum life expectance of 15 years and that are locatable when buried up to 5 feet deep to aid in locating buried Junction Boxes. Ensure the marking ball is designed to be self-leveling to provide precise horizontal positioning of the marker ball electronics (internal passive antenna) once installed in a junction box. Ensure the marker balls are

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compatible with a Metro Mark - Passive Marker Locator Model #760DX or approved equivalent and are tuned to the following frequencies:

Orange Ball – 101.4 KHz - Fiber Installations
Red Ball – 169.8 KHz – Power Cable Installations

9.3. CONSTRUCTION METHODS

(A) Junction Boxes

Install standard size junction boxes as shown in the plans. When lateral runs for electrical cables are greater than 150 feet, install additional junction boxes to ensure distances between junction boxes does not exceed 150 feet.

Install oversized junction boxes and any special oversized junction boxes at maximum intervals of 1500 feet unless otherwise stated in the plans.

Backfill beneath and around the boxes using #57 or #67 washed stone in conformance with Section 1005 of the 2024 *Standard Specifications for Roads and Structures.* Backfill beneath the box a minimum of 12-inches and around the exterior of the box a minimum of 3 inches.

Avoid placing junction boxes on slopes of 3:1 or greater.

(B) Electronic Marker Ball

Install the appropriate colored Marker Ball in each junction box upon completion of the junction box installation. Test to ensure that the Marker Ball is functioning properly with the approved electronic locater device. Record precise latitudinal and longitudinal coordinates for the location of each locate ball/junction box. See “GPS Coordinates” requirements below.

(C) GPS Coordinates

Provide real world coordinates for all junction boxes and equipment cabinets installed or used 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 a digital copy of all information regarding the location (including, but not limited to, manufacturer, model number, and NCDOT inventory number) in the Microsoft® spreadsheet shown by example below. Provide this information to the Engineer and the NCDOT ITS (TSMO) Unit.

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NCDOT Inv #	Name	Location	Latitude	Longitude	Manufacturer	Model #
05-0134	Equipment Cabinet	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
05-0134	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

9.4. MEASUREMENT AND PAYMENT

Limited Access Facilities - Junction Box (____) will be measured and paid in actual number of junction boxes with covers of each size and type furnished, installed, and accepted.

Electronic Marker Ball will be paid for as the actual number of Electronic Marker Balls furnished, installed, tested, and accepted.

No measurement will be made of covers, graded stone, ground rods, tracer wire bonding/isolation switch, tracer wire jumpers, tracer wire testing or concrete collars as these will be incidental to furnishing and installing junction boxes.

Payment will be made under:

Limited Access Facilities - Junction Box (Standard Size).....Each

Limited Access Facilities - Junction Box (Oversized).....Each

Limited Access Facilities - Junction Box (Special Oversized).....Each

Electronic Marker Ball.....Each

10. ETHERNET EDGE SWITCH

Furnish and install a managed Ethernet edge switch as specified below that is fully compatible, interoperable, and completely interchangeable and functional within the existing City, Division, or Statewide traffic signal system communications network.

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10.1. DESCRIPTION

A. Ethernet Edge Switch:

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for the traffic signal controller or ITS device as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 1000 megabits per second from each remote traffic signal controller or ITS device location to the routing switches.

Contact the City or NCDIT to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum ten (10) working days notice to allow the City or NCDIT to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the existing City, Division, or Statewide Network Management Software.

10.2. MATERIALS

A. General:

Ensure that the edge switch is fully compatible and interoperable with the trunk Ethernet network interface and that the edge switch supports half and full duplex Ethernet communications.

Furnish an edge switch that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

B. Compatibility Acceptance

The Engineer has the authority to require the Contractor to submit a sample Field Ethernet Switch and SFP along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch and Field Ethernet Transceiver for deployment**. The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City, Division, or Statewide Signal System network, monitoring software and Traffic Operations Center network hardware.** Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed

C. Standards:

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;

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- 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.

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Optical Ports: Ensure that all fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide Type LC connectors for the optical ports, as specified in the Plans or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an edge switch having a minimum of two optical 100/1000 Base X ports capable of transmitting data at 100/1000 megabits per second. Ensure that each optical port consists of a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. Ensure that the optical ports have an optical power budget of at least 15 dB. Provide small form-factor pluggable modules (SFPs) with a maximum range that meets or exceeds the distance requirement as indicated on the Plans.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 6 unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

*Port Security***:** Ensure that the edge switch supports/complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access;
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward; and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

F. Management Capabilities:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and

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- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

*Network Capabilities***:** Provide an edge switch that supports/complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON–I groups, at a minimum:
  - Part 1: Statistics
  - Part 2: History
  - Part 3: Alarm
  - Part 9: Event
- Provide support for the following RMON–2 groups, at a minimum:
  - Part 13: Address Map
  - Part 16: Layer Host
  - Part 17:Layer Matrix
  - Part 18:User History
- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet/CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

*Network Security***:** Provide an edge switch that supports/complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

G. Electrical Specifications:

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 6 ports only), and power LEDs.

H. Environmental Specifications:

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as

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defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)
- IEC 61000-6-2 (generic industrial)
- EMF – FCC Part 15 CISPR (EN5502) Class A

I. Ethernet Patch Cable:

Furnish a factory pre-terminated/pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 6 or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors
- Copper-clad aluminum is **NOT** allowed.

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 6 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB
- Return Loss: 10dB
- Propagation Delay: 548 nsec

10.3. CONSTRUCTION METHODS

A. General:

Ensure that the edge switch is UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the City, Division, or NCDIT a minimum of 10 working days prior to installation to allow for the programming of the edge switch.

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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.

10.4. MEASURMENT AND PAYMENT

Ethernet edge switch will be measured and paid as the actual number of Ethernet edge switches furnished, installed, and accepted.

No separate measurement will be made for Ethernet patch cable, small form factor pluggable modules (SFPs), power cord, mounting hardware, nuts, bolts, brackets, or edge switch programming as these will be considered incidental to furnishing and installing the edge switch.

Payment will be made under:

Ethernet Edge Switch.....Each

11. DIGITAL CCTV CAMERA ASSEMBLY

11.1. 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.

11.2. 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.

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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.

3. 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.

4. Networking Standards:

- Network Connection: Minimum 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)

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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

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- 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 1098-5 of the 2024 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

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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.

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11.3. 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 to ensure adequate lightning protection is provided by the air terminal.

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 of the 2024 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 Project Special Provisions for the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans. **Do not install lightning protection when installing a CCTV camera assembly on a signal pole.**

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

C. 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

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- 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.

A. Compatibility Tests

1. 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.

B. Operational Field Test (On-Site Commissioning)

1. 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:

C. 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.

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- 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.

D. 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.

11.4. 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,

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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

12. CCTV FIELD EQUIPMENT CABINET

12.1. DESCRIPTION

For standalone CCTV Camera installations, furnish pole mounted cabinets and all necessary hardware in accordance with the plans and specifications to house CCTV control and transmission equipment.

12.2. MATERIALS

A. CCTV Field Equipment Cabinet

Furnish Type 336S style or equivalent pole-mounted cabinet meeting the following minimum requirements:

- Single doors on both front and rear of cabinet;
- Grounding bus bar;
- 19-inch rack system for mounting of all devices in the cabinet;
- Pull-out shelf drawer 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.
- Lightning and surge protection on incoming and outgoing electrical lines (power and data);
- UPS with sufficient capacity to hold hub’s electrical load for 4 hours.
- Managed Ethernet Edge switch if called for in the plans (paid separately);
- Fiber-optic interconnect centers if called for in the plans (paid separately

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.

B. 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

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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.

C. Cabinet Light

Each cabinet must include two (2) LED 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.

D. 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.

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- 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 UPS with external temperature monitoring that will shut off when running on battery power and the maximum operating temperature for the ethernet switch is reached.

Install UPS with RJ-45 ethernet network monitoring ports that can be disabled via the UPS software/firmware.

Contractor is responsible for supplying a UPS and batteries that can adequately power the cabinet load plus an additional 20% for a **minimum** of 4 hours. Contractor shall request the power requirements for any department supplied equipment prior to submitting UPS for approval. Allow eight (8) weeks for the department to supply equipment power requirements. Provide to the Engineer for Approval, a submittal package with Engineering Calculations consisting of, as a minimum, schematic drawing, technical data sheets, and supporting documentation. Ensure the documentation demonstrates, in theory, that the battery(ies) will provide for continuous operation for a minimum of four (4) consecutive hours with no additional charging.

Furnish and install one rack mounted UPS in each new cabinet that meet the following **minimum** specifications:

Output

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
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V

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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,RJ-45 Ethernet
Control panel	LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating	480 Joules

Environmental

Operating Environment	-32 - 165 °F
Operating Relative Humidity	0 - 95%

Conformance

Regulatory Approvals	FCC Part 15 Class A, UL 1778

12.3. 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 and communications equipment from the UPS.

12.4. MEASUREMENT AND PAYMENT

CCTV 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:

Pay Item	Pay Unit
CCTV Field Equipment Cabinet	Each

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13. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

13.1. 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.

13.2. 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.

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13.3. 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 2024 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.

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13.4. 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.

14. CCTV CAMERA LOWERING SYSTEM

14.1. DESCRIPTION

Provide a CCTV lowering system for a digital CCTV camera as an integral part of the CCTV metal pole. The lowering system will consist of a support arm, camera connection unit, internal lowering system and winch cable, metal frame with winch, and all necessary cabling and wiring for installation. The camera connection unit serves a dual role as it identifies the mechanical point were the unit attaches and detaches to the support arm to carry the CCTV camera and where PoE cable connections occur. The camera connection unit is made up of two halves, the upper halve is permanently affixed to the support arm and the lower halve is affixed to the CCTV for lowering and raising operations.

Provide a portable metal frame and winch assembly to facilitate raising and lowering of the CCTV Camera.

Ensure that all exposed components of the lowering system (support arm, camera connection unit) are made of corrosion-resistant materials that are powder-coated or galvanized or otherwise protected from the environment by industry-accepted coatings that withstand exposure to the environment. Ensure the internal components of the camera connection unit (PoE cable interface and locking/latching mechanism) are protected from exposure to external environmental conditions (rain, snow, ice, and UV) by an outer covering or shield made of aluminum or other acceptable materials.

14.2. MATERIALS

A. Winch Cable

The winch cable shall be a minimum diameter of 0.125 inch and constructed of a minimum of 7 strands, 19-gauge, stainless-steel aircraft cable with a minimum breaking strength of 1,740 pounds. Provide materials as recommend by the Manufacturer to connect one end of the winch cable to the lower halve of the camera connection unit, on the opposite end provide a quick release cable connect loop.

Ensure the stainless-steel winch cable when installed will not flex and twist and ensure that only the winch cable will be in motion inside the metal pole when the lowering device is operated. Provide a bracket inside the lower position of the pole to secure the loose end of the winch cable when not in use. Ensure that all other cables remain stable and secure during lowering and raising operations.

B. Camera Connection Unit

Camera Connection Unit (Electrical):

Ensure that the camera connection unit makes accommodations for an internal PoE connection between the cabinet and the equipment installed at the support arm. Internal PoE connection shall be terminated with a RJ45 connector at the PoE injector in the CCTV cabinet. Ensure the lowering system and its camera wiring connection system are designed so that no degradation in functionality of the cameras overall performance is affected when the CCTV camera is installed and operational.

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Ensure that the camera connection unit design ensures proper alignment of the PoE cable conductors when the CCTV Camera is being lifted into place.

As an integral part of the camera connection unit, provide molded electrical terminal block halves equipped with modular, self-aligning and self-adjusting female and male socket contacts. The molded electrical terminal block halves must be equipped with sufficient contacts to permit operation of all required functions of the camera.

The female socket contacts and the male contact halves must be of heavy-duty construction and the connector blocks made of molded synthetic rubber, molded chlorosulfonated polyethylene, polymer body or approved equal. The connector pins shall be made of brass or gold-plated nickel, or gold-plated copper. The current-carrying male and female contacts shall have a minimum diameter of 0.09 inch.

Provide cored holes in the molded electrical terminal block halves to create moisture-tight seals when mated. All wire leads from both the male and female contacts shall be permanently molded in a body of chlorosulfonated polyethylene, or an approved equivalent. All contacts shall be self-wiping with a shoulder at the base of each male contact so that it recesses in the female block, thereby giving each contact a rain-tight seal when mated. The molded electrical terminal block halves shall be rated to carry the full amperage load of the camera. Upon request by the Engineer, submit documentation showing pin assignments and verification that the molded electrical terminal block halves are design sufficiently to withstand continuous operation of the camera at full load conditions.

Camera Connection Unit (Mechanical)

Ensure the camera connection unit has a minimum load capacity of 200 pounds with a 4:1 safety factor. Fixed and movable components of the camera connection unit must have a mechanical locking mechanism which automatically locks and unlocks the physical connections when engaging or disengaging the two halves. Provide a minimum of two mechanical latches for the movable assembly and, when latched, ensure that all weight is removed from the winch cable. Provide the upper halve of the unit with a heavy-duty tracking guide and a means to control the latching operation in the same position each time.

Fabricate the camera connection unit to allow the winch cable to pass through itself at the point where the upper halve connects with the lower halve. Ensure the assembly provides an internal guide to ensure the lowering cable does not scrub against the molded electrical termination block and cannot come entangled with the mechanical locking mechanisms of the unit.

For lowering of the CCTV Camera design the locking system such that by first tightening the winch cable it will allow the latching arms to re-set into a static state so that when the winch is reversed it will cause the locking arms to release so that the CCTV Camera can be lowered. For raising of the CCTV Camera design the locking system such that by first tightening the winch cable it will allow the latching arms to re-set into a static state so that when the winch is reversed it will cause the locking arms to engage so that the CCTV Camera will be supported in its operational state. When the CCTV Camera is in its operational state, ensure that all weight and pulling forces are removed from the winch cable. Design the unit with a tracking guide pin to align the bottom moving halve with the top stationary halve to ensure proper alignment of the connector pins and mechanical locking features of the unit.

Provide a protective shell around the Camera Connection Unit constructed of aluminum or other approved materials.

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C. Metal Frame and Winch Assembly

Provide a portable metal-frame with winch assembly that can be temporarily fasten and secured to the pole structure and connected to the winch cable to facilitate lowering and raising of the CCTV Camera. Ensure the metal frame and winch's combined weight is less than 35 pounds. Provide a quick release cable connector to secure the winch cables to one another. Ensure the winch is of a design that includes an adjustable safety clutch that incorporates a positive braking mechanism to secure the cable reel during raising and lowering operations to prevent freewheeling and has gearing that reduces the manual effort required to operate the manual lifting handle (handle crank) to raise and lower the load.

The physical process of lowering or raising the CCTV Camera shall be accomplished through a handle crank supplied with the lowering unit or via a portable lowering device to operate the winch assembly such as a variable-speed reversible electric drill or a lowering unit with a built-in electrical motor.

All lowering equipment shall be manufactured of durable, corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to corrosive environment. All pulleys installed for the lowering device and portable tool must have sealed self-lubricated bearings, oil-tight bronze bearings or sintered bronze bushings.

D. Variable Speed Drill

Furnish a half-inch chuck, variable-speed reversible industrial-duty electric drill that matches the manufacturer-recommended revolutions per minute or supply the metal frame with winch with a permanently attached 120 Volt electric motor. If required furnish an adapter to transition from hand crack operation to portable drill operation.

14.3. CONSTRUCTION METHODS

Assemble the CCTV lowering systems internal components inside the metal pole cavity, consisting of the winch cable, pulleys and other hardware. Secure the support arm to the metal pole using stainless steel bolts, washers and hardware and tightened to specifications provide by the manufacturer. Fish the winch cable through the metal pole and out the support arm and thought the upper halve of the connection unit and secure the winch cable to the bottom halve of the connection unit. Terminate the PoE cable to the molded termination block located in the upper connection unit. Ensure that the lower halve of the connection unit, with the CCTV Camera attached, aligns with the upper halve of the connection unit. Ensure the completed assembly aligns correctly and that the power and PoE termination points align correctly, and that the installation will not allow the unit to twist when subject to sustained 140 MPH wind speeds.

Provide 1.25-inch-diameter PVC conduit inside the metal pole cavity and install the power and data cable. Ensure the PoE cable is supported with a strain relief sleeve and routed in such a manner that it will not come into contact with the winch cable and its pully system once installed.

14.4. MEASUREMENT AND PAYMENT

CCTV Camera Lowering System will be measured and paid as the actual number of CCTV Camera Lowering Systems furnished, installed, integrated and accepted.

Variable Speed Drill will be measured and paid as the actual number of Variable Speed Drills furnished, installed and accepted.

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No payment will be made for PVC conduits installed inside the CCTV Pole, winch cable, metal frame and winch assembly, camera connection unit, support sleeves, pully and any other hardware as these will be considered incidental to furnishing and installing a CCTV Camera lowering System.

Payment will be made under:

CCTV Camera Lowering System .....Each

Variable Speed Drill .....Each

15. ELECTRICAL SERVICE FOR ITS DEVICES

15.1. DESCRIPTION

Install new electrical service equipment as shown in the plans. Installation of all new electrical service pedestals, poles, and meter base/disconnect combination panels shall be the first item of work on this project 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.

15.2. MATERIAL

A. Meter Base/Disconnect Combination Panel

Furnish and install new NEMA Type 3R meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum 100AA main service disconnect and a minimum of eight (8) additional spaces. Furnish a single pole 15A circuit breaker at CCTV locations. Furnish a double pole 50A circuit breakers at single DMS locations. Furnish a double pole 80AA circuit breakers at dual DMS locations. Furnish a double pole 60A circuit breaker at hub locations requiring 240V service, or a single pole 80A circuit breaker at hub locations requiring 120V service. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Place barriers so that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Meter base/disconnect combination panel shall be 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

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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:

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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

B. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish a single pole 15A circuit breaker at CCTV locations. Furnish double pole 50A circuit breaker at single DMS locations. Furnish double pole 80A circuit breaker at dual DMS locations. Furnish a double pole 60A circuit breaker at hub locations requiring 240V service, or a single pole 80A circuit breaker at hub locations requiring 120V service. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

C. 10KVA Single Phase General Purpose Transformer

As shown on the Plans, furnish and install a double-wound, dry type general purpose transformer to isolate the line side voltages from the load side voltages as shown in the Plans. Provide the transformer with the following specifications:

- Primary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- Secondary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- 10 kVA power rating.
- Electrostatic shielding between primary and secondary windings.
- Epoxy-silica encapsulated core and coil.
- Copper windings and copper lead wire terminations.

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- Multiple front and bottom knockout for conduit entry/exit.
- Ground studs for conduit bonding.

Provide the transformer in a NEMA 3R enclosure suitable for mounting to a metal or wood pole.

D. 3-Wire Copper Service Entrance Conductors

Furnish 3-wire stranded copper service entrance conductors with THWN rating. Provide conductors with black, red, and white insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

E. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper feeder conductors with THWN rating for supplying power to ITS field equipment cabinets. Provide conductors with black or red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

F. Grounding System

Furnish 5/8”x10’ copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

15.3. 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. 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.

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C. 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.

D. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 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.

E. 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 as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

F. Grounding System

Install ground rods as indicated in the Plans. Connect the #4 AWG grounding conductor to ground rods using an irreversible mechanical crimping method. 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.

15.4. MEASUREMENT AND PAYMENT

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, wood post, exposed vertical conduit runs to the cabinet, 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.

3-Wire copper service entrance conductors will be incidental to furnish and installing the meter base/disconnect combination panel. <u>All other required feeder conductors will be paid for separately.</u>

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, wood post and any remaining hardware and conduit to connect the equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet subpanel.

3-Wire copper feeder conductors will be measured and paid as the actual linear feet of 3-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage of combined conductors after all

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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 irreversible mechanical crimping tool as this 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**
Meter Base/Disconnect Combination Panel	Each
Equipment Cabinet Disconnect	Each
3-Wire Copper Feeder Conductors	Linear Foot

16. OBSERVATION PERIOD FOR ITS DEVICES

16.1. 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

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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, etc.)

16.2. 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.

FAMS Data shall be submitted electronically to the Engineer and ITS Design team ten business days prior to the final inspection. The FAMS Data documentation shall include, but is not limited to: final location and depth of conduits, junction box depth and locations, coupler locations, wiring external to the cabinets, locations of splice enclosures, modifications to device locations, SMFO cable terminations, and OTDR readings. 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.

Provide a digital copy of all the information required to populate the point feature classes in NCDOT’s Fiber Asset Management System (FAMS) Tool Microsoft spreadsheet template “NAME” that is available on the ITS Design Resources website. If revisions to the FAMS Data occur after the final inspection, updated as-built plans shall be resubmitted to the Engineer and ITS Design Team within thirty (30) calendar days.

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 and FAMS data.

16.3. 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.

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Project Special Provisions
Structure

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NORTH CAROLINA PROFESSIONAL SEAL 052027 ENGINEER TOM M. FORD

Signed by: Tom Ford 381F69D0AD9743D...

10/1/2026

STRUCTURE SPECIAL PROVISIONS
PROVISIONS INDICATED WITH [A]

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

Signed by: John C. Morrison C957B167F93242D...

10/1/2026

STRUCTURE SPECIAL PROVISIONS
PROVISIONS INDICATED WITH [B]

NORTH CAROLINA PROFESSIONAL SEAL 027799 ENGINEER ALLYSON K. ORR

Signed by: Allyson K. Orr B4F5C8BFAFC24CF...

10/1/2026

STRUCTURE SPECIAL PROVISIONS
PROVISIONS INDICATED WITH [C]

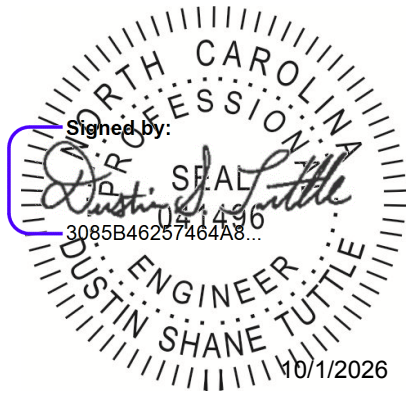
NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JILLA I. BREWER

Signed by: Jilla I. Brewer F889AE34D16E462...

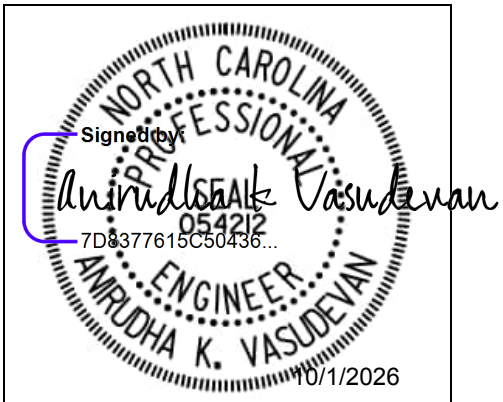
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STRUCTURE SPECIAL PROVISIONS
PROVISIONS INDICATED WITH [G]



STRUCTURE SPECIAL PROVISIONS
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FALSEWORK AND FORMWORK (11-30-23)

GENERAL

Use this Special Provision as a guide to develop temporary works submittals required by the *Standard Specifications* or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

DESIGN REQUIREMENTS

(A) Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

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If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab. For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

For link slabs, the top of girders directly beneath the link slab shall be free of overhang falsework attachments or other hardware. Submit calculations and working drawings for overhang falsework in the link slab region.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

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Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the current edition of AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

(1) Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

(2) Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the *Standard Specifications* and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent surface damage.

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Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
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		

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(B) Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the *Standard Specifications* apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

(A) Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

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(B) Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

MEASUREMENT AND PAYMENT

Unless otherwise specified, *Falsework and Formwork* will not be directly measured.

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

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SUBMITTAL OF WORKING DRAWINGS (1-31-25)

GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this Special Provision. For this Special Provision, "submittals" refers to only those listed in this Special Provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the contract. Make submittals that are not specifically noted in this provision directly to the Engineer. Either the Structures Management Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Engineer, Structures Management Unit contacts or the Geotechnical Engineering Unit contacts noted below.

To facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

ADDRESSES AND CONTACTS

For submittals to the Structures Management Unit, use the following addresses:

Via Email: SMU-wdr@ncdot.gov (do not cc SMU Working Drawings staff)

Via US mail:

Mr. D. N. Snoke, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. D. N. Snoke, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7 (Eastern Regional Office):

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Via Email: EastGeotechnicalSubmittal@ncdot.gov

Via US mail:

Mr. Thomas Santee, P. E.
Assistant State Geotechnical
Engineer – Eastern Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. Thomas Santee, P. E.
Assistant State Geotechnical
Engineer – Eastern Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14 (Western Regional Office):

Via Email: WestGeotechnicalSubmittal@ncdot.gov

Via US mail or other delivery service:

Mr. Eric Williams, P. E.
Assistant State Geotechnical
Engineer – Western Region
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's website, via the "Drawing Submittal Status" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "Geotechnical Construction Submittals" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: James Bolden (919) 707 – 6408
jlbolden@ncdot.gov
Secondary Structures Contacts: Madonna Rorie (919) 707 – 6508
mlrorie@ncdot.gov
Eastern Regional Geotechnical Contact (Divisions 1-7):
Thomas Santee (984) 920-8901
EastGeotechnicalSubmittal@ncdot.gov

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Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (980)258-6400
WestGeotechnicalSubmittal@ncdot.gov

SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit a copy of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit as specified in the tables below.

The first table below covers "Structure Submittals." The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers "Geotechnical Submittals." The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structures Management Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Submittal Required by Structures Management Unit?	Submittal Required by Geotechnical Engineering Unit?	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	Y	N	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	Y	N	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	Y	Y	Article 410-4
Foam Joint Seals [6]	Y	N	"Foam Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	Y	N	"Expansion Joint Seals"
Expansion Joint Seals (modular)	Y	N	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	Y	N	"Strip Seal Expansion Joints"

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Falsework & Forms [2] (substructure)	Y	N	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	Y	N	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	Y	N	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	Y	N	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	Y	N	Plan Note
Metal Stay-in-Place Forms	Y	N	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	Y	N	Article 1072-8
Miscellaneous Metalwork [4,5]	Y	N	Article 1072-8
Disc Bearings [4]	Y	N	"Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	Y	N	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	Y	N	Article 420-20
Prestressed Concrete Box Beam (detensioning sequences) [3]	Y	N	Article 1078-11
Precast Concrete Box Culverts	Y	N	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	Y	N	Article 1078-11
Prestressed Concrete Deck Panels	Y	N	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	Y	N	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	Y	N	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	Y	N	Article 420-3

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Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	Y	N	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	Y	N	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	Y	N	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	Y	N	Article 1072-8
Temporary Detour Structures	Y	Y	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	Y	N	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications.*
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

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GEOTECHNICAL SUBMITTALS

Submittal	Submittals Required by Geotechnical Engineering Unit	Submittals Required by Structures Management Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	Y	N	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	Y	N	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	Y	N	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	Y	N	Subarticle 450-3(F)(3)
Retaining Walls [4]	Y; drawings and calculations	Y; drawings	Applicable Provisions
Temporary Shoring [4]	Y; drawings and calculations	Y; drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications.*

2. Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email), US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.

3. The Pile Driving Equipment Data Form is available from:
   https://connect.ncdot.gov/projects/construction/ConstManRefDocs/PILE%20DRIVING%20EQUIPMENT%20DATA%20FORM.pdf
   See second page of form for submittal instructions.

4. Electronic copy of submittal is required. See referenced provision.

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CRANE SAFETY (12-5-25)

GENERAL

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

(A) Competent Person: Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

(B) Riggers: Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.

(C) Crane Inspections: Inspection records for all cranes shall be current and readily accessible for review upon request.

(D) Certifications: Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

MEASUREMENT AND PAYMENT

No direct payment will be made for providing information, certifications and documentation required for *Crane Safety*.

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GROUT FOR STRUCTURES (12-1-17)

GENERAL

This Special Provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This Special 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 Special Provision.

MATERIAL REQUIREMENT

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the *Standard Specifications.*

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3-day compressive strength is achieved.

SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease, and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

MEASUREMENT AND 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.

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MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURE AT STATION **(08-13-04)**

GENERAL

Maintain traffic on routes (see table) as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance per the table below at all times during construction.

Bridge No. (Plan Str. #)	Bridge ID Station	Route Intersected	Min. Temp. Vertical Clearance
100182 (01)	23+93.3 -Y1-	I-26 / I-240 (-L-)	17’-0"
100905 (02)	19+17.50 -Y2RPB-	Hominy Creek Rd (-Y8-)	15’-0”
100208 (03)	45+58.00 -L-	Hominy Creek Rd (-Y8-)	15’-0”
100206 (04)	45+42.50 -L-	Hominy Creek Rd (-Y8-)	15’-0”
100906 (05)	28+46.00 -Y2RPC-	Hominy Creek Rd (-Y8-)	15’-0”
100242 (06)	22+70.15 -Y2-	I-26 / I-240 (-L-)	14’-5” or existing, whichever is greater
100900 (09)	105+49.43 -L-	State St (-Y14-)	15’-0”
100901 (10)	105+49.43 -L-	State St (-Y14-)	15’-0”

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

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.

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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.

MEASUREMENT AND PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

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TEMPORARY BENTS (11-30-23)

GENERAL

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 current edition of *AASHTO Guide Design Specification for Bridge Temporary Works* (including 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.

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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.

MEASUREMENT AND PAYMENT

Temporary Bents will not be directly measured, unless otherwise specified. Payment will be full compensation at the contract unit prices for the various pay items requiring temporary bents.

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APPLICATION OF BRIDGE COATING (8-29-19)

GENERAL

This work consists of preparing and cleaning concrete and galvanized surfaces as well as furnishing and applying a colored base coating with a compatible anti-graffiti finish coating to the surfaces described herein. The base coating and anti-graffiti coating shall be applied to all surfaces indicated on the plans or as directed by the Engineer and shall be applied only after the surface preparation specified herein has been completed, inspected and approved by the Engineer.

Alternate coating methods may be submitted for review and approval.

MATERIALS

The base coating shall be compatible with the anti-graffiti finish coating and must be designed specifically for coating galvanized surfaces or damp, uncured concrete. The coating material shall be delivered to the job site in sealed containers bearing the manufacturer's original labels. The brand, color, and type shall be clearly marked on each container. A copy of the manufacturer's Materials Safety Data Sheet and a copy of the manufacturer’s printed instructions shall be presented to the Engineer at the time of delivery.

The coating material shall be stored in airtight, upright containers. The containers shall be stored in a dry location where the temperature remains above 40° F and less than 100° F.

The coating material shall have a shelf life of not less than 12 months. After application, the base coating shall be dry to the touch within 48 hours and shall achieve a final cure within 2 to 3 weeks under ideal conditions. After application, the anti-graffiti coating shall be dry to the touch within one (1) hour and shall achieve a final cure within three (3) hours.

The color of the base coating shall be in accordance with the Federal Standard 595. Colors and areas of application shall be as follows:

(A) Superstructure

FS 33522 (Light Tan) or similar color approved by the Engineer shall be applied to the tops and exterior faces of the barrier rails, exterior vertical edges of deck.

FS 30372 (Dark Tan) or similar color approved by the Engineer shall be applied to vertical and underside faces of exterior girders, deck soffit overhang.

(B) Substructure

FS 30372 (Dark Tan) or similar color approved by the Engineer shall be applied to all exposed substructure elements, excluding top surfaces of bent and end bent caps and concrete slope protection.

(C) Fascia Panels on Bridges 7-10 and back of barrier rail at Bridge 8

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On stone formliners: use a four-color mix and distribution as follows: Federal Color FS#33522 – 40%, #30372 – 35%, #20095 – 15%, #24064 – 10% (light tan to dark brown). On smooth surfaces: FS 33522.

The color of the anti-graffiti coating shall be clear after full cure.

Provide one gallon of graffiti remover, thinners, dryers and all necessary components recommended by the manufacturer to the North Carolina Department of Transportation Materials and Tests Unit, Chemical Testing Engineer.

MATERIAL TESTING AND CERTIFICATION

Before coating material is applied, a Type 2 certification shall be supplied attesting that the product furnished is in accordance with the same formula as that previously subjected to the tests specified below and approved. Copies of the current tests reports shall be attached to the certification. Reports for tests made more than four (4) years prior to shipment to the project site will not be accepted.

All testing shall be performed by a qualified commercial testing laboratory that has been approved by the North Carolina Department of Transportation Materials and Tests Unit.

The applied coating shall be subjected to and shall satisfy the requirements of the tests listed below, prior to use on the structure.

(A) Freeze-Thaw

(1) Three (3) concrete specimens, not less than 4 inches by 6 inches by 6 inches, of the mix design for the structure shall be cast and cured. Fourteen (14) days moist curing with a drying period at room temperature, 60° F to 80° F, for 24 hours will be required before applying the coating material to the specimens. Caution shall be taken that there be no excessive oil on specimen forms. The coating shall be applied to the sides of specimens at a spreading rate of 50 ± 10 square feet per gallon. Brush application will be permitted. Cementitious coatings shall be cured at room temperature and 30 percent relative humidity for 24 hours, at room temperature and 90 percent relative humidity for 48 hours, at room temperature and 50 percent relative humidity for four (4) days for a total curing time of seven (7) days.

(2) The specimens shall be immersed in water at room temperature for three (3) hours, then removed.

(3) The specimens shall be placed in cold storage at -15°F for one (1) hour and then removed.

(4) The specimens shall be thawed at room temperature for one (1) hour.

(5) Steps 3 and 4 shall be repeated for a total of 250 cycles. At the end of 250 cycles, the specimens shall show no visible defects.

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(B) Accelerated Weathering

Coating shall be subjected to a 7,500 hour exposure test in a Twin-Carbon-Arc-Weatherometer, ASTM G 23, Type D, at an opening temperature of 145° F. The test shall be made at 20-minute cycles consisting of 17 minutes of light and 3 minutes of water spray plus light. At the end of the exposure test, the exposed samples shall show no chipping, flaking, or peeling. The panels for this test shall be prepared by applying the coating at a spreading rate of 50 ± 10 square feet per gallon to both sides and edges of panels cut from asbestos cement shingles in accordance with Federal Specification SS-S-346, Type I. Curing time shall be in accordance with Freeze-Thaw Test curing time.

(C) Fungus Growth Resistance

Coating shall pass a fungus resistance test in accordance with Federal Specification TT-P-29g. Fungus growth shall not be indicated after a minimum incubation period of 21 days.

(D) Abrasion Resistance

Coating shall pass the 2,000 liter sand abrasion test in accordance with Method 6191 Abrasion Resistance-Falling Sand, Federal Test Method Standard 141a, ASTM D968-81. The specimens for this test shall be prepared by applying the coating to a cleaned steel panel at a spreading rate of 50 ± 10 square feet per gallon. The specimens shall be cured at room temperature for 21 days.

(E) Impact Resistance

Coating shall be applied to a concrete panel prepared according to Federal Test Method Standard 141a, Method 2051, at a spreading rate of 50 ± 10 square feet per gallon and allowed to cure for 21 days at room temperature. The test shall then be run using the Gardner Mandrel Impact Tester in accordance with ASTM D 2794 using a one-half inch indenter with an impact load of 6 inch-pounds. The coating shall show no chipping under this impact load.

(F) Salt-Spray Resistance

A concrete specimen shall be coated at the rate of 50 ± 10 square feet per gallon and cured for 21 days at room temperature. The coated specimen shall be exposed to a 5 percent salt solution in accordance with ASTM B 117 for 2,500 hours where the atmospheric temperature is maintained at 90° ± 2 °F. At the end of 2,500 hours of exposure, the coating shall show no ill effects, loss of adhesion, or deterioration.

(G) Flexibility

A sheet metal specimen shall be coated at a rate of 50 ± 10 square feet per gallon and allowed to cure for 48 hours at room temperature. The coated specimen shall be bent 180 degrees over a one inch round mandrel. After bending, the coating shall show no breaking.

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In addition to the certification and test reports required above, a service record shall be supplied showing that the coating material has a satisfactory service record on concrete and, when applicable, galvanized surfaces for a period of not less than five (5) years prior to the date of submission of the service record. The coating shall also have shown satisfactory service characteristics without peeling, chipping, flaking, and non-uniform change in texture or color. The structure for the specific product shall be named in the service record.

In addition to the above requirements, each batch delivered to the project shall be sampled and tested for color and the following product analysis data submitted:

(a) Weight per gallon
(b) Viscosity in Kreb units
(c) Weight percent pigment
(d) Weight percent vehicle solids
(e) Infrared spectra of vehicle solution
(f) Drying time

SURFACE PREPARATION

Prepare concrete surfaces and galvanized surfaces in accordance with Section 420-17(B) and Section 442-13 of the *Standard Specifications*, respectively, or the manufacturer's recommendations, whichever is more restrictive. All surfaces to be coated shall be free of efflorescence, flaking coatings, dirt, oil, curing compounds, release agents and other deleterious substances prior to the application of the coating.

Concrete curing compounds and release agents must be removed. Water blasting will be allowed; however, the blasting operation must not remove or damage the concrete.

Prior to application of the coating, all concrete surfaces to be coated shall be sprayed with water. If the water soaks into the concrete surfaces, the coating may be applied once all surfaces dry. If the water beads up and is repelled, the surfaces require further cleaning before application of the coating.

APPLICATION

The coating application, including equipment used, shall be in accordance with the manufacturer's recommendations. The coating shall be applied by qualified personnel with previous experience similar to the work outlined in the contract plans.

The material shall be thoroughly mixed in its original container and shall not be thinned. Containers with coatings that have formed skins shall not be permitted for use.

The base coating may be applied over damp, but not wet concrete surfaces and shall be applied at a rate of 50 ± 10 square feet per gallon. The application rate shall produce a uniform color texture. The base coating shall be applied only when the ambient temperature is between 40° F and rising, and 100° F. It shall not be applied over frozen surfaces or if rain is imminent. If a freshly applied surface is damaged by rain, re-coating may be necessary based on the Engineers assessment of the damage.

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Schedule the application of the base coating as one of the final finishing operations or when construction-generated dust will be minimal. To prevent lap marks, a wet edge shall be maintained at all times. Stopping and starting in mid-sections will not be allowed. Start or end at natural breaks in the surface, i.e. at a panel edges, corners or joints. When applying the base coating with a roller, the material shall be applied in vertical strokes initially, cross rolled for even film and appearance, and then finished with vertical strikes.

Apply the anti-graffiti coating by brush, roller or airless spray when the ambient temperature is between 45° F and 90° F, and the surface temperature is between 50° F and 100° F. Ensure the surface is clean and dry before applying the anti-graffiti coating.

FINISHED PRODUCT

All coating material in the finished state shall be capable of accommodating the thermal and elastic expansion ranges of the concrete or, when applicable, galvanized surfaces without cracking.

The texture of the completed finish coat shall be similar to that of rubbed concrete. The completed finished coating shall be tightly bonded to the structure and present a uniform appearance and texture. Additional coats may be required by the Engineer in order to produce the desired surface texture and uniformity.

Coatings shall be entirely removed from the structure and reapplied if there is failure to positively adhere as evident by chipping, flaking, peeling, or the desired surface appearance is not achieved.

The average thickness of the completed finish coating shall not exceed ⅛". The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

MEASUREMENT AND PAYMENT

Application of Bridge Coating will be paid for at the contract unit price bid per square foot and will include full compensation for surface preparation, furnishing and applying the materials, labor, equipment and any incidentals necessary to complete this work.

The quantity of applied bridge coating, consisting of base coating and anti-graffiti coating material, to be paid for will be the actual square feet of coating that has been applied and accepted.

Payment will be made under:

Pay Item	**Pay Unit**
Application of Bridge Coating	Square Foot

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ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site and must maintain accurate "as built" plans.

MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, four (4) inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with three (3) set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with three (3) set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers with a middle section consisting of a

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rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow eight (8) inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with three (3) set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 “Rigid Nonmetallic Conduit.” Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states “Install Print Line Up” to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white “tracer” duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 “Rigid Nonmetallic Conduit.”

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the *Standard Specifications*.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

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Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the *Standard Specifications.*

INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the *Standard Specifications*.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of two (2) inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

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MEASUREMENT AND PAYMENT

No direct measurement will be made for the conduit system since it will be paid for on a lump sum basis.

Electrical Conduit System for Signals at Station _____ will be made at the contract lump sum price.

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Pay Item	**Pay Unit**
Electrical Conduit System for Signals at Station _____	Lump Sum

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DISC BEARINGS (2-3-14)

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.

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 ⅛". Ensure that all

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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	 2,000 3,700	- - - -
Tensile Strength psi	D412	5,000	- - - -
Ultimate Elongation %	D412	220	- - - -
Compression Set % 22 hrs. at 158°F	D395	- - - -	40

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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:

(A) On polyether urethane structural element: 5,000 psi

(B) On PTFE Sliding Surface, filled or unfilled PTFE (recessed): 3,500 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.

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.

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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) A maximum measured sliding coefficient of friction of 3%.

(b) 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:

a. 0.04 unfilled PTFE

b. 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

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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.

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.

MEASUREMENT AND PAYMENT

Disc Bearings will be paid at the lump sum contract price bid for 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.

Payment will be made under:

Pay Item	**Pay Unit**
Disc Bearings	Lump Sum

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THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the *Thermal Sprayed Coatings (Metallization) Program* and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The *Thermal Sprayed Coatings (Metallization) Program* is available on the Materials and Tests Unit website.

QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the *Thermal Sprayed Coatings (Metallization) Program*.

MATERIALS

Use only materials meeting the requirements of Section 7 of the *Thermal Sprayed Coatings (Metallization) Program.*

SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the *Thermal Sprayed Coatings (Metallization) Program.* Apply TSC with the alloy to the thickness specified on the plans or as required by *Thermal Sprayed Coatings (Metallization) Program*.

INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the *Thermal Sprayed Coatings (Metallization) Program.*

REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the *Thermal Sprayed Coatings (Metallization) Program*.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic

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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.

(3) Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

TWELVE MONTH OBSERVATION PERIOD

All TSC materials applied under the *Thermal Sprayed Coatings (Metallization) Program* shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

MEASUREMENT AND PAYMENT

The contract price bid for the metal component to which the TSC is applied will be full compensation for the thermal sprayed coating.

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EXPANSION JOINT SEALS (9-30-11)

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.

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"

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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 three (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.

SHOP DRAWINGS

Submit nine (9) sets of working drawings to the Engineer for review, comments and acceptance. Show complete details drawn to scale and include:

(A) The proposed template details including the makeup of the template

(B) The proposed method of holding the base angle assembly in place while concrete is cast around it

(C) The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening

(D) The proposed chronology of installation including the sequence and direction of the concrete casting

(E) 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.

(F) The proposed method for removing the hold-down plate

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(G) 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.

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.

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.

(A) Watertight Integrity Test

(1) 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.

(2) 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.

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(3) If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

(4) If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no extra cost to the Department.

MEASUREMENT AND PAYMENT

Expansion Joint Seals will be paid for at the lump sum contract price. 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.

Payment will be made under:

Pay Item	Pay Unit
Expansion Joint Seals	Lump Sum

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STRIP SEAL EXPANSION JOINTS (06-25-20)

GENERAL

This Special Provision covers furnishing and installing strip seal expansion joints as shown on the contract drawings and in accordance with this Special Provision, the *Standard Specifications* and the manufacturer's recommendation. All materials, labor, equipment, and incidentals necessary for proper installation of the strip seal expansion joints are included.

MATERIALS

Provide strip seal expansion joints capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans. The components of the expansion joint include steel retainer rails and a neoprene seal gland.

The steel retainer rails shall consist of a "P" shape profile configuration with anchor studs welded to the concrete face. The rails shall have a minimum height of 8 inches, a minimum thickness of ½ inch and a maximum top surface (at the riding surface) width of 2 inches. Use AASHTO M270 Grade 36 or Grade 50 steel for the steel retainer rails.

The neoprene gland shall be extruded synthetic rubber with virgin polychloroprene as the only polymer. The gland manufacturer shall provide a Type 4 certification, in accordance with the *Standard Specifications*, attesting the gland has been tested and meets the following minimum properties:

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS
Tensile Strength, psi (min.)	ASTM D412	2,000
Elongation at break, % (min.)	ASTM D412	250
Hardness, Type A durometer, points	ASTM D2240 Modified	60 ± 10
Oven aging, 70h @ 212°F Tensile strength, % change (max.) Elongation, % change (max.) Hardness, points change (max.)	ASTM D573	 –20 –20 0 to +10
Oil Swell, ASTM Oil No. 3, 70h @ 212°F Weight change, % (max.)	ASTM D471	45
Ozone resistance 20% strain, 300 pphm in air 70h @ 104°F	ASTM D1149 Modified	No cracks
Low temperature stiffening, 7 days @ 14°F Hardness, Type A durometer, points change	ASTM D2240	0 to +15
Compression Set, 70h @ 212°F (max.)	ASTM D395 Method B (modified)	40%

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SHOP DRAWINGS

Submit a set of complete shop drawings to the Engineer via email for review, comments and acceptance and carbon copy (cc) the Structures Management Unit Working Drawing Review Group (SMU-wdr@ncdot.gov). Send the drawings well in advance of the scheduled installation time for the strip seal expansion joint rail. Prior to submitting the shop drawings, have someone, other than the draftsman who prepares the drawings, check all detailed drawings and include the signatures of both the draftsman and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor.

Steel retainer rails shall consist of one-piece construction including upturns. Welding two (2) or more components to obtain the required cross-sectional shape is not permitted. Show all dimensions, anchor stud locations, welded splice details, splice locations and any other details or data necessary to fabricate the joint on the shop drawings. Include the joint model number and joint movement range. Draw all details to scale. Identify, in detail, welding procedures to be performed in fabricating the joint. As a minimum, also show the following on the drawings:

(A) All field splice locations. Steel retainer rail field splices are only permitted at crown points, locations with abrupt changes in the deck slab cross slope, and at travel lane lines. Splices within travel lanes are not permitted and splicing on edge lines is not required. For the location of travel lane markings at the strip seal expansion joint, see the structure plans. At the field splice locations, locate the horizontal stud anchors 3 inches from the centerline of the splice.

(B) Details of the shipping device for the steel retainer rail assemblies. Ensure the device is capable of resisting shipping and handling forces without causing damage to the steel retainer rail assemblies or metallized coating.

(C) The method of supporting steel retainer rails horizontally and vertically during joint installation and placement of concrete to ensure stability and proper alignment. Ensure the method is capable of resisting construction forces without causing damage to the steel retainer rail assemblies or metalized coating and are adjustable to account for variable temperature settings. Place supports near field splices of steel retainer rails to ensure that splices are straight and even.

(D) The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening.

(E) The proposed installation procedure including the sequence and suggested direction of the concrete pour(s).

(F) The proposed mechanism to allow joint translation after the deck pour.

(G) A section through the joint detail showing horizontal offset dimensions of the steel retainer rails from the centerline of the joint. This detail is required when the vertical face of the joint opening is not perpendicular to the roadway surface (e.g. when the roadway grade is significant).

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FABRICATION

Fabricate the strip seal joint components in accordance with the approved shop drawings and the plans.

Splice sections of steel retainer rail in the shop to obtain required lengths. Do not use short pieces of steel retainer rail less than 6 feet long unless required at curbs, sidewalks or staged construction locations. Splices in an individual steel retainer rail are only permitted where a construction joint is specifically required by the plans, joint segment length exceeds 50 feet, or approved by the Engineer in writing.

At splice locations where changes in deck slab cross slope occur, cut the ends of steel retainer rails parallel to the bridge centerline for skews less than 80° and greater than 100°.

Provide a neoprene gland that is compatible with the steel retainer rail. Produce a single continuous neoprene gland for the entire length of the joint. When necessary, only vulcanized splicing of the gland in the shop is permitted. Ensure the convolution(s) of the gland does not project above the top of the steel retainer rails when the ambient temperature results in the minimum joint opening.

SHIPMENT

Bolt the steel retainer rails together in the shop to form matching pairs. Clearly mark each pair to identify where they are to be placed. Ship the neoprene gland(s) together with the steel retainer rail(s) and clearly mark them to identify where they are to be placed.

INSTALLATION

Install the strip seal expansion joint in accordance with the plan details, this Special Provision, the *Standard Specifications,* and the manufacturer's recommended installation procedures. Have a manufacturer's representative present during installation of the joint.

Install the steel retainer rail assemblies at proper grade and alignment. See contract drawings for width of joint opening.

Bolt, weld or clamp steel retainer rail assemblies in position using temporary or sacrificial brackets as required. Do not use temporary or sacrificial support brackets, bolts, clamps, etc. between the faces of the steel retainer rails. Do not weld within two (2) inches of steel retainer rail surfaces exposed in the completed structure. Do not weld strip seal expansion joint components to reinforcing steel or structural steel.

For staged construction, install steel retainer rail assemblies in a given subsequent stage to align with those installed in an adjacent prior stage after deflection and rotation due to deck casting of adjoining spans has occurred.

Protect metalized steel retainer rail assemblies during screeding operations per the manufacturer's recommendations. Provide temporary blocking material in the steel retainer rail seal cavities to prevent concrete intrusion during deck pour and finishing.

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Loosen any temporary or sacrificial support brackets, bolts, clamps, etc. that span across the joint after initial set of concrete, but not more than two hours after conclusion of concrete placement.

Install the neoprene gland after completion of deck casting. Use a single continuous neoprene gland for the entire length of the joint. Field splicing of the neoprene gland is not permitted. Remove all joint form material and blocking material prior to installing the gland. Field install the gland in accordance with manufacturer's recommendations. Thoroughly coat all contact surfaces between the gland and the steel retainer rail seal cavities with an adhesive lubricant before setting the gland in place. Use lubricant adhesive that conforms to ASTM D4070 and is compatible with manufacture's strip seal expansion joint to attach neoprene gland to the steel retainer rails.

INSPECTION

The Engineer inspects the joint system for proper alignment and proper stud placement and attachment. If any aspect of the strip seal expansion joint is deemed unacceptable, make the necessary corrections.

When concrete is cast, use a non-aluminum, 10 foot, true-to-line straight-edge to check and grade the top of the slab on each side of the joint to ensure smooth transition between spans.

(A) Watertight Integrity Test

(1) Upon completion of each strip seal expansion joint, perform a watertight integrity test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.

(2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The strip seal expansion joint is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not considered a sign of leakage.

(3) If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

(4) If measures to eliminate leakage are taken, perform a subsequent watertight integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no additional cost to the Department.

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MEASUREMENT AND PAYMENT

Strip Seal Expansion Joints will be paid for at the lump sum contract price. Payment will be full compensation for furnishing all material, including any steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the strip seal expansion joint in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

Payment will be made under:

Pay Item	Pay Unit
Strip Seal Expansion Joints	Lump Sum

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MASS CONCRETE **(3-13-2026)**

GENERAL

This Special Provision applies to substructure components excluding drilled piers (e.g. footings, columns, caps, etc.) 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 fly ash or ground granulated blast furnace slag in the amount of 25% by weight of the total cementitious material (portland cement plus fly ash). 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 (3)

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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 (6) 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 (2) 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.

MEASUREMENT AND PAYMENT

Payment for this work shall be included in the unit contract price bid for the class of concrete that includes the mass concrete.

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ASBESTOS ASSESSMENT (11-30-23)

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

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.

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.

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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

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

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:

https://epi.dph.ncdhhs.gov/asbestos/ahmp.html

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MEASUREMENT AND PAYMENT

Asbestos Assessment Payment will be paid at the lump sum contract unit price and will be full compensation for all asbestos inspections, reports, permitting and notifications.
Payment will be made under:

Pay Item	Pay Unit
Asbestos Assessment	Lump Sum

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DEMOLITION PLAN FOR PEDESTRIAN BRIDGE REMOVAL (11-30-23)

GENERAL

In addition to the requirements of Sub article 402-2(D)(1) of the *Standard Specifications*, when specified in the plans, furnish demolition plans that are prepared and sealed by a professional engineer licensed in the State of North Carolina.

PLAN REQUIREMENTS

The demolition plan shall include a structural analysis for all phases of the demolition with regard to the condition of the structure at the time the work is performed. The structural analysis shall be performed on the strength and stability of the structure based on the methods and sequence of demolition proposed, to ensure that the structure is demolished in a safe and controlled manner. Design and submit details of temporary supports, shoring or temporary bracing, if required to stabilize portions of partially remaining structures during the removal sequence or support partially remaining structures after staged removals. The demolition plan shall include design computations and detail drawings for all temporary supports, shoring or bracing, verification of design loads, attachment details, and methods for the safe transfer of loads from existing structural elements to be removed to the temporary supports, shoring, or bracing.

MEASUREMENT AND PAYMENT

No separate payment will be made for demolition plans. The demolition plans shall be compensated under the *Removal of Existing Structure(s) at Station* __ pay items.

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PRECAST CONCRETE FASCIA PANELS (SPECIAL)

GENERAL

This work consists of the prefabrication and installation of custom concrete fascia panels to give the visual appearance of an arched bridge opening at bridges 100898, 100899, 100900, and 100901. This work includes, but is not limited to, installation of anchor bolts in the edge of the barrier rail, field-measuring of superstructure and substructure geometry in its as-constructed condition, preparation of PE-sealed working drawings for the panels, connection members, and bracing, precasting of sand-lightweight concrete panels with formliner and re-usable lifting hooks, installing the panels, and applying bridge coatings to panels, in accordance with the plans and provisions. A detailed work plan shall be submitted for review prior to ordering materials or beginning construction of the bridge.

Alternate attachment methods may be submitted for review and approval. In this case, the Contractor assumes all responsibility for the panel, bracing, barrier rail connection, and deck overhang. The load to the deck and exterior girder shall not exceed the weight of the panel and connections as shown in the contract plans.

WORKMANSHIP

The Precast Concrete Fascia is intended to create the visual appearance of an arch bridge opening. As such, the contractor shall take close care to provide and install the panels in such a way as to provide uniform and consistent surfaces and textures, continuous lines, equal and plumb expansion joints between panels, and other means necessary to provide a finished product to the satisfaction of the Engineer.

A detailed plan of how this will be provided shall be included in the work plan.

MATERIALS

The base coating shall be compatible with the anti-graffiti finish coating and must be designed specifically for coating galvanized surfaces or damp, uncured concrete.

Concrete Fascia panels

Sand-lightweight concrete in accordance with Standard Specifications Section 1000-3 with a maximum cured unit weight of 115 pounds per cubic foot.

Panels shall be formed using a formliner surface treatment to give a dry-stacked stone appearance. Formliner pattern / relief, colors, workmanship shall be in accordance with the “Architectural Concrete Surface Treatment (Bridge)” special provision, except that the full cost for providing a formliner surface treatment on the precast fascia panels shall be included in the lump sum cost for Precast Concrete Fascia.

Panels shall be cast such that the formliner pattern is continuous between adjacent panels. Utilize match-casting type processes to ensure the formliner and panels maintain a continuous pattern and geometry.

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Anchor Bolts – Barrier Rail

Anchor bolts in barrier rail shall meet the requirements of ASTM F593, stainless steel, Alloy Group 2, CW2 condition with coil anchor inserts equivalent to the Dayton Superior C2 coil hanger saddle type. The coil anchor inserts shall be installed in accordance with the manufacturer's specifications and be capable of providing a base tension strength of 3,600 lbs, per bolt (strength condition).

Anchor bolts – panel to bracing, girder to bracing

Anchor bolts connecting the panel to the WT shape panel connector member shall meet the requirements of ASTM A449. Nuts shall meet the requirements of AASHTO M291-DH or AASHTO M292-2H. Washers shall meet the requirements of AASHTO M293. Bolts, nuts, and washers shall be galvanized in accordance with the Standard Specifications.

Studs in Panel

Studs welded to the WT5x34, which is a part of the connection of the panel to the barrier, and embedded in the panel shall be Type B (65 ksi) shear stud connectors and meet the requirements of AWS D1.1.

Connection bolts

Bolts used to connect WT shapes and bent plates to the angle bracing member and barrier connection member shall be ASTM F3125 Grade A325 bolts. Tension on the A325 bolts shall be calibrated using direct tension indicator washers in accordance with the Standard Specifications. Galvanize the high strength bolts, nuts, washers, and direct tension indicators in accordance with the Standard Specifications.

Bracing and Barrier Connection members

WT shape panel connector member shall be ASTM A992 steel. Angle bracing member and bent plate girder connector member shall be ASTM A572 Grade 50 steel. All plates and members shall be galvanized or metallized in accordance with the Standard Specifications. For thermal sprayed coatings (metallization), see the special provision for metallization.

Coating on Panels

Coating on panels shall be applied in accordance with the “Application of Bridge Coating” special provision, except that all cost for materials, testing, installation, and incidentals associated with coating on the precast fascia panels is paid for as part of the lump sum cost for Precast Concrete Fascia.

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SEQUENCE OF OPERATIONS

This sequence of operations shall be followed but does not relieve the contractor of the responsibility to ensure that all operations are completed in a safe and workmanlike manner. Deviations or alternative methods may be submitted to the Engineer for review as part of the work plan.

Work Plan

A work plan, detailing materials, processes, sources, and other items as noted in the special provision shall be submitted for review at least 90 days prior to beginning construction of the bridge or ordering any materials for the precast concrete fascia. All shop drawings shall be PE-sealed by an engineer licensed in the State of North Carolina.

Forming and casting of bridge barrier rail

It is permissible to adjust barrier rail reinforcement as necessary to clear the coil anchor inserts at the direction of the Engineer.

As-built measurement of top of deck and anchor bolt, mock fit-up

The barrier rail shall be cast prior to completing this step.

The contractor shall obtain as-built measurements to aid in working drawing preparation for the panels. Measurements shall include, at a minimum:

- Location of anchorages in barrier rail in plan view, measured off of a fixed point on the deck.
- Location of anchorages vertically. Report any deviations outside of tolerance from the plans to the engineer.
- Top of deck profile
- Top of MSE wall coping under the bridge, where the precast fascia panel will cross.
- Location of girder ends relative to deck reference point.

Report any deviations outside of tolerance from the plans to the engineer. Any corrective adjustments shall be at the expense of the Contractor.

Measurements shall be used to prepare mock panel fit-up specimens and panels.

Template and mock fit-up

A template specimen shall be made for each panel out of wood or similar material, to simulate the top 2’ of panel height. Templates shall be used to determine the exact location of the embedded anchorage in the panel. The Template shall be the panel width at the top.

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A mock fit-up of each panel template shall be performed prior to casting any panels.

Utilizing measurements obtained and in conjunction with the plans, locate the girder attachments for the bracing and determine the required length of bracing members.

Panel fabrication

Using measurements and the templates, develop working drawings for each panel, detailing all dimensions needed to form the panels. Adjust panel heights as necessary such that the bottom of the panel follows the profile shown in the plans and the top of the panel projects 1’ above the top of the deck at all locations. Include specific reinforcement patterns and details, in accordance with minimum reinforcement requirements in the plans. Submit working drawings for review and approval prior to ordering materials or beginning fabrication of panels.

Panels shall include lifting hooks in the top, which shall be capable of carrying the weight of the panel in accordance with applicable codes. The lifting hooks shall be recessed into the top of the panel, at least 6” from the location of an anchor bolt. The lifting hook recess shall be capped after construction such that the cap can be removed. Provide a watertight seal, using silicone or similar material, to prevent water from entering or ponding within the lifting hook recess. Lifting hook material shall be stainless steel.

Provide formliner in accordance with this provision at the locations shown in the plans.

Use templates to ensure that cast-in bracing connection bolts are located properly.

Fabricate panels in accordance with the plans and shop drawings.

After panel fabrication is complete, measure the panels and bracing bolt locations.

Panel erection

Erect the panels. Support the panel independently of the bridge until all anchor bolt nuts are secured, bracing is attached and bolts are fully-tightened. Release the weight of the panel gradually onto the bridge.

Seal the gap between adjacent panels after all panels are erected with a flexible silicone.

Finishing

Provide surface coatings and stain to formliner area in accordance with applicable provisions.

MEASUREMENT AND PAYMENT

Precast Concrete Fascia at Sta ____ will be paid for at the contract lump sum price and will include full compensation for furnishing and applying the materials, labor, equipment and any incidentals necessary to complete this work.

Payment will be made under:

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Pay Item	**Pay Unit**
Precast Concrete Fascia at Sta. _____	Lump Sum

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CAP END AESTHETIC **(SPECIAL)**

GENERAL

This work consists of installing a recessed artwork "city logo" on the right end of the Bent 1 stage 1 cap and left end of Bent 1 stage 2 cap, by way of a formliner. After curing of the concrete, the recessed area shall be coated in accordance with this provision with a colored base coating. Anti-graffiti coating is not required. Coating shall be required within the recessed area "city logo."

The Contractor shall submit to the Engineer for approval the means to achieve the aesthetic relief (recessed area) and coating prior to ordering materials or construction of the bent cap.

Alternate coating methods may be submitted for review and approval.

RECESSED ARTWORK

At the ends of the Bent 1 cap, install via a formliner a recessed image, in accordance with the plans. Care shall be taken to ensure no honeycombing or voids are present within the recessed artwork. Utilize a formliner to achieve the relief.

The Engineer shall inspect and approve the formliner positioning and dimensions prior to pouring of concrete.

After curing and formwork removal, the Engineer shall inspect the relief area. Any damage due to formwork removal, poorly consolidated concrete, or other cause shall be repaired to the satisfaction of the Engineer at no additional cost.

After acceptance of the relief area, coat the recessed area in accordance with this provision.

COATING MATERIALS

The coating must be designed specifically for coating damp, uncured concrete, and shall be on the NCDOT Approved Products List. The coating material shall be delivered to the job site in sealed containers bearing the manufacturer's original labels. The brand, color, and type shall be clearly marked on each container. A copy of the manufacturer's Materials Safety Data Sheet and a copy of the manufacturer's printed instructions shall be presented to the Engineer at the time of delivery.

The coating material shall be stored in airtight, upright containers. The containers shall be stored in a dry location where the temperature remains above 40° F and less than 100° F.

The coating material shall have a shelf life of not less than 12 months. After application, the base coating shall be dry to the touch within 48 hours and shall achieve a final cure within 2 to 3 weeks under ideal conditions.

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The color of the coating shall be in accordance with the Federal Standard 595. Colors and areas of application shall be as follows:

Cap End Aesthetic

20095 (Dark Bronze) or similar color approved by the Engineer shall be applied to the recessed area of the cap end aesthetic artwork in accordance with the plans.

Anti-graffiti coating is not required.

COATING MATERIAL TESTING AND CERTIFICATION

A service record shall be supplied showing that the coating material has a satisfactory service record on concrete surfaces for a period of not less than 5 years prior to the date of submission of the service record. The coating shall also have shown satisfactory service characteristics without peeling, chipping, flaking, and non-uniform change in texture or color. The structure for the specific product shall be named in the service record.

In addition to the above requirements, each batch delivered to the project shall be sampled and tested for color and the following product analysis data submitted:

(a) Weight per gallon
(b) Viscosity in Kreb units
(c) Weight percent pigment
(d) Weight percent vehicle solids
(e) Infrared spectra of vehicle solution
(f) Drying time

COATING SURFACE PREPARATION

Prepare concrete surfaces and galvanized surfaces in accordance with Section 420-17(B) and Section 442-13 of the Standard Specifications, respectively, or the manufacturer's recommendations, whichever is more restrictive. All surfaces to be coated shall be free of efflorescence, flaking coatings, dirt, oil, curing compounds, release agents and other deleterious substances prior to the application of the coating.

Concrete curing compounds and release agents must be removed. Water blasting will be allowed; however, the blasting operation must not remove or damage the concrete.

Prior to application of the coating, all concrete surfaces to be coated shall be sprayed with water. If the water soaks into the concrete surfaces, the coating may be applied once all surfaces dry. If the water beads up and is repelled, the surfaces require further cleaning before application of the coating.

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COATING APPLICATION

The coating application, including equipment used, shall be in accordance with the manufacturer's recommendations. The coating shall be applied by qualified personnel with previous experience similar to the work outlined in the contract plans.

The material shall be thoroughly mixed in its original container and shall not be thinned. Containers with coatings that have formed skins shall not be permitted for use.

The base coating may be applied over damp, but not wet concrete surfaces and shall be applied at a rate of 50 ± 10 square feet per gallon. The application rate shall produce a uniform color texture. The base coating shall be applied only when the ambient temperature is between 40° F and rising, and 100° F. It shall not be applied over frozen surfaces or if rain is imminent. If a freshly applied surface is damaged by rain, re-coating may be necessary based on the Engineer's assessment of the damage.

Schedule the application of the base coating as one of the final finishing operations or when construction-generated dust will be minimal. To prevent lap marks, a wet edge shall be maintained at all times. Stopping and starting in mid-sections will not be allowed. Start or end at natural breaks in the surface, i.e. at a panel edges, corners or joints. When applying the base coating with a roller, the material shall be applied in vertical strokes initially, cross rolled for even film and appearance, and then finished with vertical strikes.

FINISHED COATING PRODUCT

All coating material in the finished state shall be capable of accommodating the thermal and elastic expansion ranges of the concrete or, when applicable, galvanized surfaces without cracking.

The texture of the completed finish coat shall be similar to that of rubbed concrete. The completed finished coating shall be tightly bonded to the structure and present a uniform appearance and texture. Additional coats may be required by the Engineer in order to produce the desired surface texture and uniformity.

Coatings shall be entirely removed from the structure and reapplied if there is failure to positively adhere as evident by chipping, flaking, peeling, or the desired surface appearance is not achieved.

The average thickness of the completed finish coating shall not exceed 1/8 of an inch.

MEASUREMENT AND PAYMENT

"Cap End Aesthetic" will be measured per each "city logo" installed at the end of the cap and will include the entire work to produce the stained (coated) recessed "city logo", including formliners and formwork, coating materials, testing, containment, labor, clean-up and any incidentals necessary to complete the work to the satisfaction of the Engineer. No separate payment will be made for reinforcing steel or concrete associated with the bent cap.

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Payment will be made under:

Pay Item	**Pay Unit**
Cap End Aesthetic	Each

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ARCHITECTURAL CONCRETE SURFACE TREATMENT (BRIDGE) (SPECIAL)

GENERAL

The work covered by this special provision consists of constructing textured surfaces on exterior faces of concrete parapets, concrete barrier rail, and precast concrete fascia panels as shown on the plans and in this Special Provision. The architectural concrete surface treatment shall only apply to specific bridges as noted in the plans. The Contractor shall furnish all materials, labor, equipment, and incidentals necessary for the construction of architectural concrete surface treatment using simulated stone masonry form liners (molds), a compatible concrete coloring system, and a compatible anti-graffiti finish coating.

Except where otherwise specified, textured concrete surfaces shall be constructed using deep form lining materials and patterns to match the appearance (stone size and shape, stone color, and stone texture, pattern, and maximum 1.5" relief) of a dry stack stone pattern as specified and approved by the Engineer. The approved test panels/samples shall be the referenced standard. The form liner product shall match the pattern and texture as specified and described in the sample.

The contractor is required to use the same source of form liner and coloration contractor to construct the textured surfaces. For information purposes only, a manufacturer of form liners and source of color application artist is Sika Greenstreak, 3400 Tree Court Industrial Boulevard, St. Louis, Missouri 63122, Telephone 800-325-9504. The intended treatment should be close in appearance to No. 439, "Sierra Drystack" and treated with a four-color mix and distribution as follows: Federal Color FS#33522 – 40%, #30372 – 35%, #20095 – 15%, #24064 – 10% (light tan to dark brown).

SUBMITTALS

Shop Drawings - The Contractor shall submit for review and acceptance, plan and elevation views and details showing overall simulated stone pattern, joint locations, form tie locations, and end, edge or other special conditions. The drawings should include typical cross sections of applicable surfaces, joints, corners, stone relief, stone size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the shop drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Shop drawings should be of sufficient scale to show the detail of all stone and joints patterns. The size of the sheets used for the shop drawings shall be 22" x 34".

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. Special attention should be given to details for wrapping form liners around corners. Shop drawings shall be reviewed and accepted prior to fabrication of form liners.

Sample Panels – After the shop drawings have been reviewed and accepted by the Engineer, the Contractor shall construct 24" x 24" transportable sample panel(s) at the project site. The

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materials used in construction of the sample panel(s) shall comply with section 420 of the Standard Specifications. The sample panel(s) shall be constructed using approved form liners. Sample panels will be required for each different form liner pattern that is to be used on the project. Any sample panel that is not accepted by the Engineer is to be removed from the project site and a new sample panel produced at no additional expense to the Department.
Architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the accepted sample panel(s). Upon acceptance by the Engineer, the sample panel(s) shall be used as the quality standard for the project. After the acceptance of the completed structure, the Contractor shall dispose of the sample panels as directed by the Engineer.

MATERIAL REQUIREMENTS

Form Liner – The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system and shall not compress more than ¼" 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.

Form Release Agent – Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product. Form release agents shall be compatible with the color system applied and any special surface finish.

Form Ties - Form ties shall be set back a minimum of 2" from the finished concrete surface. The ties shall be designed so that all material in the device to a depth of at least 2" back of the concrete face (bottom of simulated mortar groove) can be disengaged and removed without spalling or damaging the concrete. The Contractor shall submit the type of form ties to the Engineer for approval.

Concrete color system/stain – Special surface color system shall be performed using approved coloring systems/stains suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color system shall be in multiple colors of gray, brown, tan, white and black to achieve a full, natural color variation in the finished surface. The approved sample panel shall be the basis for determining the appropriate color/stain application.
The coloring agent shall be a penetrating stain mix or other approved coloring system with a compatible finish 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 colors are subject to acceptance by the Engineer.

Anti-Graffiti Coating – This coating shall be compatible with the concrete color system/ stain. After application, the anti-graffiti coating shall be dry to the touch within 1 hour and shall achieve a final cure within 3 hours. The color of the anti-graffiti shall be clear after full cure. Provide one gallon of graffiti remover, thinners, dryers and all necessary components recommended by the manufacturer to the North Carolina Department of Transportation Materials and Tests Unit, Chemical Testing Engineer.

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Quality Standards - Manufacturer of simulated stone masonry form liners and custom coloring system shall have at least five years of experience making stone masonry molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors. The Contractor shall schedule a pre-installation conference with manufacturer representative and the Engineer to assure understanding of simulated stone masonry 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 simulated stone masonry manufacturer and final coloration contractor at the Preconstruction Conference.

CONSTRUCTION

Form Liner Preparation – 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 Liner Attachment – Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼" seam. Blend form liner butt joints into the stone 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 stone pattern.

Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects. Wall ties shall be coordinated with the form liner system.

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 – Form release agent shall be applied in accordance with the manufacturer's recommendations. The material shall be compatible with the form liner material and the concrete coloring system and in accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

Surface Finish – All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces to be accomplished by pressure washing with water set at 3000 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.
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

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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.
Reinforced 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.

Grout pattern joints – Grout pattern joints shall be constructed to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

Color/Stain Application – Finished concrete and patches shall stand in place 30 days after form liners are removed prior to application of coloring/staining agent. 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 trained in the special techniques to achieve realistic surface appearances. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

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.

Anti-Graffiti Coating Application - The coating shall be applied after full cure of the color coating. Apply the anti-graffiti coating by brush, roller or airless spray when the ambient temperature is between 45° F and 90° F, and the surface temperature is between 50° F and 100° F. Ensure the surface is clean and dry before applying the anti-graffiti coating. The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

Experience and Qualifications - The Contractor shall have a minimum of three consecutive years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 5 references who were responsible for supervision of similar projects and will testify to the successful completion of these projects. Include name, address, telephone number, and specific type of application.

BASIS OF PAYMENT

Architectural concrete surface treatment as described on the plans and in this Special Provision will be paid for at the contract unit price bid for "Architectural Concrete Surface Treatment (Bridge)". The above price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and shall include, but not be limited to, furnishing all labor, materials, equipment, and other incidentals including sample panels, coloring and anti-graffiti coating necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Architectural Concrete Surface Treatment (Bridge)	Square Foot

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SOUND BARRIER WALL (BRIDGE MOUNTED) (SPECIAL)

DESCRIPTION

This work consists of furnishing planks, structural steel, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision on the bridge including the approach slabs and the panels to the first ground supported posts at ends of approach slabs.

Provide post spacing consistent with the plans. Post spacing exceeding the values shown in the plans will not be allowed. Post spacing varies in the plans due to geometrical constraints. The weight of the sound barrier in its entirety shall not exceed the value provided in the contract documents.

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. Soil elevation at approach slabs shall be kept a minimum of 3" below bottom of wall panel.

ALTERNATE POST SPACING

As an alternate, the Contractor may submit plans for post spacing other than shown for review and approval. A submittal reducing the post spacing shall include the plank material and design specifications. The submittal shall also include an elevation view depicting the revised post spacing and proposed top of wall elevations. The proposed top of wall elevations shall be equal to or greater than the plan dimensions.

Submit two sets of detailed plans for review. Include all details in the plans, including the size, spacing and materials of required piles. Have a North Carolina Registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for use as the Sound Barrier Wall (Bridge Mounted) planks. Wall plank design details and materials must meet the design and construction requirements of the project and the applicable loadings except that the wall is not required to meet the traffic loading requirements. Wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications, except that traffic loading shall not be applied to the sound barrier wall.

The wall shall meet the following aesthetic requirements in addition to those noted within the contract plans. The traffic and non-traffic faces of the wall planks shall be configured such that the only the post flanges extend beyond the face of the planks as shown in the plans such that a uniform surface is visible from the traffic and non-traffic sides of the wall. This uniform

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surface appearance is to extend from the top of wall to the bottom of the vertical post members as shown in the plans. The bottom of the wall shall be detailed for free and complete drainage of wall areas. Additionally, the plank configuration proposed shall allow for visual inspection of the post to concrete barrier rail bolts from the bottom of the wall without the need to remove any components.

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 components.

Have a North Carolina Registered Professional Engineer check, seal and date the plans and, when requested, calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

MATERIALS AND FABRICATION

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures. The structural planks for the Sound Barrier Wall (Bridge Mounted) are to have the following properties:

Flexural Strength	57,000 psi	ASTM D-790
Tensile Strength	60,000 psi	ASTM D-638
Compressive Strength	65,000 psi	ASTM D-695
Tensile Modulus	3,500,000 psi	ASTM D-638
Flexural Modulus	1,600,000 psi	ASTM D-790
Specific Gravity	1.88 (typ)	ASTM D-792

The structural planks are to be colored and shall be uniform throughout the pultruded composite. The color is to be approved by the Engineer before the planks are delivered to the jobsite. The structural planks shall exhibit good workmanship and shall be free of burrs, cracks or other objectionable marks which would adversely affect the barrier's performance or serviceability. The color of planks, posts, and hardware shall be Federal Color FS#37769.

The structural planks shall exhibit good workmanship and shall be free of burrs, cracks or other objectionable marks which would adversely affect the barrier's performance or serviceability. All cracked, discolored, burned or damaged structural planks will be rejected either at the fabrication shop or the construction site even after installation, but prior to acceptance of the project.

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The structural steel is to meet the requirements of the Standard Specifications. The posts, backing angles, bolts, nuts and washers are to be painted to match the structural planks. The paint system as described in Section 442 of the Standard Specifications and the Structural Steel Shop Coatings shall by System 1, with the exception that the surfaces are not to be cleaned to an SSPC SP-10 finish after being galvanized and the top coat color is to be as noted on the contract plans and approved by the Engineer. After erection, the bolts, nuts, and washers are to be primed by brush, then the entire support system of posts, backing angles, bolts, nuts and washers are to be top-coated. The structural planks are to be masked so no overspray or spatters occur. The Contractor is to provide 3 samples of paint close to the color of the structural planks to the Engineer for his selection of the final color. The limits of the painting are from the top of the posts to the bottom of the lowest plank.

CONSTRUCTION METHODS

The erection of the sound barrier components shall not begin until the concrete in the bridge railing has reached a minimum compressive strength of 3,000 psi. Install posts as shown on the plans or in the accepted submittals with a tolerance of 1/2 inch per foot from vertical or as necessary to conform to the plank design if more restrictive.

WORKING DRAWINGS

Submit plank design calculations and specifications for approval prior to purchasing the plank materials. Submit metalwork fabrication drawings for approval prior to fabrication of steel wall components. This submittal shall clearly indicate access for visual inspection of the post attached bolts. Submit an erection plan and plank support components, for review and acceptance prior to fabrication of metalwork. Submit five sets of detail drawings.

METHOD OF MEASUREMENT

The quantity of Sound Barrier Wall (Bridge Mounted), to be paid for will be the completed and accepted wall, according to the limits shown on the plans.

BASIS OF PAYMENT

The quantity of Sound Barrier Wall (Bridge Mounted) measured as provided above, will be paid for at the contract unit price for “Sound Barrier Wall (Bridge Mounted)”.

The price bid will be full compensation for all work covered by this Special Provision including, but not limited to, furnishing panels, structural steel, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, and erecting and installing the sound barrier wall components.

Payment will be made under:

Pay Item	**Pay Unit**
Sound Barrier Wall (Bridge Mounted)	Lump Sum

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BRIDGE MOUNTED CHAIN LINK FENCE (SPECIAL)

Construct the chain link fence in accordance with the applicable sections of the Standard Specifications, the details shown on the plans and this special provision.

The quantity of chain link fence will be the actual number of linear feet of fence, measured in place from end post to end post, which has been completed and accepted. All posts used for the chain link fence are included in the price of the fence and will not be paid for separately. There will be no measurement made for installing adhesive anchors in concrete barrier rail as such work is considered incidental.

Work includes but is not limited to furnishing and installing fence fabric, tie wires, stretcher bars, stretcher bar bands, tie rods, turnbuckles, brace rails, posts, post caps, brackets, adhesive anchors, fittings and any other materials necessary to complete the work as described in the plans and this special provision.

Payment will be made under:

Pay Item	Pay Unit
72” Chain Link Fence	Linear Foot

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ANODIZED TWO BAR METAL RAIL (SPECIAL)

DESCRIPTION

Provide anodized two bar metal rails, dark bronze (AMS-STD-595 color 20095), in accordance with the Standard Specifications, the details shown in the contract plans, and this Special Provision.

MATERIAL

The aluminum two bar metal rail shall conform to the requirements of Section 460 of the *Standard Specifications* and the drawing requirements. Color shall be achieved via an anodizing process after all sections have been fully fabricated. Contractor shall submit anodizing process to engineer for approval prior to fabrication.

MEASUREMENT AND PAYMENT

Quantity paid for is the actual number of linear feet of anodized railing, complete in place and accepted, measured along the rails.

The quantity for which payment is made is shown in linear feet on the plans for "Anodized Two Bar Metal Rail". The unit bid per linear foot is full compensation for all materials, painting, tools, labor, equipment, and incidentals necessary to complete this item.

Payment will be made under:

Pay Item	**Pay Unit**
Anodized Two Bar Metal Rail	Linear Foot

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ELECTRICAL CONDUIT SYSTEM FOR LIGHTING (SPECIAL)

GENERAL

The work covered by this section consists of furnishing and installing a conduit system embedded in the 1'-2" x 3'-3" Concrete Parapet. The conduit system in the bridge rail includes anchor bolts for light standard attachment by others. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC), and Division 14 of the North Carolina Department of Transportation "Standard Specifications for Roads and Structures."

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

Non-metallic conduit shall be rigid PVC (Polyvinyl chloride) heavy wall approved for above ground and underground use without concrete encasement per U.L. 651 "Rigid Non-Metallic Conduit". Use Terminations designed for PVC conduit, to seal and stub out each PVC conduit, and to provide watertight protection.

Provide expansion joints of the appropriate size as noted in the plans. Expansion joints shall be weatherproof and provide 4" minimum of conduit movement.

Type SW junction box shall be NEMA type-4 cast iron, hot-dipped galvanized with recess flange for flush mounting sized as shown on the plans. It shall have a neoprene gasketed cover with brass or stainless steel screws and shall be suitable for a watertight installation. A mounting button with a blind tapped bolt hole shall be provided on the interior for future connection of a grounding lug. The junction box shall have a replaceable checkered cover of a standardized design so that replacement can be done without disturbing the box or conduit system.

Use mastic that is permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

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Provide jute that is burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply, with tensile strength of (2540 pounds) minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

The light standard manufacturer shall provide anchor bolts, nuts, washers and shims.

INSTALLATION

Securely fasten all conduit and boxes prior to placing any concrete. After the conduit is encased in concrete, clean each conduit by snaking with a steel band that has an approved tube cleaner, equipped with mandrel of diameter not less than 85% of the nominal inside diameter of the conduit. To ensure against corrosion in the areas where hot dipped galvanizing has been damaged, cover all raw metal surfaces with cold galvanized, zinc rich paint.

Stub the conduit out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the conduit. Place backfill in accordance with Section 300-7 of the Standard Specifications. Conduit may enter junction boxes through field drilled holes protected with zinc rich paint before the conduit is inserted. Use threaded adapter and insulating bushing at all junction box to conduit connections. Install a pull line, in each conduit for future use. Leave sufficient slack for attachment of a rope that will be used to install conductors. Coordinate electrical conduit system work with work by others. Allow installation of circuitry and light standards as directed by the Engineer.

Install anchor bolts according to light standard manufacturer’s recommendations. Protect exposed threaded portion of anchor bolts, to guard against damage from concrete installation.

The Engineer must inspect and approve all work before concealment.

BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for “Electrical Conduit System for Lighting at Station 22+70.15 -Y2-”.

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

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Pay Item	Pay Unit
Electrical Conduit System for Lighting at Sta. 22+70.15 -Y2-	Lump Sum

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CONCRETE BARRIER RAIL WITH MOMENT SLAB AT SOUND BARRIER WALL **(SPECIAL)**

DESCRIPTION

Construct Concrete Barrier Rail with Moment Slab at Sound Barrier Wall in accordance with the plans, accepted submittals and Sections 420 and 460 of the Standard Specifications. Do not remove slab falsework until concrete achieves a minimum compressive strength of 2400psi.

Concrete Barrier Rail with Moment Slab at Sound Barrier Wall shall use the standard 42" concrete barrier rail to allow for the connection of the Sound Barrier Wall in like manner to the Sound Barrier Wall attachment on the bridge and approach slab. The cost of the concrete barrier rail and sound barrier wall shall be included in the cost of the Concrete Barrier Rail with Moment Slab at Sound Barrier Wall.

Furnish planks, structural steel, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision on the moment slab including the panels to the first ground supported posts at ends of moment slab.

The Moment Slab with Sound Barrier Wall plans allow for 11'-0" maximum post spacing for Sound Barrier Wall with heights of up to 10'-0" from top of moment slab, 10'-3" maximum for heights of up to 15'-0", and 6'-11" maximum for heights of up to 18'-6". Greater post spacing will not be permitted. Provide post spacing consistent with the plans. The weight of the sound barrier in its entirety shall not exceed the value provided in the contract documents.

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 off the bridge. Top of wall elevation changes that result in a jagged appearance will not be allowed.

ALTERNATE POST SPACING

As an alternate, the Contractor may submit plans for post spacing other than shown for review and approval. A submittal reducing the post spacing shall include the plank material and design specifications. The submittal shall also include an elevation view depicting the revised post spacing and proposed top of wall elevations. The proposed top of wall elevations shall be equal to or greater than the plan dimensions.

Submit two sets of detailed plans for review. Include all details in the plans, including the size, spacing and materials of required piles. Have a North Carolina Registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

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WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for use as the Concrete Barrier Rail with Moment Slab at Sound Barrier Wall planks. Wall plank design details and materials must meet the design and construction requirements of the project and the applicable loadings except that the wall is not required to meet the traffic loading requirements. Wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications, except that traffic loading shall not be applied to the sound barrier wall.

The wall shall meet the following aesthetic requirements in addition to those noted within the contract plans. The traffic and non-traffic faces of the wall planks shall be configured such that only the post flanges extend beyond the face of the planks as shown in the plans such that a uniform surface is visible from the traffic and non-traffic sides of the wall. This uniform surface appearance is to extend from the top of wall to the bottom of the vertical post members as shown in the plans. The bottom of the wall shall be detailed for free and complete drainage of wall areas. Additionally, the plank configuration proposed shall allow for visual inspection of the post to concrete barrier rail bolts from the bottom of the wall without the need to remove any components.

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 components.

Have a North Carolina Registered Professional Engineer check, seal and date the plans and, when requested, calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

MATERIALS AND FABRICATION

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures. The structural planks for the Concrete Barrier Rail with Moment Slab at Sound Barrier Wall are to have the following properties:

Flexural Strength	57,000 psi	ASTM D-790
Tensile Strength	60,000 psi	ASTM D-638
Compressive Strength	65,000 psi	ASTM D-695
Tensile Modulus	3,500,000 psi	ASTM D-638

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Flexural Modulus	1,600,000 psi	ASTM D-790
Specific Gravity	1.88 (typ)	ASTM D-792

The structural planks are to be colored and shall be uniform throughout the pultruded composite. The color is to be approved by the Engineer before the planks are delivered to the jobsite.

The structural planks shall exhibit good workmanship and shall be free of burrs, cracks or other objectionable marks which would adversely affect the barrier's performance or serviceability. All cracked, discolored, burned or damaged structural planks will be rejected either at the fabrication shop or the construction site even after installation, but prior to acceptance of the project.
The structural steel is to meet the requirements of the Standard Specifications. The posts, backing angles, bolts, nuts and washers are to be painted to match the structural planks. The paint system as described in Section 442 of the Standard Specifications and the Structural Steel Shop Coatings shall by System 1, with the exception that the surfaces are not to be cleaned to an SSPC SP-10 finish after being galvanized and the top coat color is to be as noted on the contract plans and approved by the Engineer. After erection, the bolts, nuts, and washers are to be primed by brush, then the entire support system of posts, backing angles, bolts, nuts and washers are to be top-coated. The structural planks are to be masked so no overspray or spatters occur. The Contractor is to provide 3 samples of paint close to the color of the structural planks to the Engineer for his selection of the final color. The limits of the painting are from the top of the posts to the bottom of the lowest plank.

CONSTRUCTION METHODS

The erection of the sound barrier components shall not begin until the concrete in the bridge railing has reached a minimum compressive strength of 3,000 psi. Install posts as shown on the plans or in the accepted submittals with a tolerance of 1/2 inch per foot from vertical or as necessary to conform to the plank design if more restrictive.

WORKING DRAWINGS

Submit plank design calculations and specifications for approval prior to purchasing the plank materials. Submit metalwork fabrication drawings for approval prior to fabrication of steel wall components. This submittal shall clearly indicate access for visual inspection of the post attached bolts. Submit an erection plan and plank support components, for review and acceptance prior to fabrication of metalwork. Submit five sets of detail drawings.

METHOD OF MEASUREMENT

The approximate quantity of Concrete Barrier Rail with Moment Slab at Sound Barrier Wall shown in the plans is an estimate based on the limits of the moment slab. No measurement for payment will be made for this pay item.

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BASIS OF PAYMENT

Concrete Barrier Rail with Moment Slab at Sound Barrier Wall will be paid for at the contract lump sum price for "Concrete Barrier Rail with Moment Slab at Sound Barrier Wall".

The price bid will be full compensation for all work covered by this Special Provision including, but not limited to, furnishing panels, structural steel, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, and erecting and installing the Concrete Barrier Rail with Moment Slab at Sound Barrier Wall components.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Barrier Rail with Moment Slab at Sound Barrier Wall	Linear Foot

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CONCRETE BARRIER RAIL WITH MOMENT SLAB AND LIGHT SUPPORT **(SPECIAL)**

DESCRIPTION

Construct concrete barrier rail connected to moment slabs and light support to resist traffic impact above retaining walls. Construct concrete barrier rail with moment slab in accordance with the contract and accepted submittals.

MATERIALS

Refer to Division 10 of the Standard Specifications

Item:	Section
Barrier Delineators	1088-2
Portland Cement Concrete	1000
Reinforcing Steel	1070

Concrete for the concrete barrier shall meet the requirements for Class AA concrete.

Class A concrete shall be used for moment slabs and light Support.

Provide epoxy coated reinforcing steel that meets Article 1070-7 of the Standard *Specifications* for vertical concrete barrier rail.

METHOD OF CONSTRUCTION

Construct concrete barrier rail with moment slab and light support in accordance with the plans and accepted submittals. Construct cast-in-place reinforced concrete moment slabs and Light Support in accordance with Section 420 of the Standard Specifications. Unless otherwise noted, construct concrete barrier rail and light support detailed in the plans using conventional forms or by slip-forming using an approved self-propelled extrusion machine. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi.

All exposed surfaces of the concrete barrier rail and light support which are not satisfactory to the Engineer as to uniformity of color and texture or because of excessive patching shall be corrected as required by the Engineer. Give the exposed faces of the concrete barrier rail and light support constructed using forms a Class 2 surface finish in accordance with Section 420-17(F) of the Standard Specifications. Use a broom finish on exposed faces of slip-formed concrete barrier rail being performed. The light post installation shall not begin until the concrete in the light support has reached a minimum compressive strength of 3,000 psi.

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MEASUREMENT AND PAYMENT

Concrete Barrier Rail with Moment Slab and Light Support will be measured and paid in linear feet. Concrete Barrier Rail with Moment Slab and Light Support will be measured as the length of concrete barrier rail installed and accepted. The contract unit price for Concrete Barrier Rail with Moment Slab and Light Support will be full compensation for submittals, labor, tools, equipment and concrete barrier with moment slab and light support materials, excavating, backfilling, hauling and removing excavated materials and supplying any incidentals necessary to construct the concrete parapet with moment slab.

There will be no direct payment for barrier rail delineators as they are incidental to the work being performed.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Barrier Rail with Moment Slab and Light Support	Linear Foot

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SOUND BARRIER WALL (SPECIAL)

GENERAL

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. Changes at the top of wall elevation that result in a jagged appearance will not be allowed.

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 (3) years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer three (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 (5) 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

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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.

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 (2) 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.

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 (2) 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.

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 (5) sets of detail drawings on 22" x 34" sheets.

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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.

MATERIALS AND FABRICATION OF STANDARD PRECAST PANELS

Provide materials and fabricate members in accordance with the requirements of Division 10 of the *Standard Specifications*. 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 their natural concrete color.

Furnish three (3) 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

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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.

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

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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.

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

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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.

MEASUREMENT AND PAYMENT

Sound Barrier Wall will be paid for at the unit price bid per square foot. Payment 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 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.

Architectural Surface Treatment will be paid at the unit price bid per square foot and 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.

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

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without architectural surface treatment, or piles in the measurement. Area of sample panels shall not be included in the measurement of architectural surface treatment.

Payment will be made under:

Pay Item	**Pay Unit**
Sound Barrier Wall No. ____	Square Foot
Architectural Surface Treatment (Sound Barrier Wall)	Square Foot

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SOUND ABSORPTIVE BARRIER WALL (SPECIAL)

DESCRIPTION

Sound absorptive barrier wall surface shall be approved by NCDOT. Unless noted otherwise, sound absorptive noise wall panels and sound absorptive barrier wall construction shall be precast panels as described in "Sound Barrier Wall" construction drawings and special provisions. Sound absorptive wall panels shall have the minimum sound absorptive design parameters:

Noise Absorptive: Panels shall have a noise reduction coefficient of 0.85 according to ASTM Method C423-90a.

BASIS OF PAYMENT

The quantity of sound absorptive barrier wall, 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 Absorptive 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 absorptive barrier wall members.

Payment will be made under:

Pay Item	Pay Unit
Sound Absorptive Barrier Wall No.___	Square Foot

Docusign Envelope ID: CF8B5021-867C-86A5-82C7-AEF5A25F01F9

TEMPORARY DECK DRAINAGE (SPECIAL)

1.0 DESCRIPTION AND APPLICABILITY

This provision covers the requirement of the Contractor to maintain bridge deck drainage on the bridges as directed in the plans (including temporary detour bridge) during construction to limit hydraulic spread to shoulder areas. The Contractor shall submit a plan in writing to the engineer 30 days prior to beginning construction on the subject bridge that addresses how temporary deck drainage will be provided and maintained during construction. No work may begin on the bridge until the plan is approved.

2.0 HYDRAULIC SPREAD DESIGN REQUIREMENTS

At all times during construction, the contractor shall ensure that hydraulic spread is limited to shoulder areas and does not encroach into the travel lanes, except for times and locations as specifically permitted by the Engineer. For every stage of construction, the Contractor shall provide for means to contain hydraulic spread due to rainfall runoff to the shoulder, in accordance with the pertinent Roadway, Work Zone Traffic Control, and/or Structure plans. Any deviations from the plans shall not be permitted except as in writing by the Engineer, and deviations shall demonstrate full compliance with all requirements. If the Contractor elects to use alternate methods to contain spread, a submittal to the Engineer shall be made that includes Working Drawings and calculations, both signed by a professional engineer licensed in the State of North Carolina. Determination of spread shall be in accordance with the North Carolina Department of Transportation “Guidelines for Drainage Studies and Hydraulic Design”, latest edition, and any applicable memos or revisions. No work may proceed until the plan is approved.

Hydraulic spread calculations may assume 0% blocked area in any drain, slot, or scupper when calculating spread for temporary conditions. See item 4.0 below for maintenance of drains.

3.0 HYDRAULIC SPREAD CONSTRUCTION LIMITATIONS

Hydraulic spread is typically controlled by permitting gutter flow to exit the gutterline via drains, scuppers, or horizontal slots in the barrier. Such means of exit are spaced as necessary to remove water from the gutter as engineering design indicates. The following measures shall be provided on the project:

1. Bridge on I240/I26 Right Lane over Hominy Creek, Stage 3 construction: The median-side Portable Concrete Barrier (anchored) shall provide drain slots in accordance with NCDOT Standard 1170.01 throughout the full length of the bridge and approach slab.
2. Bridge on I240/I26 Right Lane over Hominy Creek, Stage 3 construction (until traffic is placed in the final pattern): the left-side permanent barrier rail shall provide slots (8” wide x 4” tall) spaced at 4’-0” centers within the station ranges shown on the plans.

Any slots through the permanent barrier rails shall be closed at the completion of construction after traffic is placed into the final pattern. Utilize Type 3 grout material

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approved by the Materials and Tests Unit to close the slots. The Contractor shall include a method for closing the slots in the temporary deck drainage plan.

4.0 MAINTENANCE OF EXISTING DECK DRAINS, PROPOSED DECK DRAINS, TEMPORARY BARRIER SLOTS, OR OTHER MEANS OF DRAINING THE DECK

During all phases of construction, the Contractor shall be responsible for maintaining the free passage of water through any and all elements intended to drain the deck. Drainage elements shall be kept free of debris at all times.

5.0 WASHING OF THE DECK FOLLOWING APPLICATION OF DE-ICING SALTS AND ADVERSE WEATHER

During construction, deck runoff is not carried to below the bottom of the girders. After winter storm events where de-icing salts were applied to the deck, the Contractor shall temporarily plug all drainage elements and shall wash the deck with clean water and simultaneously vacuum wash water from the gutterlines to prevent wash water from leaving the deck surface. The Contractor shall make every reasonable effort to complete washing of the deck prior to the next rainfall event.

Such washing operations shall be designed to commence under a rolling road block or under lane closure as permitted by the Contract Transportation Management Plans and the Engineer. Washing operations shall not commence until after the winter storm has completed and shall be coordinated with NCDOT maintenance personnel. Washing operations may not take place during rain. Only drains in gutterlines adjacent to washing operations may be blocked temporarily, and drains must be opened to traffic immediately following the vacuuming of wash water.

Prior to construction, the Contractor shall submit to the Engineer for review and approval the methods for washing the deck, containing, and removing wash water.

6.0 MEASUREMENT AND PAYMENT

Maintenance of temporary deck drainage and hydraulic spread, maintenance of deck drainage elements during construction, and washing of the deck and containment of wash water shall be considered incidental to the construction. The closing of slots in the barrier shall be considered incidental to the cost of “Concrete Barrier Rail”. The Contractor shall receive no separate payment for any of these items.

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-24) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Water Resources, DEQ State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-13 of the *Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the restricted waters, wetlands or buffer zones, provided that activities outside those areas is done in such a manner as to not affect the restricted waters, wetlands or buffer zones.

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JOSH STEIN
GOVERNOR

DANIEL H. JOHNSON
SECRETARY

July 30, 2026

MEMORANDUM TO: Division Environmental and Construction Units

FROM: Michael A. Turchy, ECAP Group Leader
Environmental Analysis Unit

SUBJECT: Environmental Permits for the I-26 Asheville Connector from I-40 east of SR 1224, to US 19/23 near the Broadway St Interchange, Buncombe County, Division 13, **TIP: I-2513.**

Please find enclosed the following permits for this project:

Agency	Permit Type	Permit Expiration
US Army Corps of Engineers Section 404 Clean Water Act Permit	Individual Permit, dated 2/6/2024 *Authorizes construction of Sections AA, AB, and AC* *Does not authorize construction of Sections B, C, and D*	Dec. 31, 2034
	Individual Permit Modification, dated 6/26/2025 *Authorizes Geotechnical Investigations on Section BD*	
	Individual Permit Modification, dated 10/31/2025 *Authorizes Additional Utility Impacts on Section AA*	
	Individual Permit Modification, dated 7/17/2026 *Authorizes Construction of Sections B & D*	
NC Division of Water Resources Section 401 Water Quality Certification	Individual Cert. No. 006377, dated 10/30/2023 *Authorizes construction of Sections AA, AB, and AC* *Does not authorize construction of Sections B, C, and D*	Dec. 31, 2034
	Individual Certification Modification, dated 6/24/2025 *Authorizes Geotechnical Investigations on Section BD*	
	Individual Certification Modification, dated 10/9/2025 *Authorizes Additional Utility Impacts on Section AA*	
	Individual Certification Modification, dated May 20, 2026 *Authorizes Construction of Sections B & D*	

Work is authorized by the above referenced permit provided it is accomplished in strict accordance with the permitted plans.

The Environmental Coordination and Permitting Group or the Division Environmental Office must be consulted if any deviation from the permit(s) is required.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL ANALYSIS UNIT
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

Telephone: (919) 707-6000
Customer Service: 1-877-368-4968
Website: www.ncdot.gov

Location:
1000 BIRCH RIDGE DRIVE
RALEIGH NC 27610

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DEPARTMENT OF THE ARMY PERMIT

Permittee **NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**
ATTN: MR. MICHAEL A. TURCHY, ECAP GROUP LEADER

Permit No. **SAW-2004-9986803, STIP Project No. I-2513**

Issuing Office **CESAW-RG-D**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: **To construct STIP I-2513, the project involves the permanent discharge of fill material into 6,425 linear feet (lf) of streams and 1.22 acres of wetlands along the 7-mile project corridor in Buncombe County, North Carolina.**

Project Location: **STIP I-2513 is located in Asheville, Buncombe County, North Carolina, and is commonly referred to as the I-26 Connector. The I-26 Connector project would connect I-26 from I-40 in southwestern Asheville to US 19-23-70 in northwest Asheville and have a total length of approximately 7 miles. Center coordinates for the project are 35.5671, -82.5878.**

THIS IS A PHASED PERMIT AUTHORIZATION: This permit only authorizes work on Sections AA, AB, and AC of STIP I-2513 (Phase 1 of the project). The Permittee is authorized to impact regulated waters along Sections AA, AB, and AC of STIP I-2513 (Phase 1) as follows: the permanent discharge of fill material into 1,780 lf of streams and 1.12 acres of wetlands. The permittee is also authorized to temporarily impact 395 lf of streams during construction. Construction on the remaining sections/phases of STIP I-2513 (i.e., Sections I-2513 B, I-2513 C, and I-2513 D) shall not commence until: (a) final design for those sections/phases has been completed and submitted to the U.S. Army Corps of Engineers (Corps); (b) the Permittee has minimized impacts to waters and wetlands to the maximum extent practicable for those sections/phases and the Corps concurs with this assessment through standard Merger 4B and 4C meetings; (c) any modification(s) to the permit plans for those sections/phases have been approved by the Corps in writing; (d) NCDOT submits final versions of the Bridge Construction and Demolition Plan, River User Safety Plan, and Strategic Communication Plan that adequately address the Corps' Public Interest Review Factors (to include recreation, safety, navigation, and flood hazards); and (e) a final compensatory mitigation plan for those sections/phases has been submitted by the Permittee and approved by the Corps.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2034.** If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you

may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit,

Special Conditions:

SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit, Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

DocuSigned by:
Michael Turchy
3CFF2BCF59604C1...

05-February-2024

(PERMITTEE) **NC DEPARTMENT OF TRANSPORTATION**
ATTN: MR. MICHAEL A. TURCHY

(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Monte Matthews

2024.02.06 09:45:17 -05'00'

FOR

(DISTRICT COMMANDER) **BRAD A. MORGAN, COLONEL**

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)

(DATE)

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

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SPECIAL CONDITIONS
FEBRUARY 5, 2024
ACTION ID. SAW-2004-9986803
NC DEPARTMENT OF TRANSPORTATION
STIP I-2513, BUNCOMBE COUNTY

Failure to institute and carry out the details of the following special conditions will result in a directive to cease all ongoing and permitted work within waters of the U.S. associated with the permitted project, or such other remedies and/or fine as the Wilmington District Engineer, or his authorized representatives, may seek.

WORK LIMITS

1) The entire 7 mile project is identified as STIP I-2513. This permit only authorizes work on Sections I-2513 AA, AB, and AC of STIP I-2513, also known as "Phase 1" for permitting purposes. Construction on the remaining sections/phases of the I-2513 project (i.e., Sections I-2513 B, I-2513 C, and I-2513 D) shall not commence until: (a) final design for those sections/phases has been completed and submitted to the U.S. Army Corps of Engineers (Corps); (b) the Permittee has minimized impacts to waters and wetlands to the maximum extent practicable for those sections/phases and the Corps concurs with this assessment through standard Merger 4B and 4C meetings; (c) any modification(s) to the permit plans for those sections/phases have been approved by the Corps in writing; (d) NCDOT submits final versions of the Bridge Construction and Demolition Plan, River User Safety Plan, and Strategic Communication Plan that adequately address the Corps' Public Interest Review Factors (to include recreation, safety, navigation, and flood hazards); and (e) a final compensatory mitigation plan for those sections/phases has been submitted by the Permittee and approved by the Corps.

2) All work authorized by this permit shall be performed in strict compliance with the following:

- The description of work in the revised application dated August 17, 2023.
- All information submitted in response to the Corps' requests for additional information.
- All final environmental commitments that NCDOT has agreed to, to include (but not limited to) the Biological Opinion (BO) and the Amended BO and Conference Opinion (special condition #14 of this permit), and the Section 106 Memorandum of Agreement (special condition #15 of this permit).
- The attached permit plans titled (1) "I-2513AA/AB", Permit Drawings Sheets 1-26, and (2) "I-2513AC", Permit Drawings Sheets 1-36.

The Permittee shall ensure that the construction design plans for this project do not deviate from the approved permit plans referenced above. Any modification to the approved permit plans must be approved by the U.S. Army Corps of Engineers prior to any active construction in waters or wetlands.

3) Unauthorized Dredge and/or Fill: Except as authorized by this permit or any U.S. Army Corps of Engineers approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, nor shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and waste activities connected with this project.

4) Maintain Flows and Circulation Patterns of Waters: Except as specified in the approved permit plans referenced above, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands, or to reduce the reach of waters or wetlands.

5) Permit Distribution: The Permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, drawings and attachments shall be available at the project site during the construction and maintenance of this project.

NOTIFICATIONS

6) Pre-Construction Meeting: The Permittee shall schedule a pre-construction meeting between their representatives, the contractor, and the U.S. Army Corps of Engineers (Corps), Wilmington District, NCDOT Regulatory Project Manager for Division 13, prior to conducting any work in jurisdictional waters of the U.S. to ensure that there is a mutual understanding of all terms and conditions contained in this Department of the Army permit. To schedule this preconstruction meeting, the Permittee shall poll, at least two weeks ahead of any proposed meeting date, the representatives from the Corps and the North Carolina Division of Water Resources as to their availability; this poll shall include multiple potential dates and times for the preconstruction meeting. If other special conditions of this permit require other agency representatives (e.g., U.S. Fish and Wildlife Service, North Carolina Wildlife Resources Commission, etc.) to be invited to the preconstruction meeting, NCDOT shall include those agency representatives in the poll and shall schedule the meeting when all required agency representatives can attend the meeting. To determine if other agency representatives must be included in the poll for the preconstruction meeting, NCDOT shall review all other special conditions of the permit, to include all referenced documents, letters, correspondence, etc. The Permittee shall provide the Corps and all other required agency representatives with a copy of the final permit plans (if different than the approved permit plans referenced

above) at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe.

7) Notification of Construction Commencement and Completion: The Permittee shall advise the U.S. Army Corps of Engineers in writing at least two (2) weeks prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

8) Reporting Address: All reports, documentation, and correspondence required by the conditions of this permit shall be submitted to the following: U.S. Army Corps of Engineers, Wilmington District Asheville Regulatory Field Office, Attn: Lori Beckwith, 151 Patton Ave., Room 208, Asheville, NC 28801-5006, or by email to loretta.a.beckwith@usace.army.mil . The Permittee shall reference the following permit number on all submittals: SAW-2004-9986803, STIP Project No. I-2513.

9) Reporting Violations: Violation of these permit conditions or violation of Section 404 of the Clean Water Act shall be reported to the U.S. Army Corps of Engineers by email to loretta.a.beckwith@usace.army.mil and by telephone at 828-230-0483, or 828-271-7980 (Asheville Office general number), within 24 hours of the Permittee's discovery of the violation.

10) Permit Revocation: The Permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

RELATED LAWS

11) Clean Fill: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, construction debris, metal and plastic products, and concrete block with exposed reinforcement bars. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act. Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source.

12) Water Contamination: All mechanized equipment shall be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the Permittee shall immediately report it to the North Carolina Division of Water Resources at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act

shall be followed.

13) Endangered Species Act: The Permittee shall implement all necessary measures to ensure the authorized activity does not kill, injure, capture, harass, or otherwise harm any federally-listed threatened or endangered species. While accomplishing the authorized work, if the Permittee discovers or observes an injured or dead threatened or endangered species, the Permittee shall immediately notify the U.S. Army Corps of Engineers, Wilmington District, Asheville Field Office, Attn: Lori Beckwith (Corps Project Manager for NCDOT Division 13) at loretta.a.beckwith@usace.army.mil or by telephone at 828-230-0483, or 828-271-7980 (Asheville Office general number), so that the required Federal coordination can occur.

14) Endangered Species Act consultation: This Department of the Army permit does not authorize you to take a federally listed species. In order to legally take a federally listed species, you must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion (BO) under ESA Section 7, with "incidental take" provisions with which you must comply). The U.S. Fish and Wildlife Service's (USFWS's) BO for this project titled, "Biological Opinion I-26 Connector from I-40 to US 19/23/70 North of Asheville Buncombe County, Asheville, North Carolina FWS Log # 02-252", dated June 19, 2020, was ammended on December 14, 2023 by a document titled, "Biological Opinion and Conference Opinion Addendum to the June 19, 2020 Biological Opinion for I-26 Connector from I-40 to US 19/23/70 North of Asheville, Buncombe County, North Carolina Service Log #02-252 NCDOT STIP I-2513"; these documents contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with incidental take for the species specified in these documents. Your authorization under this permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of these documents. Failure to comply with the terms and conditions associated with incidental take detailed in these doucments, where a take of a federally listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your permit. The USFWS is the appropriate authority to determine compliance with the terms and conditions of these doucments/its Opinion(s), and with the ESA. These documents are attached to the pemit for this project.

15) National Historic Preservation Act: NCDOT shall abide by all stipulations identified in the executed Memorandum of Agreement titled, "MEMORANDUM OF AGREEMENT AMONG THE FEDERAL HIGHWAY ADMINISTRATION, the NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, and the NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICE PURSUANT TO 36 CFR 800.6 regarding the I-26 CONNECTOR BUNCOMBE COUNTY, NORTH CAROLINA NCDOT TIP No. I-2513 FA No. MANHF-26-1(53). This MOA is attached to the permit for this project.

AQUATIC LIFE/CULVERTS

16) Prohibitions on Concrete: The Permittee shall take all measures necessary to prevent live or fresh concrete, including bags of uncured concrete, from coming into contact with any water in or entering into waters of the United States. Water inside coffer dams or casings that has been in contact with concrete shall only be returned to waters of the United States when it no longer poses a threat to aquatic organisms (concrete is set and cured).

17) Aquatic Life Movement: No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area. All discharges of dredged or fill material within waters of the United States shall be designed and constructed to maintain low flows to sustain the movement of aquatic species.

18) Unless otherwise requested in the application and depicted on the approved permit plans, culverts greater than 48 inches in diameter shall be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert shall be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Culverts shall be designed and constructed in a manner that minimizes destabilization and head cutting.

19) Measures shall be included in the construction/installation of culverts that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

SEDIMENT AND EROSION CONTROL

20) During the clearing phase of the project, heavy equipment shall not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

21) No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the approved plan drawings and specifically authorized by this permit. This includes, but is not limited to, sediment control fences and other barriers intended to catch sediment losses.

22) The Permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the “North Carolina Sediment and Erosion Control Planning and Design Manual” to ensure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to ensure compliance with the appropriate turbidity water quality standards. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project shall remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A, Article 4). Adequate sedimentation and erosion control measures shall be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures shall be inspected and maintained regularly, especially following rainfall events. All fill material shall be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

23) The Permittee shall implement all reasonable and practicable measures to ensure that equipment, structures, work, and operations associated with this project do not adversely affect upstream and/or downstream reaches. Adverse effects include, but are not limited to, channel instability, flooding, and/or stream bank erosion. The Permittee shall routinely monitor for these effects, cease all work when detected, take initial corrective measures to correct actively eroding areas, and notify this office immediately. Permanent corrective measures may require additional authorization by the U.S. Army Corps of Engineers.

24) The Permittee shall ensure that all excavation and/or construction areas in regulated waters, to inlcude wetlands, are temporarily dewatered during work.

25) Temporary Fills: Within thirty (30) days of the date of completing the authorized work, the Permittee shall remove all temporary fills in waters of the United States and restore the affected areas to pre-construction contours and elevations. The affected areas shall be re-vegetated with native, non-invasive vegetation as necessary to minimize erosion and ensure site stability.

BORROW AND WASTE

26) To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent waters and wetlands, except as authorized by this permit, the Permittee shall require its contractors and/or agents to identify all areas to be used as borrow and/or waste sites associated with this project. The Permittee shall provide the U.S. Army Corps of Engineers with appropriate maps indicating the locations of proposed borrow and/or waste sites as soon as such information is available. The Permittee shall submit to the Corps site-specific information needed to ensure that borrow and/or waste sites comply with all applicable Federal requirements, to include compliance with the Endangered Species Act and the National Historic Preservation Act, such as surveys or correspondence with agencies (e.g., the U.S. Fish and Wildlife Service, the North Carolina Historic Preservation Office, etc.). The required information shall also include the location of all aquatic features, if any, out to a distance of 400 feet beyond the nearest boundary of the site. The Permittee shall not approve any borrow and/or waste sites before receiving written confirmation from the Corps that the proposed site meets all Federal requirements, whether or not waters of the U.S., including wetlands, are located in the proposed borrow and/or waste site. All delineations of aquatic sites on borrow and/or waste sites shall be verified by the U.S. Army Corps of Engineers and shown on the approved reclamation plans. The Permittee shall ensure that all borrow and/or waste sites comply with Special Condition #3 of this permit. Additionally, the Permittee shall produce and maintain documentation of all borrow and waste sites associated with this project. This documentation will include data regarding soils, vegetation, hydrology, any delineation(s) of aquatic sites, and any jurisdictional determinations made by the Corps to clearly demonstrate compliance with Special Condition #3. All information will be available to the U.S. Army Corps of Engineers upon request. The Permittee shall require its contractors to complete and execute reclamation plans for each borrow and/or waste site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the U.S. Army Corps of Engineers within 30 days of the completion of the reclamation work.

COMPENSATORY MITIGATION

27) In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit.

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DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

June 26, 2025

Regulatory Division

Action ID: SAW-2004-9986803, STIP Project No. I-2513

North Carolina Department of Transportation
Attn: Mr. Michael A. Turchy
Environmental Coordination and Permitting Group Leader
1598 Mail Service Center
Raleigh, North Carolina 27699-1598
Sent Via Email: maturchy@ncdot.gov

Dear Mr. Turchy:

I refer to your permit modification request dated May 22, 2025, for authorization to impact waters of the U.S. to conduct in-water geotechnical borings for Sections B&D of the I-2513 project. As background, the I-2513 project is 7 miles in length and is located in Asheville, Buncombe County, North Carolina. The U.S. Army Corps of Engineers (USACE) issued a Department of the Army Individual Permit to the North Carolina Department of Transportation (NCDOT) for Phase 1 (Sections AA, AB, and AC) of this project on February 6, 2024, under file number SAW-2004-9986803.

As noted in the modification request, refinements are being made by the NCDOT I-2513 B&D Design Build Team to collect additional input as the project's design continues to progress from preliminary to final stage. As a result, the team determined that the relatively low normal water level (less than two ft) in the French Broad River does not allow for proper draft of the previously proposed barge mounted equipment. NCDOT now proposes the use of drill rigs mounted to large diameter rubber tire all terrain carriers to perform the borings. Riverbed disturbance will occur along the routes that will be established for the carriers through repeated use, though it is noted that the low-pressure tires would minimize contact pressures with the riverbed. Drilling will be performed during low water levels within the river (approximately 2 feet). The drill rigs will be in the river during the day and then moved, whenever possible, to the adjacent floodplain during the night.

Approximately 30 borings will be needed in the French Broad River. The borings will cover 15 sq ft. in total. The total temporarily impacted riverbed will be approximately 12,000 sq ft. The approximate length of the travel paths is 2,300 feet with width of tires for rig carriers being 31 inches. The impacted area accounts for two-wheel paths.

The USACE coordinated the modification request with the U.S. Fish and Wildlife Service (USFWS), the U.S. Environmental Protection Agency, the N.C. Division of Water Resources (NCDWR), and the N.C. Wildlife Resources Commission on May 29, 2025. No objections were raised. Note that NCDOT consulted with the USFWS about this modification request and the USFWS issued a modified Biological Opinion (BO) for the modified work/geotechnical borings on May 12, 2025; however, this modified BO does not contain any additional reasonable and prudent measures or terms and conditions. Additionally, NCDWR issued a modification to the Section 401 Water Quality Certification (WQC) for this project on June 24, 2025 (enclosed).

The USACE has also reviewed NCDOT's modification request and has no objections. As such, NCDOT is authorized to impact waters of the U.S. to conduct the geotechnical investigations, as described in the permit modification request of May 22, 2025. This authorization is conditioned on compliance with the general and special conditions of the original permit issued on February 6, 2024, and with the following additional conditions:

1. This work shall be conducted in accordance with the requirements of the modified 401 WQC.

2. The permittee shall ensure that any equipment that is placed on the floodplain overnight, or at any other time, is moved to higher ground (above potential flooding) when either of the following situations is forecasted or anticipated: (1) the water level will rise to a point where the equipment could be flooded (even during work days), and/or (2) the water level is expected to rise overnight, or over a non-work period of time, to a point where the equipment could be flooded.

The expiration date of the USACE authorization for this project (December 31, 2034) remains unchanged. If you have any questions, please contact Lori Beckwith, Regulatory Project Manager, WRDA/Transportation Permitting at loretta.a.beckwith@usace.army.mil or at 828-230-0483.

Sincerely,

M. Scott Jones, PWS
WRDA / Transportation Branch Chief
USACE, Wilmington District

Enclosure

Copies furnished by email with enclosure:

USFWS, Ms. Holland Youngman
USEPA, Ms. Amanetta Sommerville
NCDWR, Ms. Amy Annino
NCWRC, Mr. Dave McHenry
NCDOT, Mr. Jeff Hemphill
NCDOT, Mr. Mike Sanderson

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DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

October 31, 2025

Regulatory Division

Action ID: SAW-2004-9986803, STIP Project No. I-2513

North Carolina Department of Transportation
Attn: Mr. Michael A. Turchy
Environmental Coordination and Permitting Group Leader
1598 Mail Service Center
Raleigh, North Carolina 27699-1598
Sent Via Email: maturchy@ncdot.gov

Dear Mr. Turchy:

I refer to your permit modification request dated October 6, 2025, for authorization to impact waters of the U.S. to conduct in-water utility work in Sections AA&AB of the I-2513 project. As background, the I-2513 project is 7 miles in length and is located in Asheville, Buncombe County, North Carolina. The U.S. Army Corps of Engineers (USACE) issued a Department of the Army Individual Permit to the North Carolina Department of Transportation (NCDOT) for Phase 1 (Sections AA, AB, and AC) of this project on February 6, 2024, under file number SAW-2004-9986803. Additionally, on June 26, 2025, the USACE authorized impacts to waters of the U.S. to conduct geotechnical investigations in Sections B&D of this project (Modification #1).

As noted in the current request, a modification of the authorized impacts to waters of the U.S. would allow NCDOT to conduct necessary utility work at Site 2 in Sections AA&AB. This work would impact 30 linear feet (lf) of an unnamed tributary to Ragsdale Creek and 50 lf of Ragsdale Creek at Site 2.

The USACE coordinated the modification request with the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the N.C. Division of Water Resources (NCDWR), and the N.C. Wildlife Resources Commission on October 7, 2025, and requested agency comment by October 21, 2025. The agencies did not raise any objections to the proposed work.

In response to NCDOT's request, NCDWR issued a modified Section 401 Water Quality Certification (WQC) on October 9, 2025.

The USACE also reviewed NCDOT's modification request and has no objections. As such, NCDOT is authorized to impact waters of the U.S. to conduct the in-water utility work, as described in the request of October 6, 2025. This authorization is conditioned on the work being conducted in strict accordance with the following:

- The description of work in the request dated October 6, 2025.
- The enclosed plans.
- The general and special conditions of the original permit that was issued on February 6, 2024.
- The requirements of the modified 401 WQC dated October 9, 2025 (enclosed).

The expiration date of the USACE authorization for the I-2513 project (December 31, 2034) remains unchanged. If you have any questions, please contact Lori Beckwith, Regulatory Project Manager, WRDA/Transportation Permitting Branch at loretta.a.beckwith@usace.army.mil or at 828-230-0483.

Sincerely,

M. Scott Jones, PWS
WRDA / Transportation Branch Chief
USACE, Wilmington District

Enclosures

Copies furnished by email with enclosure:

USFWS, Ms. Holland Youngman
USEPA, Ms. Amanetta Sommerville
NCDWR, Ms. Amy Annino
NCWRC, Mr. Dave McHenry
NCDOT, Ms. Erin Cheely
NCDOT, Mr. Jeff Hemphill

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, WILMINGTON DISTRICT
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

July 17, 2026

Regulatory Division
SAW-2004-9986803

North Carolina Department of Transportation
Attn: Mr. Michael A. Turchy
Environmental Coordination and Permitting Group Leader
1598 Mail Service Center
Raleigh, North Carolina 27699-1598
Sent Via Email: maturchy@ncdot.gov

Dear Mr. Turchy,

I refer to the Department of the Army (DA) Individual Permit (IP) dated February 6, 2024, in which the U.S. Army Corps of Engineers (Corps) authorized NCDOT to place fill material into streams and wetlands to construct STIP I-2513, also known as the Asheville Connector. As we noted at that time, construction of this project will permanently impact 6,425 linear feet (lf) of streams and 1.22 acres of wetlands along the 7-mile project corridor in Buncombe County, North Carolina.

Because STIP I-2513 is being processed as a phased permit, the IP issued on February 6, 2024, only authorized work on the sections that had final design – i.e., I-2513 Sections AA, AB, and AC (Phase 1 for permitting). The impacts authorized for Phase 1 are as follows: permanent discharge of fill material into 1,780 lf of streams and 1.12 acres of wetlands, and temporary impacts to 395 lf of streams. As noted in Special Condition #1 of the IP:

> This permit only authorizes work on Sections I-2513 AA, AB, and AC of STIP I-2513, also known as “Phase 1” for permitting purposes. Construction on the remaining sections/phases of the I-2513 project (i.e., Sections I-2513 B, I-2513 C, and I-2513 D) shall not commence until: (a) final design for those sections/phases has been completed and submitted to the U.S. Army Corps of Engineers (Corps); (b) the Permittee has minimized impacts to waters and wetlands to the maximum extent practicable for those sections/phases and the Corps concurs with this assessment through standard Merger 4B and 4C meetings; (c) any modification(s) to the permit plans for those sections/phases have been approved by the Corps in writing; (d) NCDOT submits final versions of the Bridge Construction and Demolition Plan, River

User Safety Plan, and Strategic Communication Plan that adequately address the Corps' Public Interest Review Factors (to include recreation, safety, navigation, and flood hazards); and (e) a final compensatory mitigation plan for those sections/phases has been submitted by the Permittee and approved by the Corps.

I also refer to NCDOT's modification request for authorization to impact waters of the U.S. for construction of Phase 2 (Sections B&D), dated October 31, 2025. The Corps coordinated this request with the U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), NC Division of Water Resources (NCDWR), and NC Wildlife Resources Commission (NCWRC) on December 14, 2025. The Corps also published a public notice specific to the temporary impacts from construction of the causeways and trestle bridge that are necessary to construct the three new bridges over the French Broad River in Phase 2 on November 14, 2025.

On June 17, 2026, the USFWS issued a modified Biological Opinion (BO) that includes effects from Phase 2 (Sections B&D) of the I-2513 project.

On May 15, 2026, NCDWR issued an Approval of Modification of Individual 401 Water Quality Certification for the I-2513 project, to include Phase 2 (Sections B&D). On May 20, 2026, NCDWR issued a correction to the WQC to correct stream impacts.

On December 15, 2025, NCWRC provided five comments. These comments have been addressed and are reflected in the revised Integrated Plan.

No comments from EPA were received.

After review of the information that NCDOT submitted in the modification request, the revised Integrated Plan, and all responses to our requests for additional information, the Corps has determined that (1) NCDOT has met the requirements of Special Condition #1 of the 2024 IP, and (2) NCDOT's existing DA authorization/IP for I-2513 is hereby modified to include impacts to waters of the U.S. for construction of I-2513 Sections B&D (Phase 2 for permitting). Accordingly, in addition to the impacts that have already been authorized for construction of Phase 1, the following impacts to waters of the U.S. are authorized for construction of Phase 2 (Sections B&D): permanent discharge of fill material into 2,245 lf of stream and 0.19 acres of wetlands, and temporary impacts to 2,465 lf of stream and 0.04 acres of wetlands.

The permit special conditions that were included with the 2024 IP have been revised to reflect issues associated with Phase 2. These revisions are highlighted in yellow and are attached to this letter. Please note that failure to institute and carry out the details of the attached special conditions will result in a directive to cease all ongoing and permitted work within waters of the U.S. associated with the permitted project,

or such other remedies and/or fine(s) as the Wilmington District Engineer, or his authorized representatives, may seek. Specific emphasis is placed on special condition #2, which notes that until the Riverbank Monitoring Plan is approved by the Corps, USFWS, NCDWR, and NCWRC, is finalized by NCDOT, is sent to the Corps, and the Corps acknowledges receipt in writing, no in-water work is authorized to occur in the French Broad River in the area where the temporary causeways and trestle bridge will be constructed.

Also attached to this letter is a Mitigation Responsibility Transfer Form (MRTF) for the impacts for Phase 2 (Sections B&D). In accordance with special condition #27:

> In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit.

Please note that a signed copy of the MRTF must be returned to this office. While this may be accomplished by the sponsor (NCDMS) or by the permittee (NCDOT), it is ultimately the permittee's responsibility to ensure that a signed copy of the form is provided to the Corps.

If you have any questions related to this modification approval letter or have issues accessing documents referenced in this letter, please contact Lori Beckwith, Regulatory Project Manager of the WRDA/Transportation Branch at loretta.a.beckwith@usace.army.mil. Please take a moment to complete our customer satisfaction survey located at https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

M. Scott Jones, PWS
WRDA / Transportation Branch Chief
USACE, Wilmington District

Enclosures

Copies Furnished by email:

USFWS, Ms. Holland Youngman
USEPA, Ms. Amanetta Sommerville
NCDWR, Ms. Amy Annino
NCWRC, Mr. Dave McHenry
NCDOT, Mr. Jeff Hemphill
NCDOT, Ms. Erin Cheely

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SPECIAL CONDITIONS
Revised July 17, 2026
ACTION ID. SAW-2004-9986803
NC DEPARTMENT OF TRANSPORTATION
STIP NO. I-2513
BUNCOMBE COUNTY, NC

Below are the special conditions for the modification approval for Phase 2. These conditons consist of the special conditions that were issued with the permit for Phase 1, and necessary revisions for Phase 2. Revisions for Phase 2 are indicated below in yellow highlight.

WORK LIMITS

1) The entire 7 mile project is identified as STIP I-2513. This permit only authorizes work on Sections I-2513 AA, AB, AC, B, and D of I-2513, also known as "Phase 1" and "Phase 2" for permitting purposes. Construction on the remaining section/phase of the I-2513 project (i.e., I-2513 C) shall not commence until: (a) final design for that section/phase has been completed and submitted to the U.S. Army Corps of Engineers (Corps); (b) the Permittee has minimized impacts to waters and wetlands to the maximum extent practicable for that section/phase and the Corps concurs with this assessment through standard Merger 4B and 4C meetings; (c) any modification(s) to the permit plans for that section/phase have been approved by the Corps in writing; (d) NCDOT submits the revised and final version of the Integrated Plan that adequately addresses the Corps' Public Interest Review Factors (to include recreation, safety, navigation, and flood hazards) for that phase; and (e) a final compensatory mitigation plan for that section/phase has been submitted by the Permittee and approved by the Corps.

2) All work authorized by this permit shall be performed in strict compliance with the following:

- Description of work in the revised application dated August 17, 2023.
- Description of work in the request for modification for Phase 2 dated October 31, 2025.
- Permit plans titled (1) "I-2513AA/AB", Permit Drawings Sheets 1-26, and (2) "I-2513AC", Permit Drawings Sheets 1-36, as amended by previous permit modifications.
- Permit plans titled "I-2513 B&D, WETLAND AND SURFACE WATER IMPACTS PERMIT", Permit Drawing Sheets 1-85.
- All information submitted in response to the Corps' requests for additional information.
- All final environmental commitments that NCDOT has agreed to, to include (but not limited to):
    - Biological Opinion (BO), Amended BO, and modifications (special condition #14 of this permit)

- Section 106 Memorandum of Agreement (special condition #15 of this permit).
- *Integrated Plan for Communications, Construction/Demolition, and River Users Safety for the I-2513 Asheville Connector from I-40 to US 19/23/70 North of Asheville in Buncombe County, North Carolina (Integrated Plan), dated March 2026 (attached).
- *I-2513 Commitment Tracker (Tracker), dated June 2026 (attached).
- **Final and approved Riverbank Monitoring Plan

* NCDOT has noted that some information in both the Integrated Plan and I-2513 Commitment Tracker will change for Phase 3. In the case of the Tracker, NCDOT considers it to be a living document. To remain in compliance with Phases 1 and 2 of this permit for I-2513, NCDOT must comply with the information in the versions of the Integrated Plan and Tracker referenced above and attached to this modification approval. If any changes that would affect waters of the U.S. or the PIR factors occur, NCDOT must coordinate with the Corp prior to implementation; coordination by email will be acceptable.

**NCDOT is currently revising the Riverbank Monitoring Plan. Until that plan is approved by the Corps, N.C. Division of Water Resources, U.S. Fish and Wildlife Service, and N.C. Wildlife Resources Commission, is finalized by NCDOT, is sent to the Corps, and the Corps acknowledges receipt in writing, no in-water work is authorized to occur in the French Broad River in the area where the temporary causeways and trestle bridge will be constructed.

The Permittee shall ensure that the construction design plans for this project do not deviate from the approved permit plans referenced above. Any modification to the approved permit plans must be approved by the U.S. Army Corps of Engineers prior to any active construction in waters or wetlands.

3) Unauthorized Dredge and/or Fill: Except as authorized by this permit or any U.S. Army Corps of Engineers approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, nor shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and waste activities connected with this project.

4) Maintain Flows and Circulation Patterns of Waters: Except as specified in the approved permit plans referenced above, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands, or to reduce the reach of waters or wetlands.

5) Permit Distribution: The Permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, drawings and attachments shall be available at the project site during the construction and maintenance of this project.

NOTIFICATIONS

6) Pre-Construction Meeting: The Permittee shall schedule a pre-construction meeting between their representatives, the contractor, and the U.S. Army Corps of Engineers (Corps), Wilmington District, NCDOT Regulatory Project Manager for Division 13, prior to conducting any work in jurisdictional waters of the U.S. to ensure that there is a mutual understanding of all terms and conditions contained in this Department of the Army permit. To schedule this preconstruction meeting, the Permittee shall poll, at least two weeks ahead of any proposed meeting date, the representatives from the Corps and the North Carolina Division of Water Resources as to their availability; this poll shall include multiple potential dates and times for the preconstruction meeting. If other special conditions of this permit require other agency representatives (e.g., U.S. Fish and Wildlife Service, North Carolina Wildlife Resources Commission, etc.) to be invited to the preconstruction meeting, NCDOT shall include those agency representatives in the poll and shall schedule the meeting when all required agency representatives can attend the meeting. To determine if other agency representatives must be included in the poll for the preconstruction meeting, NCDOT shall review all other special conditions of the permit, to include all referenced documents, letters, correspondence, etc. The Permittee shall provide the Corps and all other required agency representatives with a copy of the final permit plans (if different than the approved permit plans referenced above) at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe.

7) Notification of Construction Commencement and Completion: The Permittee shall advise the U.S. Army Corps of Engineers in writing at least two (2) weeks prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

8) Reporting Address: All reports, documentation, and correspondence required by the conditions of this permit shall be submitted to the following: U.S. Army Corps of Engineers, Wilmington District Asheville Regulatory Field Office, Attn: WRDA project manager for NCDOT Div 13, 151 Patton Ave., Room 208, Asheville, NC 28801-5006, or by email to scott.jones@usace.army.mil . The Permittee shall reference the following permit number on all submittals: SAW-2004-9986803, STIP Project No. I-2513.

9) Reporting Violations: Violation of these permit conditions or violation of Section 404 of the Clean Water Act shall be reported to the U.S. Army Corps of Engineers by email to scott.jones@usace.army.mil within 24 hours of the Permittee's discovery of the violation.

10) Permit Revocation: The Permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

RELATED LAWS

11) Clean Fill: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, construction debris, metal and plastic products, and concrete block with exposed reinforcement bars. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act. Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source.

12) Water Contamination: All mechanized equipment shall be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the Permittee shall immediately report it to the North Carolina Division of Water Resources at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act shall be followed.

13) Endangered Species Act: The Permittee shall implement all necessary measures to ensure the authorized activity does not kill, injure, capture, harass, or otherwise harm any federally-listed threatened or endangered species. While accomplishing the authorized work, if the Permittee discovers or observes an injured or dead threatened or endangered species, the Permittee shall immediately notify the U.S. Army Corps of Engineers, Wilmington District, Asheville Field Office, Attn: WRDA project manager for NCDOT Div 13, 151 Patton Ave., Room 208, Asheville, NC 28801-5006, or by email to scott.jones@usace.army.mil so that the required Federal coordination can occur.

14) Endangered Species Act consultation: This Department of the Army permit does not authorize you to take a federally listed species. In order to legally take a federally listed species, you must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion (BO) under ESA Section 7, with "incidental take" provisions with which you must comply). The U.S. Fish and Wildlife Service's (USFWS's) BO for this project titled, "Biological Opinion I-26 Connector from I-40 to US 19/23/70 North of Asheville Buncombe County, Asheville, North Carolina FWS Log # 02-252", dated June 19, 2020, was ammended on December 14, 2023, by a document titled, "Biological Opinion and Conference Opinion

Addendum to the June 19, 2020 Biological Opinion for I-26 Connector from I-40 to US 19/23/70 North of Asheville, Buncombe County, North Carolina Service Log #02-252 NCDOT STIP I-2513", then modified on May 12, 2025, February 11, 2026, and June 17, 2026; these documents contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with incidental take for the species specified in these documents. Your authorization under this permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of these documents. Failure to comply with the terms and conditions associated with incidental take detailed in these doucments, where a take of a federally listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your permit. The USFWS is the appropriate authority to determine compliance with the terms and conditions of these doucments/its Opinion(s), and with the ESA. These documents are attached to the pemit for this project.

15) National Historic Preservation Act: NCDOT shall abide by all stipulations identified in the executed Memorandum of Agreement titled, "MEMORANDUM OF AGREEMENT AMONG THE FEDERAL HIGHWAY ADMINISTRATION, the NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, and the NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICE PURSUANT TO 36 CFR 800.6 regarding the I-26 CONNECTOR BUNCOMBE COUNTY, NORTH CAROLINA NCDOT TIP No. I-2513 FA No. MANHF-26-1(53). This MOA is attached to the permit for this project.

AQUATIC LIFE/CULVERTS

16) Prohibitions on Concrete: The Permittee shall take all measures necessary to prevent live or fresh concrete, including bags of uncured concrete, from coming into contact with any water in or entering into waters of the United States. Water inside coffer dams or casings that has been in contact with concrete shall only be returned to waters of the United States when it no longer poses a threat to aquatic organisms (concrete is set and cured).

17) Aquatic Life Movement: No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area. All discharges of dredged or fill material within waters of the United States shall be designed and constructed to maintain low flows to sustain the movement of aquatic species.

18) Unless otherwise requested in the application and depicted on the approved permit plans, culverts greater than 48 inches in diameter shall be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert shall be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Culverts shall be designed and constructed in a manner that minimizes destabilization and head cutting.

19) Measures shall be included in the construction/installation of culverts that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

SEDIMENT AND EROSION CONTROL

20) During the clearing phase of the project, heavy equipment shall not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

21) No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the approved plan drawings and specifically authorized by this permit. This includes, but is not limited to, sediment control fences and other barriers intended to catch sediment losses.

22) The Permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the “North Carolina Sediment and Erosion Control Planning and Design Manual” to ensure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to ensure compliance with the appropriate turbidity water quality standards. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project shall remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A, Article 4). Adequate sedimentation and erosion control measures shall be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures shall be inspected and maintained regularly, especially following rainfall events. All fill material shall be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

23) The Permittee shall implement all reasonable and practicable measures to ensure that equipment, structures, work, and operations associated with this project do not adversely affect upstream and/or downstream reaches. Adverse effects include, but are

not limited to, channel instability, flooding, and/or stream bank erosion. The Permittee shall routinely monitor for these effects, cease all work when detected, take initial corrective measures to correct actively eroding areas, and notify this office immediately. Permanent corrective measures may require additional authorization by the U.S. Army Corps of Engineers. As noted in special condition #2, the temporary work in the French Broad River is subject to the Riverbank Monitoring Plan, as it contains specific requirements for this area.

24) The Permittee shall ensure that all excavation and/or construction areas in regulated waters, to inlcude wetlands, are temporarily dewatered during work.

25) Temporary Fills: Within thirty (30) days of the date of completing the authorized work, the Permittee shall remove all temporary fills in waters of the United States and restore the affected areas to pre-construction contours and elevations. The affected areas shall be re-vegetated with native, non-invasive vegetation as necessary to minimize erosion and ensure site stability.

BORROW AND WASTE

26) To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent waters and wetlands, except as authorized by this permit, the Permittee shall require its contractors and/or agents to identify all areas to be used as borrow and/or waste sites associated with this project. The Permittee shall provide the U.S. Army Corps of Engineers with appropriate maps indicating the locations of proposed borrow and/or waste sites as soon as such information is available. The Permittee shall submit to the Corps site-specific information needed to ensure that borrow and/or waste sites comply with all applicable Federal requirements, to include compliance with the Endangered Species Act and the National Historic Preservation Act, such as surveys or correspondence with agencies (e.g., the U.S. Fish and Wildlife Service, the North Carolina Historic Preservation Office, etc.). The required information shall also include the location of all aquatic features, if any, out to a distance of 400 feet beyond the nearest boundary of the site. The Permittee shall not approve any borrow and/or waste sites before receiving written confirmation from the Corps that the proposed site meets all Federal requirements, whether or not waters of the U.S., including wetlands, are located in the proposed borrow and/or waste site. All delineations of aquatic sites on borrow and/or waste sites shall be verified by the U.S. Army Corps of Engineers and shown on the approved reclamation plans. The Permittee shall ensure that all borrow and/or waste sites comply with Special Condition #3 of this permit. Additionally, the Permittee shall produce and maintain documentation of all borrow and waste sites associated with this project. This documentation will include data regarding soils, vegetation, hydrology, any delineation(s) of aquatic sites, and any jurisdictional determinations made by the Corps to clearly demonstrate compliance with Special Condition #3. All information will be available to the U.S. Army Corps of Engineers upon request. The Permittee shall require its contractors to complete and execute reclamation plans for each borrow and/or waste site and provide written documentation that the reclamation plans have been implemented and all work is

completed. This documentation will be provided to the U.S. Army Corps of Engineers within 30 days of the completion of the reclamation work.

COMPENSATORY MITIGATION

27) In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit.

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ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

October 30, 2023

Mr. Michael Turchy
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, NC 27699-1598

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the proposed I-26 Asheville Connector (I-2513) in Buncombe County, Federal Aid Project No. NHF-26-1(53), TIP No. I-2513.
NCDWR Project No. 20231008

Dear Mr. Turchy:

Attached hereto is a copy of Certification No. 006377 issued to the North Carolina Department of Transportation (NCDOT) dated October 30, 2023.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

DocuSigned by:
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Richard E. Rogers, Jr., Director
Division of Water Resources

Electronic copy only distribution:
Lori Beckwith, US Army Corps of Engineers Asheville Regulatory Field Office
Jeff Hemphill, NC Department of Transportation
Amanetta Somerville, Environmental Protection Agency
Dave McHenry, NC Wildlife Resources Commission
Holland Youngman, US Fish and Wildlife Service

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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 2,185 linear feet of jurisdictional streams and 1.11 acres of wetlands in Buncombe County. The project shall be constructed pursuant to the application dated received July 19, 2023. The authorized impacts are as described below:

Stream Impacts in the French Broad River Basin

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)
Section AA,AB	131	37	789	134	1,091	0
Section AC	380	60	480	164	1,084	0
Utility Impacts	-	-	-	10	10	0
TOTAL	**511**	**97**	**1,269**	**308**	**2,185**	**0**

Total Stream Impact for Project: 1,780 linear feet of permanent and 405 linear feet of temporary.

Wetland Impacts in the French Broad River Basin

Site	Permanent Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
Section AA,AB	<0.01	<0.01	-	<0.01	<0.01	0.01
Section AC	0.76	0.03	0.31	-	1.10	1.10
Utility Impacts	-	<0.01	-	-	<0.01	-
TOTAL	**0.77**	**0.03**	**0.31**	**0.00**	**1.11**	**1.11**

Total Wetland Impact for Project: 1.11 acres of impact.

The application provides adequate assurance that the discharge of fill material into the waters of the French Broad 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 July 19, 2023. 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 0.1 acre or 300 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (c) (2) and (4).

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.

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Conditions of Certification:

Project Specific Conditions

1. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand the potential issues with stream and pipe alignment at the permitted site. NCDWR staff shall be invited to the pre-construction meeting. [15A NCAC 02H.0506(b)(2) and (b)(3)]

2. Compensatory mitigation for 1.11 acres of wetland is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams and wetlands 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 letters dated August 15, 2023, 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. [15A NCAC 02H .0506 (c)]

3. The Permittee shall comply with all applicable measures for Appalachian Elktoe detailed under the Project Commitments in the Record of Decision dated May 2023. [15A NCAC 02B .0211(1)]

4. 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. To meet the requirements of NCDOT's NPDES permit NCS000250, please refer to the most recent version of the *North Carolina Department of Transportation Stormwater Best Management Practices Toolbox* manual for approved measures. [15A NCAC 02H .0506(b)(2)]

5. As a condition of this 401 Water Quality Certification, the 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 .0506(b)(2)]

6. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage. [15A NCAC 02H.0506(b)(2)]

7. When final design plans are completed for I-2513 Sections B, C, and D, a modification to the 401 Water Quality Certification shall be submitted 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. No construction activities that impact any wetlands, streams, or surface waters located in I-2513 Sections B, C, and D shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification from the NC Division of Water Resources.

General Conditions

1. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance

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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 hydro seeders 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 on-site project manager. [15A NCAC 02H .0507(c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

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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 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 Permittee shall complete and return the enclosed "Certification of Completion Form" to notify the NCDWR when all work included in the 401 Certification has been completed. [15A NCAC 02H.0502(f)]

19. Native riparian vegetation must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction. [15A NCAC 02B.0506(b)(2)]

20. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities. [15A NCAC 02H.0506(b)(3) and (c)(3)]

21. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards [15A NCAC 02H.0506(b)(3) and (c)(3]):

    a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
    b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
    c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
    d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

22. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification. [15A NCAC 02H.0506(b)(3) and (c)(3)]

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.

This approval and its conditions are final and binding unless contested [G.S. 143-215.5]. Please be aware that impacting waters without first applying for and securing the issuance of a 401 Water Quality Certification violates Title 15A of the North Carolina Administrative Code (NCAC) 2H .0500. Title 15A NCAC 2H .0500 requires certifications pursuant to Section 401 of the Clean Water Act whenever construction or operation of facilities will

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result in a discharge into navigable waters, including wetlands, as described in 33 Code of Federal Regulations (CFR) Part 323. It also states any person desiring issuance of the State certification or coverage under a general certification required by Section 401 of the Federal Water Pollution Control Act shall file with the Director of the North Carolina Division of Water Quality. Pursuant to G.S. 143-215.6A, these violations and any future violations are subject to a civil penalty assessment of up to a maximum of $25,000.00 per day for each violation.

This Certification can be contested as provided in Chapter 150B of the North Carolina General Statutes by filing a Petition for a Contested Case Hearing (Petition) with the North Carolina Office of Administrative Hearings (OAH) within sixty (60) calendar days. Requirements for filing a Petition are set forth in Chapter 150B of the North Carolina General Statutes and Title 26 of the North Carolina Administrative Code. Additional information regarding requirements for filing a Petition and Petition forms may be accessed at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000.

A party filing a Petition must serve a copy of the Petition on:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

If the party filing the Petition is not the permittee, then the party must also serve the recipient of the Certification in accordance with N.C.G.S 150B-23(a).

This the 30th day of October 2023

DIVISION OF WATER RESOURCES

DocuSigned by:
4F4DD2F21EA846E...
Richard E. Rogers, Jr., Director

WQC No. 006377

Docusign Envelope ID: 5F6E5600-7087-467B-8136-444560A9BEDA

JOSH STEIN
Governor
D. REID WILSON
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

June 24, 2025

Mr. Michael Turchy
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for Proposed I-26 Asheville Connector (I-2513) in Buncombe County, Federal Aid Project No. NHF-26-I(53), TIP No. I-2513
NCDWR Project No. 20231008 v. 2

Dear Mr. Turchy:

Attached hereto is a modification of Certification No. 006377 issued to The North Carolina Department of Transportation (NCDOT) dated October 30, 2023.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Signed by:
Susan Locklear
375CAE2BB9F540C...

Richard E. Rogers, Jr., Director
Division of Water Resources

Electronic copy only distribution:
Lori Beckwith, US Army Corps of Engineers, Asheville Regulatory Field Office
Mike Sanderson, Division 14 Environmental Officer
Jeff Hemphill, NC Department of Transportation
Amanetta Somerville, US Environmental Protection Agency
Holland Youngman, US Fish and Wildlife Service
Dave McHenry, NC Wildlife Resources Commission
File Copy

Docusign Envelope ID: 5F6E5600-7087-467B-8136-444560A9BEDA

Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact an additional 2,300 linear feet of jurisdictional streams in Buncombe County. The project shall be constructed pursuant to the modification received May 27, 2025. The authorized additional impacts are as described below:

Additional Stream Impacts in the French Broad River Basin

Site	Temporary Fill for Geotechnical Boring in Perennial Stream (linear ft)	Total Stream Impact (linear feet)	Stream Impacts Requiring Mitigation (linear ft)
Section BD	2,300	2,300	0
TOTAL:	2,300	2,300	0

Total Temporary Stream Impact for Section BD: 2,300 linear feet

The application provides adequate assurance that the discharge of fill material into the waters of the French Broad 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 modified application dated received May 27, 2025. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated October 30, 2023 still apply except where superseded by this certification. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

Project Specific Conditions

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions of certification associated with the original Water Quality Certification dated October 30, 2023, still apply except where superseded by this certification.

2. Heavy equipment necessary for geotechnical boring in the French Broad River may be operated within the river channel; however, its usage shall be minimized. In accordance with your application, drill rigs shall follow the planned path as depicted in the *French Broad River Path* figure included in the application; drill rigs shall be mounted to large-diameter rubber-tire all terrain carriers with low-pressure tires to minimize contact pressures with the riverbed; drilling shall be performed during low water levels within the river (approximately 2 feet); and drill rigs shall be moved to the adjacent floodplain during the night. [15A NCAC 02H.0506(b)(3)]

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3. The turbidity standard of 50 NTUs (Nephelometric Turbidity Units) shall not be exceeded as described in 15 A NCAC 02B .0200. Appropriate sediment and erosion control practices must be used to meet this standard. [15A NCAC 02B .0211 (21)]

4. In accordance with your application, NCDOT shall protect recreational river user safety in the project area through the following protocol: move drill rigs to the floodplain for storage during overnight hours; utilize orange and white mooring buoys in the water immediately around the drill rigs as a safety area that river users will need to avoid; position workers in the water in waders adjacent to drilling equipment to communicate to river users; and maintain a River User Page as a resource for recreational users. [15A NCAC 02H .0506 (b)(1) and (2); 15A NCAC 02H .0507 (c)]

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 24th day of June 2025

DIVISION OF WATER RESOURCES

Signed by:
Susan Locklear
375CAE2BB9F540C...
Richard E. Rogers, Jr., Director

WQC No. 006377

Docusign Envelope ID: B135FB3C-5D6A-4714-B7FF-81ADCA45219A

JOSH STEIN
Governor
D. REID WILSON
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

October 9, 2025

Mr. Michael Turchy
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for Proposed I-26 Asheville Connector (I-2513) in Buncombe County, Federal Aid Project No. NHF-26-I(53), TIP No. I-2513
NCDWR Project No. 20231008 v. 3

Dear Mr. Turchy:

Attached hereto is a modification of Certification No. 006377 issued to The North Carolina Department of Transportation (NCDOT) dated October 30, 2023, and subsequently modified on June 24, 2025, and October 9, 2025.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Signed by:
Faith Hardin
318523092EA45F...
Faith Hardin, Supervisor
401 & Buffer Transportation Permitting Branch

Electronic copy only distribution:
Lori Beckwith, US Army Corps of Engineers, Asheville Regulatory Field Office
Mike Sanderson, Division 14 Environmental Officer
Jeff Hemphill, NC Department of Transportation
Amanetta Somerville, US Environmental Protection Agency
Holland Youngman, US Fish and Wildlife Service
Dave McHenry, NC Wildlife Resources Commission
File Copy

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Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact an additional 80 linear feet of jurisdictional streams in Buncombe County. The project shall be constructed pursuant to the modification received October 7, 2025. The authorized additional impacts are as described below:

Additional Stream Impacts in the French Broad River Basin

Site	Permanent Fill in Intermittent Stream (linear feet)	Temporary Fill in Intermittent Stream (linear feet)	Permanent Fill in Perennial Stream (linear feet)	Temporary Fill in Perennial Stream (linear feet)	Total Stream Impact (linear feet)	Stream Impacts Requiring Mitigation (linear feet)
Original approved impacts at Site 2	0	0	191	10	201	0
New additional impacts with this approval at Site 2	0	0	0	80	80	0
TOTAL:	**0**	**0**	**191**	**90**	**281**	**0**

Total Stream Impact for (Site/Modification): 80 linear feet of temporary.

The application provides adequate assurance that the discharge of fill material into the waters of the French Broad 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 modified application dated received October 7, 2025. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated October 30, 2023, still apply except where superseded by this certification. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions of certification associated with the original Water Quality Certification dated October 30, 2023, and subsequent modification dated June 24, 2025, still apply except where superseded by this certification.

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. This Certification shall expire upon the expiration of the 404.

Docusign Envelope ID: B135FB3C-5D6A-4714-B7FF-81ADCA45219A

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:

Dan Hirschman, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This, the 9th day of October 2025

Signed by:
Faith Hardin
3185423002EA45E...
Faith Hardin, Supervisor
401 & Buffer Transportation Permitting Branch

WQC No. 006377

Docusign Envelope ID: D4A8D323-D25E-4B45-8A05-AC69AADD6B67

JOSH STEIN
Governor
D. REID WILSON
Secretary
RICHARD E. ROGERS, JR.
Director

NORTH CAROLINA
Environmental Quality

May 20, 2026

DWR #20231008 v4
Buncombe County

Mr. Michael Turchy
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Delivered via email to: maturchy@ncdot.gov

Subject: **Correction of Modification of Individual 401 Water Quality Certification**
I-26 Asheville Connector (I-2513) in Buncombe County, Federal Aid Project No. NHF-26-I(53), TIP No. I-2513
USACE Action ID. No. SAW-2004-9986803

Location: 35.56718, -82.58783

Dear Mr. Michael Turchy:

Attached hereto is a copy of Certification No. WQC006377 issued to Mr. Michael Turchy and the North Carolina Department of Transportation (NCDOT), dated May 20, 2026. This Certification replaces the Certification issued May 15, 2026, to correct an error that inaccurately listed the total stream impact for the project below the table titled Additional Stream Impacts in the French Broad River Basin for B & D Sections. The errors have been corrected. This Certification is being issued pursuant to a modification request submitted on October 31, 2025 with fee received October 31, 2025, due to completion of final designs for I-2513 sections B & D: I-240 / I-26 from north of SR 3548 (Haywood Road) to SR 1781 (Broadway Street); and from SR 1517 (Hill Street) to SR 1781 (Broadway Street). All of the authorized activities and conditions of certification associated with the Water Quality Certification No. WQC006377 dated October 30, 2023, and subsequent modifications dated June 24, 2025, and October 8, 2025, still apply except where superseded by this certification.

This Water Quality Certification does not relieve the Permittee of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

Upon the presentation of proper credentials, the Division of Water Resources (Division or DWR) may inspect the property.

This Water Quality Certification shall expire on the same day as the expiration date of the corresponding Section 404 Permit that is current at the time this Certification is issued. The conditions shall remain in effect for the life of the project, regardless of the expiration date of this Water Quality Certification.

Non-compliance with or violation of the conditions herein set forth may result in revocation of this Water Quality Certification for the project and may also result in criminal and/or civil penalties.

This approval and its conditions are final and binding unless contested [G.S. 143-215.5].

Notice regarding the right to contest this 401 Water Quality Certification decision is attached to this letter.

This letter completes the Division's review under section 401 of the Clean Water Act and 15A NCAC 02H .0500. Please contact Amy Annino at 828-296-4668 or amy.annino@deq.nc.gov if you have any questions or concerns.

Sincerely,

DocuSigned by:
80ECA32C7C38490...

Faith Hardin, Supervisor
401 & Buffer Transportation Permitting Branch

Electronic cc: Lori Beckwith, US Army Corps of Engineers Asheville Regulatory Field Office
Jeff Hemphill, NC Department of Transportation
Mike Sanderson, NC Department of Transportation
Tori Fowler, NC Department of Transportation
Amanetta Somerville, Environmental Protection Agency
Dave McHenry, NC Wildlife Resources Commission
Holland Youngman, US Fish and Wildlife Service
Elizabeth Harmon, DMS
DWR 401 & Buffer Permitting Branch Electronic file

Docusign Envelope ID: D4A8D323-D25E-4B45-8A05-AC69AADD6B67

NOTICE REGARDING THE RIGHT TO CONTEST A DWR 401 WATER QUALITY CERTIFICATION DECISION

Right of Persons Aggrieved to File a Contested Case for the issuance of a 401 water quality certification: Pursuant to 15A NCAC 02H .0507(f), the Division's decision on a 401 water quality certification application is subject to review under NCGS 150B-23.

Rights of Persons Aggrieved to File a Contested Case: Pursuant to NCGS 150B, Article 3, a party or person aggrieved may commence a contested case by filing a petition under NCGS 150B-23 in the Office of Administrative Hearings within 60 days after the Division provides notice of its decision on a permit application, as provided in NCGS 150B-23(f). If no contested case is commenced within the required time, the Division's decision is final and is not subject to review.

General Filing Instructions: A petition for contested case hearing must be in the form of a written petition, conforming to NCGS 150B-23, and filed with the Office of Administrative Hearings, 1711 New Hope Church Road, Raleigh NC, 27609, along with a fee in an amount provided in NCGS 150B-23.2. A petition for contested case hearing form may be obtained upon request from the Office of Administrative Hearings or on its website at https://www.oah.nc.gov/hearings-division/filing/hearing-forms. Additional specific instructions for filing a petition are set forth at 26 NCAC Chapter 03.

Service Instructions: A party filing a contested case is required to serve a copy of the petition, by any means authorized under 26 NCAC 03 .0102, on the process agent for the Department of Environmental Quality:

Daniel Hirschman, General Counsel
North Carolina Department of Environmental Quality
1601 Mail Service Center
Raleigh, North Carolina 27699-1601

If the party filing the petition is a person aggrieved other than the permittee or permit applicant, the party **must also** serve the permittee in accordance with NCGS 150B-23(a).

Be aware that other rules or laws may apply to the filing of a petition for a contested case. Additional information is available at https://www.oah.nc.gov/hearings-division/hearing-process/filing-contested-case. Please contact the Office of Administrative Hearings at (984) 236-1850 with all questions regarding the filing fee and/or the details of the filing process.

Docusign Envelope ID: D4A8D323-D25E-4B45-8A05-AC69AADD6B67

NORTH CAROLINA 401 WATER QUALITY CERTIFICATION

CERTIFICATION #WQC006377 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to North Carolina's Regulations in 15 NCAC 02H .0500 and 15A NCAC 02B .0200, to Mr. Michael Turchy and NCDOT, who have authorization for the impacts listed below, as described within your modification request received by the Division of Water Resources (Division or DWR) on October 31, 2026, and subsequent information on February 26, 2026, April 15, 2026, April 17, 2026, and May 8, 2026, and by Public Notice issued by the U. S. Army Corps of Engineers on November 14, 2025, and within the *Reasonable Period of Time* pursuant to 40 CFR Part 121.6.

The State of North Carolina certifies that this activity will comply with water quality requirements and the applicable portions of Sections 301, 302, 303, 306, 307 of the Public Laws 92-500 and PL 95-217 if conducted in accordance with the application, the supporting documentation, and conditions hereinafter set forth.

The following impacts are hereby approved. Impacts added pursuant to this modification are shown within the impact table. No other impacts are approved, including incidental impacts. [15A NCAC 02H .0506(b)]

Additional Wetland Impacts in the French Broad River Basin for B & D Sections

Permit Site / Wetland ID		Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
2	WC,WC2	0.029	0	0	-	-	0.029	0.029
3	WF, WF2	0.104	0	0			0.104	0.104
5	WBA	0.045	0	0			0.045	0.045
9	WAK	0.009	0	0			0.009	0.009
12	WBB	0.003	0	0.003			0.006	0.003
14	WBD	0	0.031	0			0.031	0
20	WBC	0	0.005	0	0	0	0.005	0
TOTAL		**0.190**	**0.036**	**0.003**	**0**	**0**	**0.229**	**0.193**

For Permit Site and Station Specific Impact Description, see pg124-126 of Phased Modification Application Package 20251031

Total Wetland Impact for Project: 0.193 acres of permanent and 0.036 acres of temporary.

Additional Stream Impacts in the French Broad River Basin for B & D Sections

Permit Site	Stream Name / PJD ID	Status / Class	Permanent Impacts (linear ft)		Temporary Impacts (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
			Channel Impacts	Bank Stabilization			
Site 1	UT to Smith Mill Creek / SG	Perennial C	551	112	91	754	551
Site 2	UT to Smith Mill Creek / SU	Intermittent C	410	0	12	422	0
Site 4	Smith Mill Creek / SR	Perennial C	18	39	46	103	0
Site 5	UT to Smith Mill Creek / SS	Intermittent C	43	0	0	43	0
Site 6	Smith Mill Creek / SR	Perennial C	41	65	1,528	1,634	0
Site 7	French Broad River / SA	Perennial B	6	85	461	552	0
Site 8	UT to French Broad River / SO	Intermittent B	27	0	0	27	0
Site 9	UT to French Broad River / SM	Intermittent B	0	33	7	40	0
Site 10	UT to French Broad River / SL	Intermittent B	101	0	11	112	0
Site 11	UT to French Broad River / SI	Perennial B	415	12	22	449	415
Site 12	UT to French Broad River / SK	Perennial B	75	0	10	85	0
Site 13	UT to French Broad River / SJ	Perennial B	0	10	24	34	0
Site 14	UT to French Broad River / SAU	Perennial B	0	0	43	43	0
Site 15	UT to French Broad River / SAV	Perennial B	0	12	28	40	0
Site 16	UT to French Broad River / SBB	Perennial B	0	21	0	21	0
Site 17	French Broad River / SA	Perennial B	0	20	22	42	0
Site 18	French Broad River / SA	Perennial B	0	34	30	64	0
Site 19	French Broad River / SA	Perennial B	0	48	29	77	0
Site 20	UT to French Broad River / ST	Perennial B	0	12	29	41	0
Site 21	Emma Branch / SP	Perennial C	34	21	60	34	0

Permit Site	Stream Name / PJD ID	Status / Class	Permanent Impacts (linear ft)		Temporary Impacts (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
			Channel Impacts	Bank Stabilization			
Site 22	UT to French Broad River / SBC	Perennial B	0	0	12	12	0
TOTAL			**1,721**	**524**	**2,465**	**4,710**	**966**

For Permit Site and Station Specific Impact Description, see pg124-126 of Phased Modification Application Package 20251031

Total Stream Impact for Project: 2,245 linear feet of permanent and 2,465 linear feet of temporary.

This approval requires you to follow the conditions listed in the certification below.

CONDITIONS OF CERTIFICATION [15A NCAC 02H .0507(c)]:

1. Compensatory mitigation for impacts to 0.193 acres of wetlands and 966 linear feet of impact to perennial streams is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands and streams through the North Carolina Division of Mitigation Services (DMS), and that the DMS has agreed to implement the mitigation for the project. DMS has indicated in a letter dated November 3, 2025, 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.

   Citation: 15A NCAC 02H .0506(c); 15A NCAC 02H .0507(c)

2. The plans and specifications for this project are incorporated by reference as part of this Water Quality Certification. Any final construction plans for a project must include or reference the application and plans submitted to the DWR. The Permittee must evaluate all other acquired permits to ensure that they are consistent with the plans submitted to the DWR, and all relative impacts are accounted for and shown on the final construction plans. Any modifications or additional impacts to streams and/or wetlands and/or waters within the project require the permittee to notify the DWR and may require submission of a new application package with the appropriate fee.

   Citation: 15A NCAC 02H .0506(b)(2) and (3); 15A NCAC 02H .0507(c)

3. The Permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Director), upon the presentation of credentials and other documents as may be required by law, to: *Citation: 15A NCAC 02H .0502(e); 15A NCAC 02H .0507(c)*

   a. Enter, at reasonable times, upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this certificate;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this certificate;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this certificate; and
d. Sample or monitor at reasonable times, for the purposes of assuring certificate compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location

5. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand the potential issues with stream and pipe alignment at the permitted site. NCDWR staff shall be invited to the pre-construction meeting.

   Citation: 15A NCAC 02H.0506(b)(2) and (b)(3)

6. The Permittee shall comply with all applicable measures for Appalachian Elktoe detailed under the Project Commitments in the Record of Decision dated May 2023, along with all subsequent modifications to the U.S. Fish and Wildlife Service's Biological Opinion specific to Appalachian Elktoe.

   Citation: 15A NCAC 02B .0211(1) and (2)

7. Prior to commencing project activities to construct temporary impacts at Site 7, which include the temporary bridge and temporary causeway in the French Broad River (Station 73+39 to Station 77+07), the NC Department of Transportation will develop an acceptable Riverbank Monitoring Plan (Plan). The Plan will include the following components: (1) establishing the reach(es) along the French Broad River in which to monitor riverbanks for stability, (2) monitoring methods, (3) monitoring frequency, (4) monitoring duration, and (5) a plan of action should monitoring identify bank erosion. No work to begin construction of the temporary impacts at Site 7 (Station 73+39 to Station 77+07) shall commence until an acceptable Plan has been submitted to and approved by the NC Division of Water Resources.

   Citation: 15A NCAC 02H .0506(b)(3); 15A NCAC 02H .0507(c); 15A NCAC 02B.0200

8. When final design plans are completed for I-2513 Section C, a modification to the 401 Water Quality Certification shall be submitted 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. No construction activities that impact any wetlands, streams, or surface waters located in I-2513 Sections C shall begin until after the permittee applies for and receives a written modification of the 401 Water Quality Certification from the NC Division of Water Resources.

   Citation: 15A NCAC 02H .0506(b)(3); 15A NCAC 02H .0507(c); 15A NCAC 02B.0200

9. Channel relocations at Site 1, Site 10, and Site 11 shall be completed and stabilized, and approved on site by NCDWR staff, prior to diverting water into the new channel. Stream banks shall be matted with coir-fiber matting. Vegetation used for bank stabilization shall be limited to native riparian vegetation and should include establishment of a vegetated buffer on both sides of the relocated channel to the maximum extent practical. Also, rip-rap may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. Once the stream has been turned into the new channel, it may be necessary to relocate stranded fish to the new channel to prevent fish kills.

    Citation: 15A NCAC 02H .0506(b)(3)

10. All bridge construction shall be performed from the existing bridge, temporary work bridges, temporary causeways, or floating or sunken barges. If work conditions require barges, they shall be floated into position and then sunk. The barges shall not be sunk and then dragged into position. Under no circumstances should barges be dragged along the bottom of the surface water.

    Citation: 15A NCAC 02H .0506(b)(3)

11. All wetlands, streams, and surface waters located within the limits of disturbance and within 50 feet of the limits of disturbance/construction area on the project site shall be clearly marked (example- orange fabric fencing) prior to any land disturbing activities. The marking/fencing shall be maintained until the project or project phase is completed. Impacts to areas within the marked area/fencing are prohibited unless otherwise authorized by this certification.

    Citation: 15A NCAC 02H .0506(b)(2); 15A NCAC 02H .0507(c)

12. When requested by DWR, the Permittee and/or authorized agent shall schedule a pre-construction meeting with DWR, shall contact the appropriate DWR Regional Office upon project commencement of construction, shall submit a Certificate of Completion and/or shall provide as-built documentation.

    Citation: 15A NCAC 02H .0502(e); 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

13. The permittee shall report to the appropriate DWR Regional Office any noncompliance with, and/or any violation of, stream or wetland standards [15A NCAC 02B .0200], including but not limited to sediment impacts to streams or wetlands. Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the permittee became aware of the non-compliance circumstances.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

14. No additional temporary or permanent impacts from waste, spoil, solids, fill, excavation, or staging of equipment, shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts) identified in this Certification.

    Citation: 15A NCAC 02H .0506; 15A NCAC 02H .0507(c)

15. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sedimentation Pollution Control Act of 1973). Regardless of applicability of the Sedimentation Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur.

    Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Erosion and Sediment Control Planning and Design Manual*, or the *North Carolina Department of Transportation Erosion and Sediment Control Design and Construction Manual*.

    Appropriate measures should be installed prior to any land clearing activities to protect wetlands, streams, and/or buffers from turbidity and/or sedimentation. These measures should be routinely inspected and properly maintained, and excavated materials should be contained outside wetland, stream, and/or buffer boundaries.

    For installation of bridges that involve driving or drilling activities within stream channels, open waters, or along streambanks turbidity curtains shall be installed within the surface water.

    All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

    For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*. Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

    If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality Waters (HQW), or Outstanding Resource Waters (ORW), then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds*.

    Citation: 15A NCAC 02H .0506(b)(2); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

16. Sediment and Erosion Control Measures (S&EC) in wetlands or waters should be avoided to the maximum extent possible and any S&EC occurring in wetlands or waters shall be restored to pre-existing conditions upon completion of the project. The Permittee shall utilize sediment and erosion control measures that avoid and minimize the need for the placement of silt fence along streams at the normal water level. Where measures are placed within authorized impact areas then placement of such measures shall not be conducted in a manner that results in a loss of function of any wetlands, streambeds, or streambanks. Any erosion control measures, including silt fence, installed within wetlands shall be removed from wetlands and the natural grade restored and revegetated within two (2) months of the date the appropriate sediment and erosion control program has released the specific area within the project to ensure wetland standards are maintained upon completion of the project.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

17. Erosion control matting shall not be placed within a stream bed. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

18. If the project is covered by NPDES Construction Stormwater Permit Number NCG010000 or NPDES Construction Stormwater Permit Number NCG250000, full compliance with permit conditions including the erosion and sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required.

    Citation: 15A NCAC 02H .0506(b) and (c); 15A NCAC 02H .0507(c)

19. The North Carolina Department of Transportation (NCDOT) shall maintain full compliance with the conditions related to construction activities and post construction stormwater design, construction and maintenance, within the most recent version of their Individual NPDES Stormwater Permit Number NCS000250.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

20. All work in or adjacent to streams, ponds, lakes, and reservoirs shall be conducted so that the work area is isolated from surface waters. Approved best management practices from the most current version of the DEMLR *NC Erosion and Sediment Control Planning and Design Manual*, or the *NC Department of Transportation Best Management Practices For Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, pump-arounds, and other diversion structures shall be used to minimize excavation in flowing water. Water that comes in contact with the work area shall be treated through an appropriate sediment/erosion control measure (sediment basin, filter bag, etc) prior to discharging to a surface water. All temporarily disturbed areas for the purpose of isolation/dewatering shall be restored to original grade, including each stream's original cross-sectional dimensions, planform pattern, and longitudinal bed profile. All temporarily impacted sites shall be restored and stabilized with native vegetation as practicable. *Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200*

21. Bridge piles and bents shall be constructed using driven piles (hammer or vibratory) or drilled shaft construction methods. More specifically, jetting or other methods of pile driving are prohibited under this Certification.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200

22. Unless already approved by an NPDES permit, bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. This condition may be waived with prior written approval from the NCDWR.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

23. Demolition of existing structures, such as culvert or bridge removal, shall be conducted to ensure water quality standards are maintained. NCDOT activities shall adhere to NCDOT's *Best Management Practices for Construction and Maintenance Activities*.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200

24. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allows for aquatic life movement during low flows. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. If the width of the culvert is wider than the stream channel, the culvert shall include multiple boxes/pipes, baffles, benches and/or sills to maintain the natural width of the stream channel. If multiple culverts/pipes/barrels are used, low flows shall be accommodated in one culvert/pipe and additional culverts/pipes shall be installed such that they receive only flows above bankfull.

    Placement of culverts and other structures in streams shall also meet one of the following requirements:

a. For structures less than 72" in diameter/width and in area where topographic constraints dictate culvert slopes will be greater than 2.5%, culverts shall be installed "at grade" such that low flow conditions in the stream are maintained provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross-vanes, sills, baffles etc.); or
b. When bedrock is present in culvert locations, culvert burial is not required, provided that there is documentation of the presence of bedrock.
c. For all other culverts:
    i. Culverts with a diameter greater than 48 inches shall be below the elevation of the streambed by one foot
    ii. Culverts with diameter less than or equal to 48 inches shall be below the streambed by 20% of the culvert diameter

If a culvert outlet is submerged within a pool or scour hole and designed to provide for aquatic passage, then culvert burial into the streambed is not required.

Documentation such as a location map of the culvert, culvert profile drawings, slope calculations, geotechnical reports, photographs, etc. shall be provided to DWR upon written request.

For culvert replacements within the same location/footprint, and of similar length, culverts shall be designed and installed to meet the above requirements of this Condition unless prohibited by existing conditions on site, such as existing infrastructure or topographic constraints.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

25. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0231

26. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in, or adjacent to, surface waters is prohibited.

    Citation: 15A NCAC 02H.0506(b)

27. If concrete is used during construction (including bulkhead components, such as deadman anchors, tie-back systems and concrete caps), then all necessary measures shall be taken to isolate the concrete from waters of the state by maintaining a dry work area to prevent direct contact between curing concrete and surface waters. Drill slurry and water that inadvertently contacts uncured concrete shall not be discharged to waters of the state. 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. Any water that contacts uncured concrete shall be captured, treated, and disposed of properly.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

28. All temporary pipes, culverts, rip-rap pads etc. in streams shall be installed so as not to restrict stream flow or installed in such a manner that restricts aquatic life movement during low flow conditions. All temporary pipes and/or culverts shall be installed as outlined in the most recent edition of the *North Carolina Erosion and Sediment Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities*.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

29. All temporary fill and temporary culverts shall be removed, and the impacted area shall be returned to natural conditions, within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross-sectional dimensions, planform pattern, and longitudinal bed profile. All temporarily impacted sites shall be restored and stabilized with native vegetation when practicable. For all areas where wetlands are impacted by temporary roads constructed by temporary fill material, the Permittee shall remove the fill material and conduct activities necessary to restore preconstruction hydrology by addressing soil compaction. When temporary fill has been added to wetlands, or heavy equipment has been placed within a wetland, the Permittee shall ensure restoration of preconstruction soil conditions when restoring wetland areas. Upon restoration of the wetland, the Permittee shall inspect the area quarterly for a minimum of two years to document successful restoration. The Permittee shall provide documentation of inspections to DWR when requested. The monitoring requirement can be relieved with review and written approval by DWR. If the area is not restored to preconstruction conditions the impacts shall be considered permanent, and the Permittee shall request a modified Certification from DWR. With prior written approval from DWR, removal of temporary fill and temporary culverts and restoration of the impacted area may be postponed to accommodate moratorium periods.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

30. Any rip-rap or other armoring materials required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the construction activity covered by this Certification. All rip-rap or other non-natural armoring material placed in streams shall be placed such that the original streambed elevation and streambank contours are restored, and that the finished elevation of the rip rap shall not exceed that of the original stream bed. All rip-rap or other armoring materials shall consist of clean rock or masonry material free of debris or toxic pollutants. Placement of rip-rap or other armoring materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or be installed in a manner that precludes aquatic life passage.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

31. Any rip-rap or other non-natural armoring material (i.e. gabion baskets, revetments, bulkheads, seawalls, retaining walls) used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows, and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap or other armoring materials shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures. Any rip-rap or other armoring materials placed in the streambed shall be such that the finished elevation of the rip rap or other armoring materials shall not exceed that of the original stream bed.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0201

32. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication, and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

33. Heavy equipment working in wetlands shall be placed on mats or non-impact equipment shall be used to ensure no disturbance and/or compaction of soil from equipment except within the footprint of the impacts covered by this Certification. Heavy equipment necessary for in stream activities shall be operated from the banks to the maximum extent practical and in no cases shall cause unstable stream banks or a violation of water quality standards.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0231

34. In accordance with G.S. 143-215.85(b), the Permittee shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

Docusign Envelope ID: D4A8D323-D25E-4B45-8A05-AC69AADD6B67

Citation: 15A NCAC 02H .0507(c); N.C.G.S 143-215.85(b)

35. The Permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

36. A copy of this Certification shall be retained on site during the construction and maintenance of this project, or with the project manager, and be available for inspection at all times. The Permittee shall require its contractors and/or agents to comply with the terms and conditions of this Certification in the construction and maintenance of this project and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this Certification. If the Permittee becomes aware of any inability to comply with any of the conditions of this Certification, they must notify the appropriate Regional Office within 24 hours (or the next business day if a weekend or holiday) from the time the Permittee becomes aware of the circumstances.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

37. This Water Quality Certification neither grants nor affirms any property right, license, or privilege in any lands or waters, or any right of use in any waters. This Water Quality Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and does not create any prescriptive right or any right of priority regarding any usage of water. This Water Quality Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Water Quality Certification to possess any prescriptive or other right of priority with respect to any other consumptive user.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

This Water Quality Certification shall expire on the same day as the expiration date of the corresponding Section 404 Permit that is current at the time this Certification is issued. The conditions shall remain in effect for the life of the project, regardless of the expiration date of this Water Quality Certification.

This, the 20th day of May 2026

DocuSigned by:
80ECA32C7C38490...

Faith Hardin, Supervisor
401 & Buffer Transportation Permitting Branch

CONTRACT: TIP PROJECT: I-2513AC

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PERMIT DRAWING
SHEET 1 OF 36

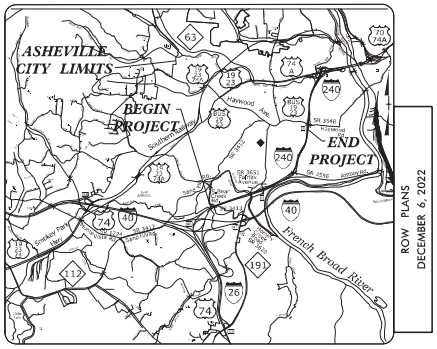
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-2513AC	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34165.1.13		P.E.
34165.2.18		R/W
34165.2.19		UTIL.
34165.3.8		CONST.

BUNCOMBE COUNTY

LOCATION: I-26/I-40/I-240 INTERCHANGE TO SR 3548 (HAYWOOD RD)

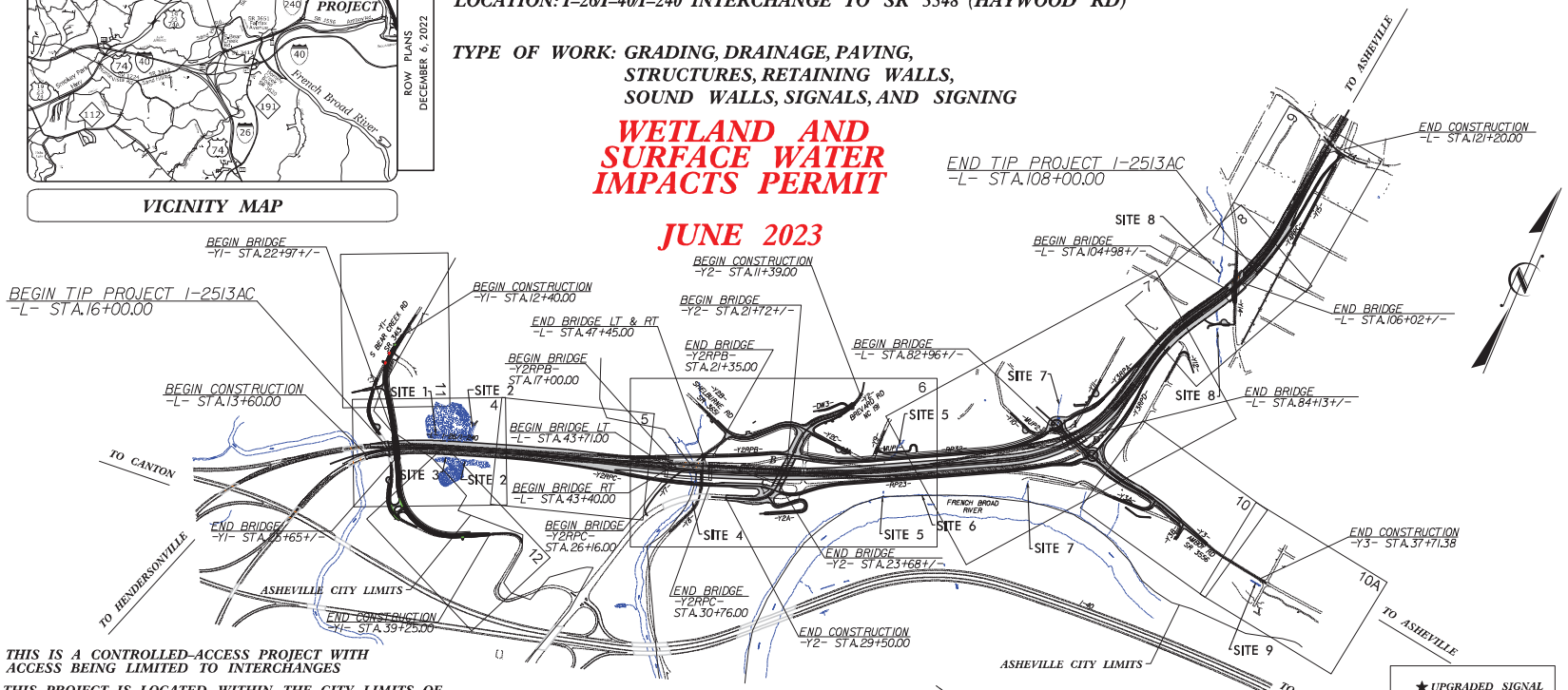
TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, RETAINING WALLS, SOUND WALLS, SIGNALS, AND SIGNING



VICINITY MAP

WETLAND AND SURFACE WATER IMPACTS PERMIT

JUNE 2023



THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES

THIS PROJECT IS LOCATED WITHIN THE CITY LIMITS OF THE CITY OF ASHEVILLE

CLEARING ON THIS PROJECT WILL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

A DESIGN EXCEPTION IS REQUIRED FOR HORIZONTAL SSD ON -L-

A DESIGN EXCEPTION IS REQUIRED FOR MINIMUM HORIZONTAL RADIUS ON -Y2-

★ UPGRADED SIGNAL

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS 50 25 0 50 100

PROFILE (HORIZONTAL) 50 25 0 50 100

PROFILE (VERTICAL) 5 2 0 5 10

DESIGN DATA

ADT 2024 = NA
ADT 2040 = 101,400
K = 9 %
D = 55 %
T = 10 % *
V = 60 MPH
* TTST = 5% DUAL 5%
FUNC CLASS = INTERSTATE

STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-2513AC = 1.623 MI

LENGTH STRUCTURE TIP PROJECT I-2513AC = 0.119 MI

TOTAL LENGTH TIP PROJECT I-2513AC = 1.742 MI

AECOM
NC FIRM LICENSE No: F-0342
5438 Wade Park Blvd, Suite 200
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259(FAX)

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: NOVEMBER 15, 2022

LETTING DATE: FEBRUARY 20, 2024

JOHN SLOAN, P.E.
PROJECT ENGINEER

ED EDENS, P.E.
PROJECT DESIGN ENGINEER

KEVIN E. MOORE, P.E.
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

09/28/99
SYSTIME
SIGNATURES

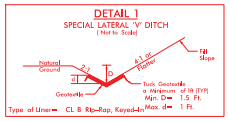
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I-2513AC	2D-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

Prepared in the Office of: AECOM
NC FIRM LICENSE No P-0342
5438 Wade Park Boulevard Suite 200
Raleigh, NC 27607
(919) 854-6200 (919) 854-6259(FAX)

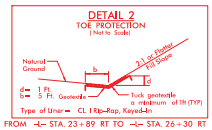
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DETAIL 1
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



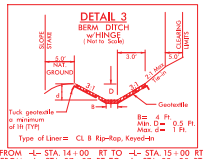
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DETAIL 2
TOE PROTECTION
(Not to Scale)



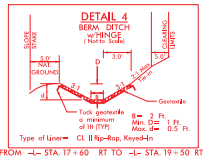
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DETAIL 3
BERM DITCH w/HINGE
(Not to Scale)



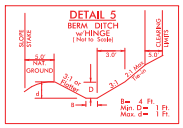
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FROM –L– STA. 37+87 RT TO –L– STA. 39+25 RT

DETAIL 4
BERM DITCH w/HINGE
(Not to Scale)



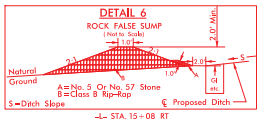
FROM –L– STA. 17+60 RT TO –L– STA. 19+50 RT

DETAIL 5
BERM DITCH w/HINGE
(Not to Scale)



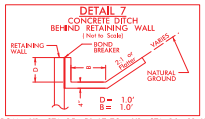
FROM –L– STA. 15+10 RT TO –L– STA. 16+16 RT
FROM –L– STA. 35+50 RT TO –L– STA. 36+14 RT
FROM –L– STA. 36+14 RT TO –L– STA. 37+19 RT
FROM –L– STA. 37+20 RT TO –L– STA. 37+87 RT
FROM –L– STA. 39+25 RT TO –L– STA. 42+00 RT

DETAIL 6
ROCK FALSE SUMP
(Not to Scale)



–L– STA. 15+08 RT

DETAIL 7
CONCRETE DITCH BEHIND RETAINING WALL
(Not to Scale)



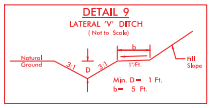
FROM –Y2– STA. 25+50 LT TO –Y2– STA. 26+62 LT
FROM –Y2– STA. 26+62 LT TO –Y2– STA. 28+96 LT
FROM –Y2B– STA. 11+78 LT TO –Y2B– STA. 15+75 LT
FROM –Y2RPB– STA. 21+28 LT TO –Y2B– STA. 14+44 RT
FROM –L– STA. 54+78 TO –L– STA. 55+33 RT
FROM –L– STA. 55+59 TO –L– STA. 63+75 LT
FROM –L– STA. 60+17 TO –L– STA. 80+86 RT
FROM –L– STA. 83+57 TO –L– STA. 98+25 LT
FROM –L– STA. 88+32 TO –L– STA. 97+50 RT
FROM –L– STA. 115+50 RT TO –L– STA. 121+00 RT

DETAIL 8
SPECIAL CUT BASE DITCH
(Not to Scale)



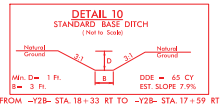
–L– STA. 44+87 LT
FROM –Y2B– STA. 21+65 LT TO –Y2B– STA. 19+84 LT

DETAIL 9
LATERAL 'V' DITCH
(Not to Scale)



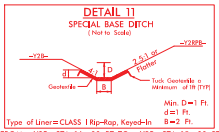
FROM –Y2C– STA. 11+50 RT TO –Y2C– STA. 12+50 RT
FROM –L– STA. 18+50 LT TO –L– STA. 19+40 LT

DETAIL 10
STANDARD BASE DITCH
(Not to Scale)



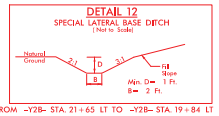
FROM –Y2B– STA. 18+33 RT TO –Y2B– STA. 17+59 RT

DETAIL 11
SPECIAL BASE DITCH
(Not to Scale)



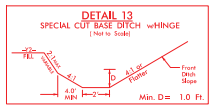
FROM –Y2B– STA. 16+00 RT TO –Y2B– STA. 15+00 RT

DETAIL 12
SPECIAL LATERAL BASE DITCH
(Not to Scale)



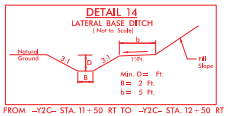
FROM –Y2B– STA. 21+65 LT TO –Y2B– STA. 19+84 LT

DETAIL 13
SPECIAL CUT BASE DITCH w/HINGE
(Not to Scale)



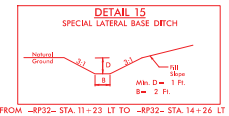
FROM –Y2RPC– STA. 31+30 RT TO –Y2RPC– STA. 32+81 RT

DETAIL 14
LATERAL BASE DITCH
(Not to Scale)



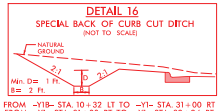
FROM –Y2C– STA. 11+50 RT TO –Y2C– STA. 12+50 RT

DETAIL 15
SPECIAL LATERAL BASE DITCH



FROM –RP32– STA. 11+23 LT TO –RP32– STA. 14+26 LT

DETAIL 16
SPECIAL BACK OF CURB CUT DITCH
(NOT TO SCALE)



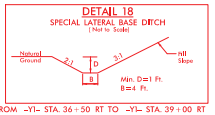
FROM –Y1B– STA. 10+32 LT TO –Y1– STA. 31+00 RT
FROM –Y1– STA. 31+00 RT TO –Y1– STA. 32+24 RT
FROM –Y1– STA. 32+24 RT TO –Y1– STA. 34+97 RT
FROM –Y1– STA. 34+97 RT TO –Y1– STA. 36+50 RT

DETAIL 17
HEAD DITCH
(Not to Scale)



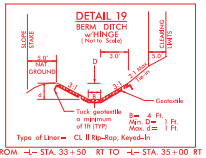
FROM –Y1– STA. 39+00 RT TO –Y1– STA. 40+30 RT

DETAIL 18
SPECIAL LATERAL BASE DITCH
(Not to Scale)



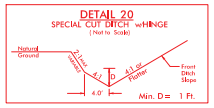
FROM –Y1– STA. 36+50 RT TO –Y1– STA. 39+00 RT

DETAIL 19
BERM DITCH w/HINGE
(Not to Scale)



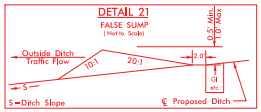
FROM –L– STA. 33+50 RT TO –L– STA. 35+00 RT

DETAIL 20
SPECIAL CUT DITCH w/HINGE
(Not to Scale)



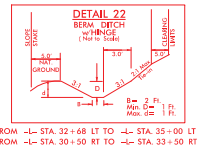
FROM –Y2RPC– STA. 31+23 RT TO –Y2RPC– STA. 34+83 RT
FROM –L– STA. 41+00 RT TO –L– STA. 42+00 RT
FROM –L– STA. 42+00 RT TO –L– STA. 42+50 RT
FROM –L– STA. 14+50 RT TO –L– STA. 15+64 RT
FROM –L– STA. 15+64 RT TO –L– STA. 16+40 RT
FROM –L– STA. 17+00 LT TO –L– STA. 18+50 LT

DETAIL 21
FALSE SUMP
(Not to Scale)



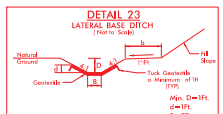
FROM –L– STA. 23+97 RT TO –L– STA. 24+47 RT
FROM –L– STA. 37+21 RT TO –L– STA. 37+71 RT
FROM –L– STA. 39+27 RT TO –L– STA. 39+77 RT
FROM –L– STA. 35+52 RT TO –L– STA. 36+02 RT
FROM –L– STA. 48+10 LT TO –L– STA. 48+60 LT
FROM –L– STA. 17+07 RT TO –L– STA. 17+57 RT
AT –L– STA. 51+48 LT
AT –Y3RPD– STA. 15+78 RT
AT –Y3RPD– STA. 19+93 LT
AT –Y3RPD– STA.21+05 LT
AT –L– STA. 108+87 LT
AT –L– STA. 111+37 LT
AT –L– STA. 113+98 LT

DETAIL 22
BERM DITCH w/HINGE
(Not to Scale)



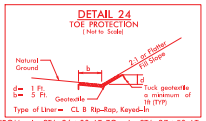
FROM –L– STA. 32+68 LT TO –L– STA. 35+00 LT
FROM –L– STA. 30+50 RT TO –L– STA. 33+50 RT

DETAIL 23
LATERAL BASE DITCH
(Not to Scale)



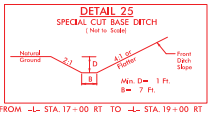
FROM –L– STA. 26+35 RT TO –L– STA. 28+50 RT

DETAIL 24
TOE PROTECTION
(Not to Scale)



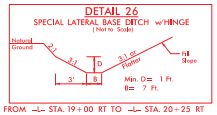
FROM –L– STA. 26+00 LT TO –L– STA. 27+50 LT
FROM –Y1– STA. 21+38 RT TO –Y1– STA. 22+38 RT

DETAIL 25
SPECIAL CUT BASE DITCH
(Not to Scale)



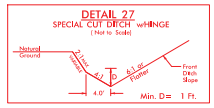
FROM –L– STA. 17+00 RT TO –L– STA. 19+00 RT

DETAIL 26
SPECIAL LATERAL BASE DITCH w/HINGE
(Not to Scale)



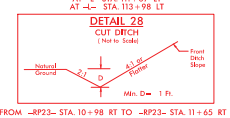
FROM –L– STA. 19+00 RT TO –L– STA. 20+25 RT

DETAIL 27
SPECIAL CUT DITCH w/HINGE
(Not to Scale)



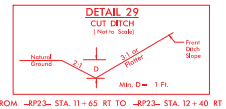
FROM –L– STA. 14+50 LT TO –L– STA. 16+40 LT

DETAIL 28
CUT DITCH
(Not to Scale)



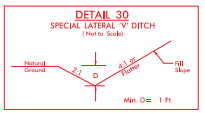
FROM –RP23– STA. 10+98 RT TO –RP23– STA. 11+65 RT

DETAIL 29
CUT DITCH
(Not to Scale)



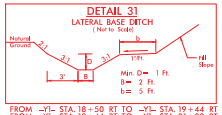
FROM –RP23– STA. 11+65 RT TO –RP23– STA. 12+40 RT

DETAIL 30
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



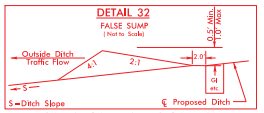
FROM –DW3– STA. 10+53 LT TO –DW3– STA. 11+46 LT

DETAIL 31
LATERAL BASE DITCH
(Not to Scale)



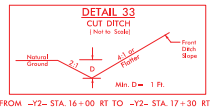
FROM –Y1– STA. 18+50 RT TO –Y1– STA. 19+44 RT
FROM –Y1– STA. 19+44 RT TO –Y1– STA. 21+00 RT

DETAIL 32
FALSE SUMP
(Not to Scale)



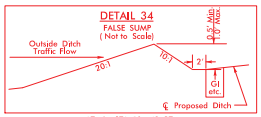
FROM –Y2B– STA. 17+72 RT TO STA. 17+84 RT
FROM –Y6– STA. 19+55 LT to STA. 19+62 LT

DETAIL 33
CUT DITCH
(Not to Scale)



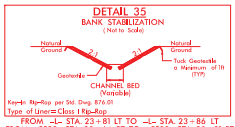
FROM –Y2– STA. 16+00 RT TO –Y2– STA. 17+30 RT

DETAIL 34
FALSE SUMP
(Not to Scale)



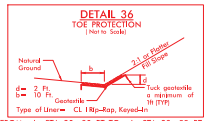
AT –L– STA. 19+42 RT
AT –RP32– STA. 14+40 LT
AT –RP32– STA. 14+86 LT
AT –RP32– STA. 16+09 RT
AT –Y3RPA– STA. 16+49 LT
AT –L– STA. 106+38 RT
AT –L– STA. 108+38 RT
AT –L– STA. 111+97 RT
AT –L– STA. 115+87 RT
AT –L– STA. 117+85 RT

DETAIL 35
BANK STABILIZATION
(Not to Scale)



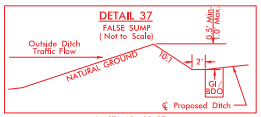
FROM –L– STA. 23+81 LT TO –L– STA. 23+86 LT
FROM –RP23– STA. 20+64 RT TO –RP23– STA. 20+91 RT
FROM –RP32– STA. 20+49 LT TO –RP32– STA. 20+64 LT
FROM –RP23– STA. 34+80 RT TO –RP23– STA. 35+00 RT

DETAIL 36
TOE PROTECTION
(Not to Scale)



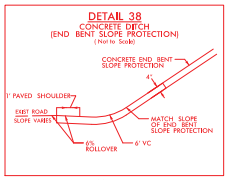
FROM –L– STA. 20+30 RT TO –L– STA. 23+88 RT

DETAIL 37
FALSE SUMP
(Not to Scale)



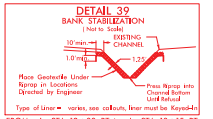
–L– STA. 12+98 RT
–L– STA. 42+13 LT
–L– STA. 42+02 RT
–L– STA. 30+50 RT
–Y2RPC– STA. 31+27 RT

DETAIL 38
CONCRETE DITCH (END BENT SLOPE PROTECTION)
(Not to Scale)



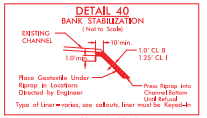
FROM –Y8– STA. 15+66 RT TO –Y8– STA. 18+33 RT

DETAIL 39
BANK STABILIZATION
(Not to Scale)



FROM –L– STA. 12+88 RT to –L– STA. 13+15 RT
FROM –L– STA. 43+73 LT TO –L– STA. 44+12 LT

DETAIL 40
BANK STABILIZATION
(Not to Scale)



–L– STA. 44+87 LT
–Y8– STA. 14+16 LT
–Y8– STA. 15+74 LT
–Y8– STA. 17+70 LT
–Y8– STA. 18+54 LT

PERMIT DRAWING
SHEET 2 OF 36

5/14/99
nts\6086467\I5-2513A\900-CAD GIS\910_CAD\70_NCDOT TIP\Hydraulics\VHB_Design\PSH\I-2513A_Hyd_Details.dgn
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jsf324 AM
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5/14/2021

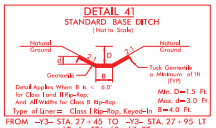
PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	2D-2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

Prepared in the Office of: AECOM
NC FIRM LICENSE No F-0342
5438 Wade Park Boulevard, Suite 200
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

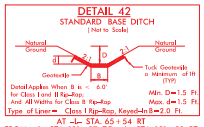
DETAIL 41
STANDARD BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip-Rap;
And All Widths for Class B Rip-Rap
Type of Liner = Class I Rip-Rap, Keyed-In
Min. D= 1.5 Ft.
Max. d= 3.0 Ft.
B=4.0 Ft.

FROM –Y3– STA. 27+45 TO –Y3– STA. 27+95 LT
AT –L– STA. 63+67 RT

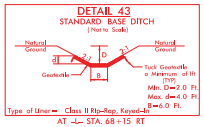
DETAIL 42
STANDARD BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip-Rap;
And All Widths for Class B Rip-Rap
Type of Liner = Class I Rip-Rap, Keyed-In
Min. D= 1.5 Ft.
Max. d= 1.5 Ft.
B=2.0 Ft.

AT –L– STA. 65+54 RT
FROM –L– STA. 101+07 TO –L– STA. 101+53 RT

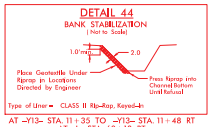
DETAIL 43
STANDARD BASE DITCH
(Not to Scale)



Min. D= 2.0 Ft.
Max. d= 4.0 Ft.
B=6.0 Ft.

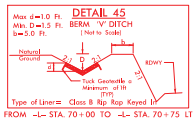
Type of Liner = Class II Rip-Rap, Keyed-In
AT –L– STA. 68+15 RT

DETAIL 44
BANK STABILIZATION
(Not to Scale)



Type of Liner = CLASS II Rip-Rap, Keyed-In
AT –Y13– STA. 11+35 TO –Y13– STA. 11+48 RT
AT –L– STA. 68+13 RT

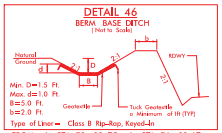
DETAIL 45
BERM 'V' DITCH
(Not to Scale)



Max d=1.0 Ft.
Min. D=1.5 Ft.
b=5.0 Ft.

Type of Liner = Class B Rip-Rap Keyed In
FROM –L– STA. 70+00 TO –L– STA. 70+75 LT

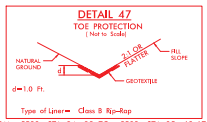
DETAIL 46
BERM BASE DITCH
(Not to Scale)



Min. D=1.5 Ft.
Max. d=1.0 Ft.
B=5.0 Ft.
b=2.0 Ft.

Type of Liner = Class B Rip-Rap, Keyed-In
FROM –L– STA. 73+00 TO –L– STA. 76+00 LT

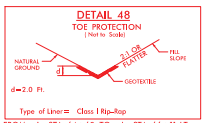
DETAIL 47
TOE PROTECTION
(Not to Scale)



d=1.0 Ft.

Type of Liner = Class B Rip-Rap
FROM –RP32– STA. 34+29 TO –RP32– STA. 35+68 LT
FROM –RAB1– STA. 11+11 TO –RAB1– STA. 11+78 RT
FROM –Y3A– STA. 11+55 TO –Y3A– STA. 12+00 LT
FROM –Y3A– STA. 13+00 TO –Y3A– STA. 14+50 LT

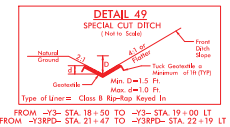
DETAIL 48
TOE PROTECTION
(Not to Scale)



d=2.0 Ft.

Type of Liner = Class I Rip-Rap
FROM –L– STA. 64+60 TO –L– STA. 66+11 LT
FROM –RP32– STA. 31+21 TO –RP32– STA. 32+99 LT

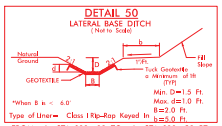
DETAIL 49
SPECIAL CUT DITCH
(Not to Scale)



Min. D=1.5 Ft.
Max. d=1.0 Ft.

Type of Liner = Class B Rip-Rap Keyed In
FROM –Y3– STA. 18+50 TO –Y3– STA. 19+00 LT
FROM –Y3RPD– STA. 21+47 TO –Y3RPD– STA. 22+19 LT

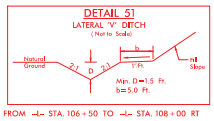
DETAIL 50
LATERAL BASE DITCH
(Not to Scale)



Min. D=1.5 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
*When B is < 6.0'

Type of Liner = Class I Rip-Rap Keyed In b=5.0 Ft.
FROM –L– STA. 100+00 TO –L– STA. 100+90 RT

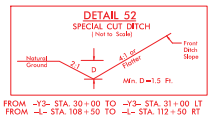
DETAIL 51
LATERAL 'V' DITCH
(Not to Scale)



Min. D=1.5 Ft.
b=5.0 Ft.

FROM –L– STA. 106+50 TO –L– STA. 108+00 RT

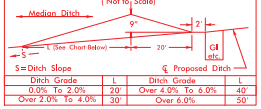
DETAIL 52
SPECIAL CUT DITCH
(Not to Scale)



Min. D=1.5 Ft.

FROM –Y3– STA. 30+00 TO –Y3– STA. 31+00 LT
FROM –L– STA. 108+50 TO –L– STA. 112+50 RT

DETAIL 53
FALSE SUMP
(Not to Scale)

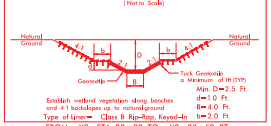


S=Ditch Slope

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

AT STA. 111+37 –L– MED
AT STA. 113+98 –L– MED
AT STA. 115+33 –L– MED
AT STA. 116+99 –L– MED

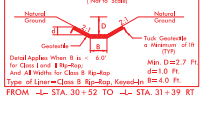
DETAIL 54
BASE DITCH W/VEGETATED BENCH
(Not to Scale)



Establish wetland vegetation along benches and 4:1 backslopes up to natural ground
Type of Liner = Class B Rip-Rap, Keyed-In
Min. D=2.5 Ft.
d=1.0 Ft.
B=4.0 Ft.
b=2.0 Ft.

FROM –Y3– STA. 28+98 TO –Y3– 30+52 RT

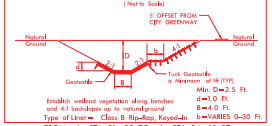
DETAIL 55
STANDARD BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip-Rap;
And All Widths for Class B Rip-Rap
Type of Liner = Class B Rip-Rap, Keyed-In
Min. D=2.7 Ft.
d=1.0 Ft.
B=4.0 Ft.

FROM –L– STA. 30+52 TO –L– STA. 31+39 RT

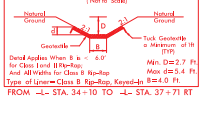
DETAIL 56
BASE DITCH W/VEGETATED BENCH
(Not to Scale)



Establish wetland vegetation along benches and 4:1 backslopes up to natural ground
Type of Liner = Class B Rip-Rap, Keyed-In
Min. D=2.5 Ft.
d=1.0 Ft.
B=4.0 Ft.
b=VARIES 0–30 Ft.

FROM –L– STA. 31+39 TO –L– STA. 34+10 RT

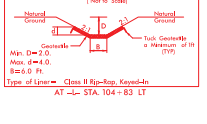
DETAIL 57
STANDARD BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip-Rap;
And All Widths for Class B Rip-Rap
Type of Liner = Class B Rip-Rap, Keyed-In
Min. D=2.7 Ft.
Max d=5.4 Ft.
B=4.0 Ft.

FROM –L– STA. 34+10 TO –L– STA. 37+71 RT

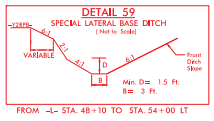
DETAIL 58
STANDARD BASE DITCH
(Not to Scale)



Min. D=2.0.
Max. d=4.0.
B=6.0 Ft.

Type of Liner = Class II Rip-Rap, Keyed-In
AT –L– STA. 104+83 LT

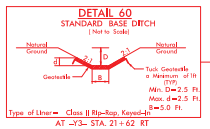
DETAIL 59
SPECIAL LATERAL BASE DITCH
(Not to Scale)



Min. D= 1.5 Ft.
B= 3 Ft.

FROM –L– STA. 48+10 TO STA. 54+00 LT

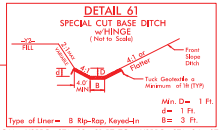
DETAIL 60
STANDARD BASE DITCH
(Not to Scale)



Min. D=2.5 Ft.
Max. d=2.5 Ft.
B=5.0 Ft.

Type of Liner = Class II Rip-Rap, Keyed-In
AT –Y3– STA. 21+62 RT

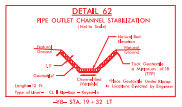
DETAIL 61
SPECIAL CUT DITCH
w/HINGE
(Not to Scale)



Min. D= 1 Ft.
d= 1 Ft.
B= 3 Ft.

Type of Liner = B Rip-Rap, Keyed-In
FROM –Y2RPC– STA. 32+81 RT TO –Y2RPC– STA. 34+67 RT

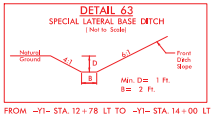
DETAIL 62
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



*Tuck Geotextile Under Riprap at Locations Directed by Engineer

–B– STA. 19+32 LT

DETAIL 63
SPECIAL LATERAL BASE DITCH
(Not to Scale)

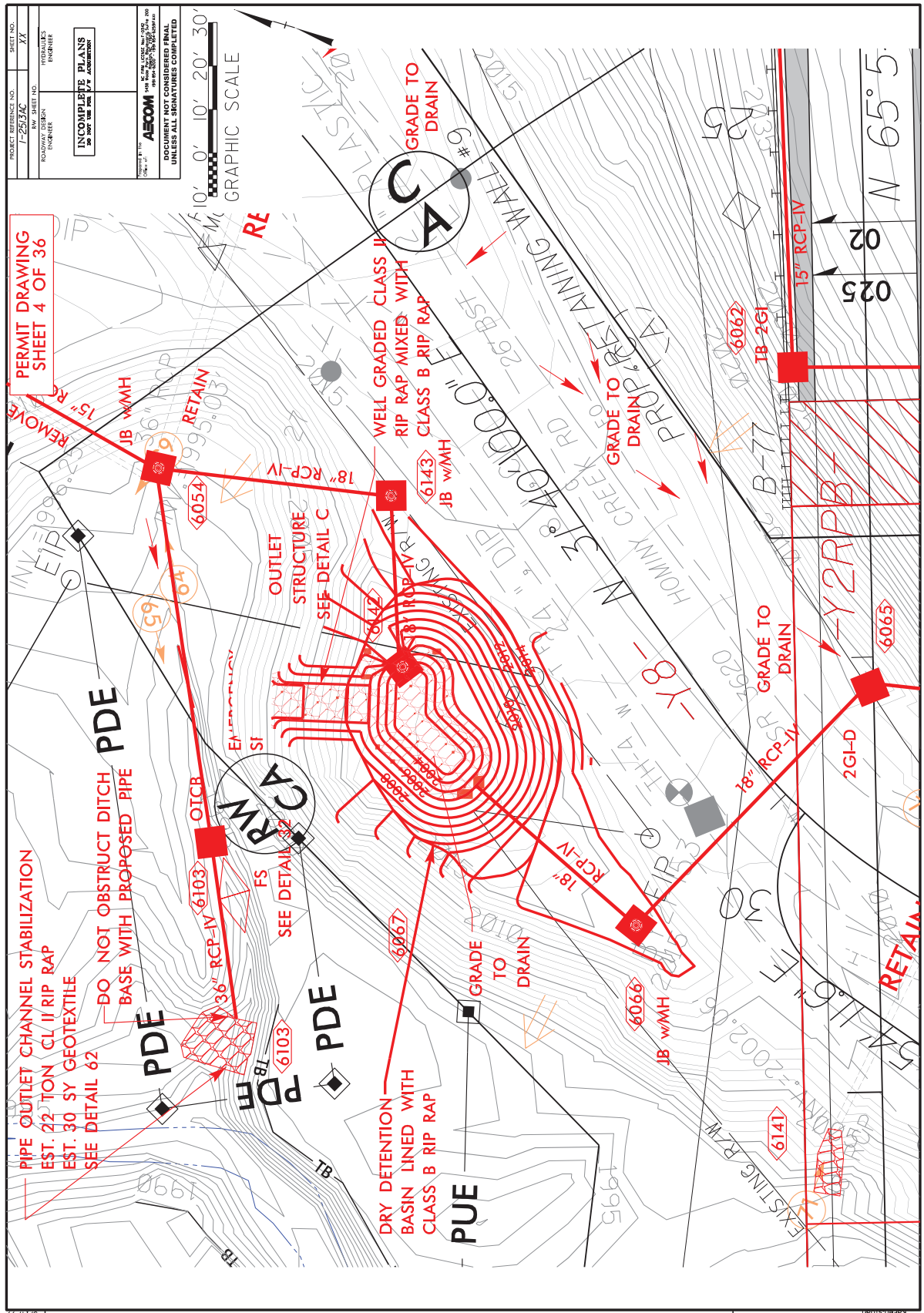


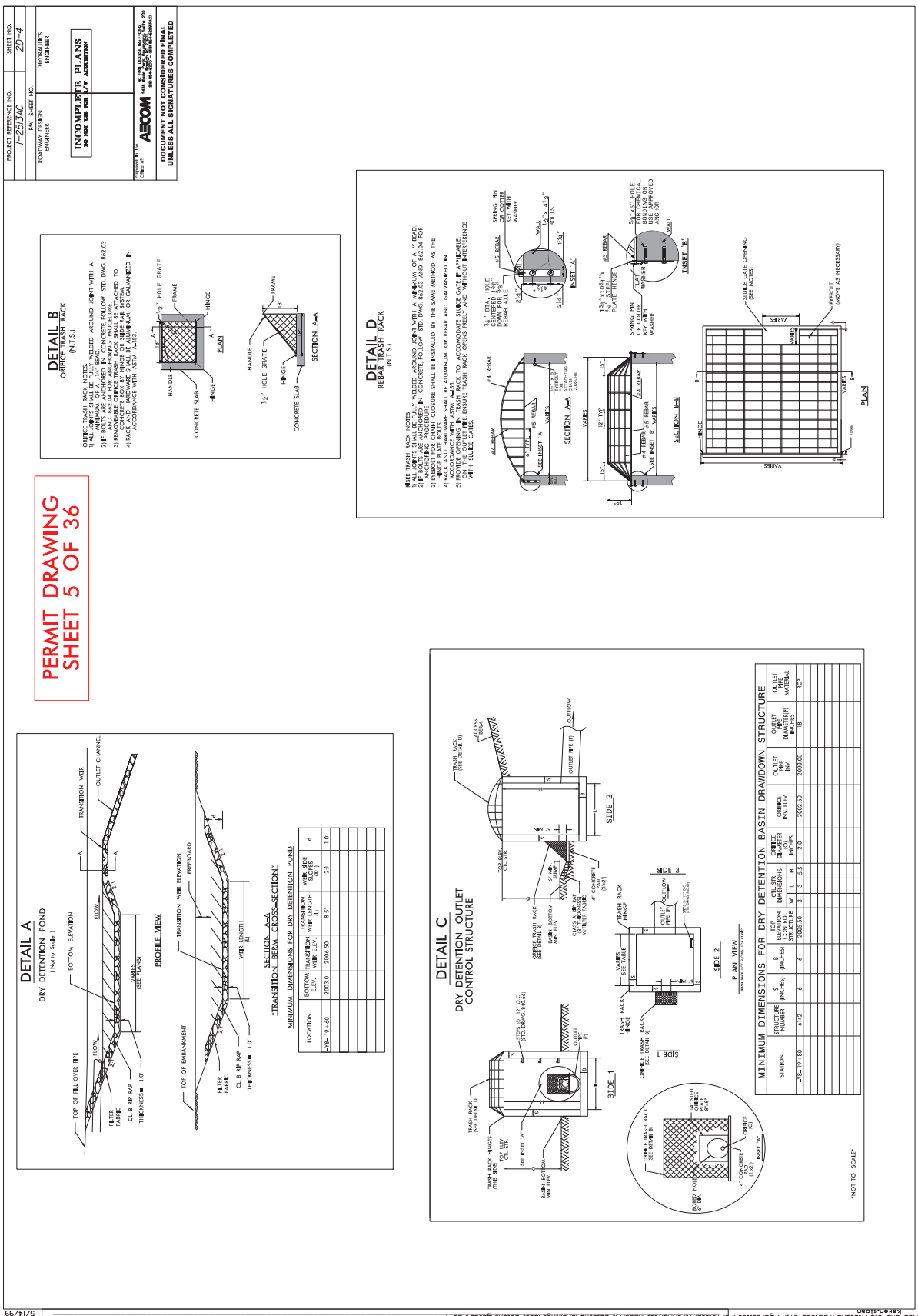
Min. D= 1 Ft.
B= 2 Ft.

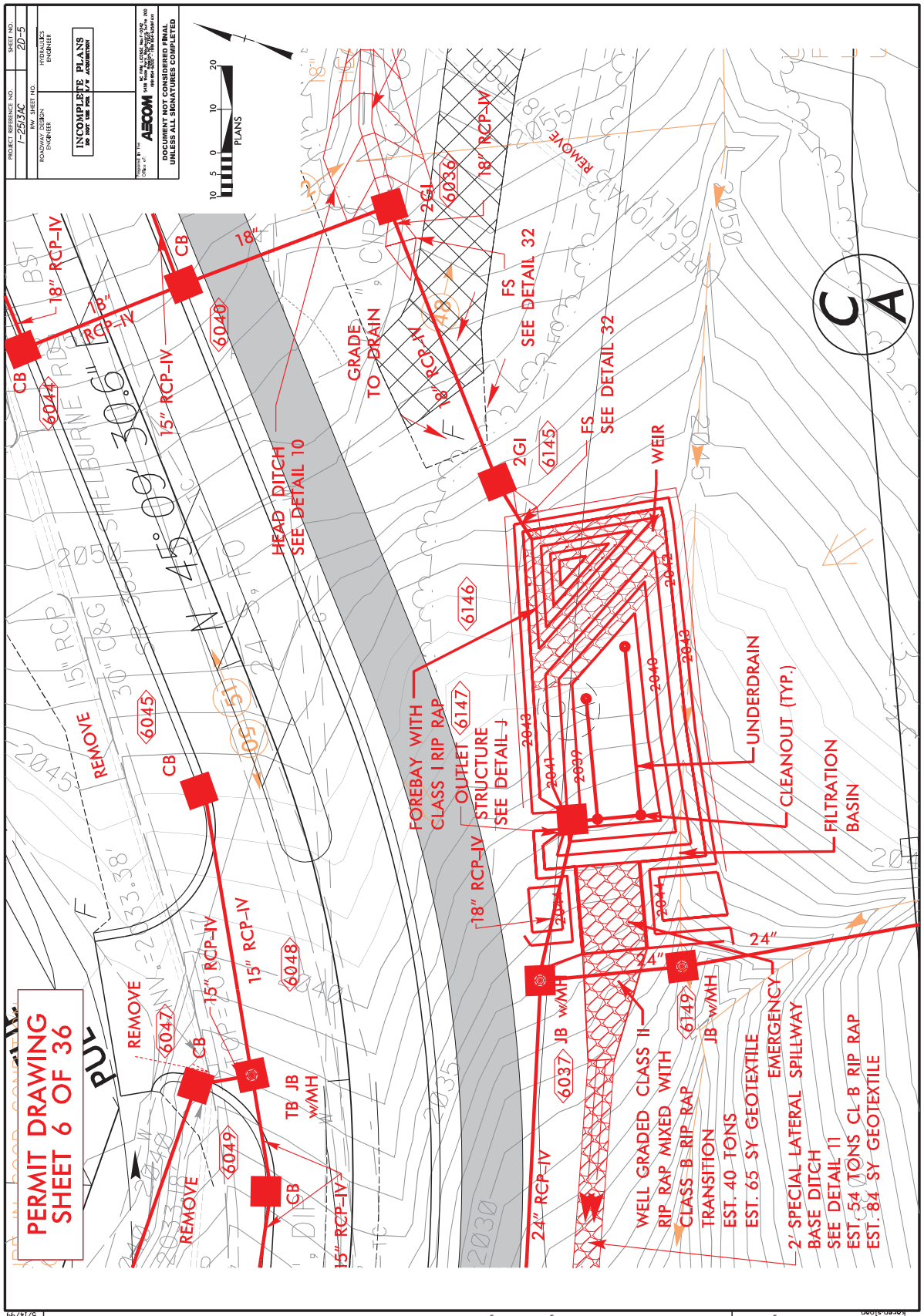
FROM –Y1– STA. 12+78 LT TO –Y1– STA. 14+00 LT

PERMIT DRAWING
SHEET 3 OF 36

P-59


PERMIT DRAWING
SHEET 4 OF 36
INCOMPLETE PLANS
DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
AECOM
PROJECT REFERENCE NO.
1-2513AC
SHEET NO.
XX
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
RW SHEET NO.
GRAPHIC SCALE
10' 0' 10' 20' 30'
PIPE OUTLET CHANNEL STABILIZATION
EST. 22 TON CL II RIP RAP
EST. 30 SY GEOTEXTILE
SEE DETAIL 62
DO NOT OBSTRUCT DITCH
BASE WITH PROPOSED PIPE
PDE
OICB
6103
36" RCP-IV
FS
SEE DETAIL 62
RW
CA
TB
DRY DETENTION
BASIN LINED WITH
CLASS B RIP RAP
PUE
GRADE
TO
DRAIN
6067
6066
JB w/MH
6141
EXISTING R/W
18" RCP-IV
2GI-D
6065
GRADE TO
DRAIN
6062
TB 2GI
15" RCP-IV
B-77
PROP. REST AINING WALL
HOMMY CREEK RD
N 31°40'00.00" E
S 69° 55' 02 025
WELL GRADED CLASS II
RIP RAP MIXED WITH
CLASS B RIP RAP
6143
JB w/MH
6042
18" RCP-IV
OUTLET
STRUCTURE
SEE DETAIL C
6054
18" RCP-IV
JB w/MH
RETAIN
REMOVE
15" R
REVISIONS
5/14/99
3/13/2023


PERMIT DRAWING
SHEET 5 OF 36
DETAIL A
DRY DETENTION POND
DETAIL B
OFFICE TRASH RACK
DETAIL C
DRY DETENTION OUTLET
CONTROL STRUCTURE
DETAIL D
REBAR TRASH RACK
MINIMUM DIMENSIONS FOR DRY DETENTION BASIN DRAWDOWN STRUCTURE
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR BIDDING OR CONSTRUCTION
PROJECT REFERENCE NO.
I-2513AC
SHEET NO.
20-4
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
REVISIONS


PROJECT REFERENCE NO.
1-25134C
SHEET NO.
20-5
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
AECOM
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PLANS
PERMIT DRAWING
SHEET 6 OF 36
PUE
REMOVE
CB
18" RCP-IV
15" RCP-IV
HEAD DITCH
SEE DETAIL 10
GRADE TO DRAIN
FS
SEE DETAIL 32
2GI
WEIR
FOREBAY WITH
CLASS I RIP RAP
OUTLET STRUCTURE
SEE DETAIL J
UNDERDRAIN
CLEANOUT (TYP.)
FILTRATION BASIN
TB JB w/MH
JB w/MH
24" RCP-IV
WELL GRADED CLASS II
RIP RAP MIXED WITH
CLASS B RIP RAP
TRANSITION
EST. 40 TONS
EST. 65 SY GEOTEXTILE
EMERGENCY
2' SPECIAL LATERAL SPILLWAY
BASE DITCH
SEE DETAIL 11
EST. 54 TONS CL B RIP RAP
EST. 84 SY GEOTEXTILE
6036
6037
6040
6044
6045
6046
6047
6048
6049
6145
6146
6147
6149
2030
2035
2040
2045
2050
2055
2060
2041
2042
2043
2044
45°-09'-30"
N
REVISIONS
5/14/99
3134\900-CAD OUTS\910-CADV70-NCDOT_11PrHyd-aulicsVPermits-Environmental\AECOM\1-2513-BC\Drainage\06-I-25136-hyd-det-20-5
3/13/2023

FILTRATION BASIN DETAILS (ALIGNMENT –Y2B–)

PERMIT DRAWING
SHEET 7 OF 36

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	2D-6
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

GENERAL NOTES:

① ENGINEERED SOIL MEDIA

Filtration Basin Soil Mix Blend

The Engineered Soil Mix shall consist of the following blend:

Recycled Expanded Slate Fines	80%
Approved Compost Organic Component	20%

Mechanically mix 1 part compost with 4 parts of the expanded slate fines until a uniform distribution of the components is achieved. The slate aggregate fines and organic component consist of the following:

Recycled Expanded Slate Fines

The recycled expanded slate aggregate fines shall conform to the following screening operation:

Sieve Size	% Retained
#4	4–8%
#8	28–38%
#16	46–58%
#30	63–75%
#50	74–84%
#100	82–90%
Fine Material	2.79–3.53% passing #100

Organic Component

The compost or organic component shall conform to the following specifications:

1. Humus material shall have an ash content of no less than 8 percent and no more than 40 percent.
2. The pH of the organic matter shall be between 5.5 and 8.5.
3. The salt content shall be less than 10 mmhos/cm at 25 degrees C, (Ece<10) on a saturated past extract.
4. Types of acceptable composted products can be derived from yard wastes, low in salts, low in phosphorous (P205 below 1% wet wt. bas us), free from weed seeds, free of pathogens and other deleterious materials.
5. Composted pine bark products are conditionally acceptable (stable humus must be present).
6. Sludge based materials are not acceptable including municipal sewage sludge bio-solids.
7. The organic amendment must have a Carbon:Nitrogen ratio of <25:1.
8. The compost shall be aerobic without malodorous presence of decomposition products.
9. From 75 to 100 percent organic amendment particles shall pass the 4.0 mm sieve size.
10. From 45 to 65 percent moisture measure via wet weight basis.
11. Free of stones, debris, plant material.
12. Organic content must be above 50% on a dry weight basis.
13. Metals and contaminants must meet or exceed US EPA Standard 40.

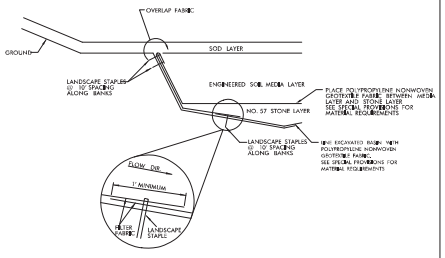
② WASHED GRAVEL (NO. 57 STONE), LIMESTONE BASED AGGREGATES SHOULD NOT BE USED

③ FESCUE/BLUEGRASS BLEND SOD; THE SOD SOIL LAYER SHALL CONTAIN MINIMAL CLAY CONTENT IN ORDER TO FACILITATE FILTRATION. THE SOD SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION (TOP OF SOD IS FINISHED GRADE)

④ THE UNDERDRAIN PIPES SHALL HAVE A MINIMUM SLOPE OF 0.005 FT./FT.

⑤ FOR FURTHER FILTRATION BASIN DETAIL, SEE PROJECT SPECIAL PROVISIONS.

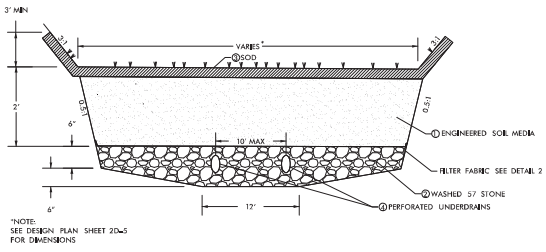
DETAIL F
FILTRATION BASIN
FABRIC INSTALLATION
N.T.S.



NOTES:
1) LINING FABRIC SHOULD BE FOLDED BACK TO OVERLAP DIVIDING FABRIC AND SECURED WITH LANDSCAPE STAPLES TO ENSURE SEALING THE STONE FROM SOIL.
2) FABRIC SHOULD BE LAYED IN A WAY TO PREVENT WATER FROM FLOWING BETWEEN OVERLAPPED PIECES. (SEE BLOWUP)
3) FABRIC SHOULD BE OVERLAPPED A MINIMUM OF 12 INCHES AND SECURED WITH STAPLES.
4) NO OVERLAPPING SHOULD OCCUR UNDER DRAIN PIPES.

ESTIMATED BILL OF MATERIALS FOR BASIN ALIGNMENT –Y2B–

SOD – 80 SY
6" HDPE PERFORATED UNDERDRAINS – 68 LF
CLEANOUTS – 4 EA
SOIL MEDIA, WASHED STONE – SEE SHEET 2D–5
6" HDPE – 15 LF

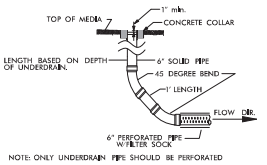


*NOTE:
SEE DESIGN PLAN SHEET 2D–5
FOR DIMENSIONS

DETAIL E TYPICAL FILTRATION CROSS SECTION
NOT TO SCALE

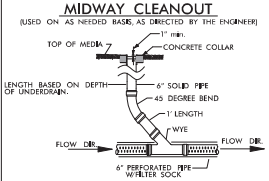
DETAIL G
UNDERDRAIN CLEANOUTS

END CLEANOUT
*NOT TO SCALE



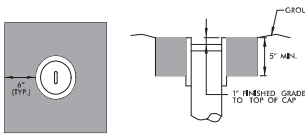
NOTE: ONLY UNDERDRAIN PIPE SHOULD BE PERFORATED

MIDWAY CLEANOUT
(USED ON AS NEEDED BASIS, AS DIRECTED BY THE ENGINEER)



NOTE: ONLY UNDERDRAIN PIPE SHOULD BE PERFORATED *NOT TO SCALE

RECESSED CLEANOUT W/CONCRETE COLLAR



TOP VIEW SIDE VIEW

NOTES:
1. CLEANOUT CAP SHALL BE RECESSED 1" MIN. BELOW GROUND, REMOVABLE, WATER TIGHT, AND CLOSED UNDER NORMAL CONDITIONS.
2. CONCRETE SHALL BE 3,000 PSI.
3. THIS CONCRETE COLLAR DETAIL SHALL BE APPLIED TO ALL CLEANOUTS ON PROJECT.
4. USE 45 DEG ELBOWS AT ALL BENDS IN PIPE CLEANOUTS.

*NOT TO SCALE

REVISIONS

8/17/99

3/17/2023
sarah.spencer@hdrinc.com
ACCDocs\HDR, Inc\ACCDocs\NCDOT_I-2513AC_Design-Build_Team_Documents\Project Documents\Design\Roadway\Drawings\Sheets\I-2513AC_2D-6_Filtration_Basin_Details.dgn

P-63

FILTRATION BASIN DETAILS (ALIGNMENT –Y2B–)

PERMIT DRAWING
SHEET 7A OF 36

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	20-7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

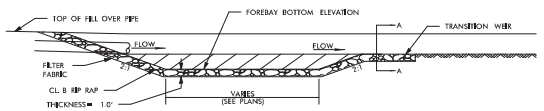
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

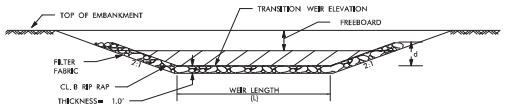
DETAIL H

FOREBAY

(Not to Scale)



PROFILE VIEW



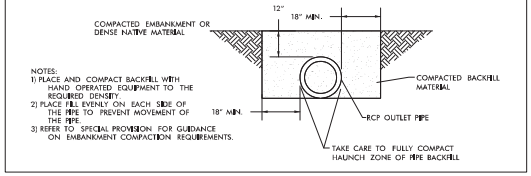
SECTION A–A
"TRANSITION BERM CROSS-SECTION"

MINIMUM DIMENSIONS FOR FOREBAY

LOCATION	FOREBAY BOTTOM ELEV.	TRANSITION WEIR ELEV.	TRANSITION WEIR LENGTH (L)	WEIR SIDE SLOPES (X:1)	d
–Y2B– 16+93	2038	2041	34	2	1
–Y2C– 34+70	2065.99	2068.99	15	2	1

DETAIL I

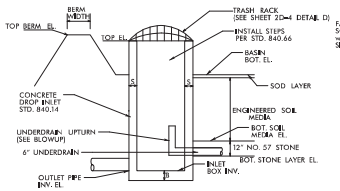
OUTLET PIPE INSTALLATION THROUGH EMBANKMENT
(N.T.S.)



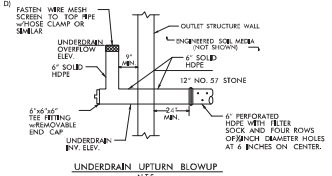
NOTES:
1) PLACE AND COMPACT BACKFILL WITH HAND OPERATED EQUIPMENT TO THE REQUIRED DENSITY.
2) PLACE FILL EVENLY ON EACH SIDE OF THE PIPE TO PREVENT MOVEMENT OF THE PIPE.
3) REFER TO SPECIAL PROVISION FOR GUIDANCE ON EMBANKMENT COMPACTION REQUIREMENTS.

DETAIL J

FILTRATION BASIN
OUTLET CONTROL STRUCTURE



BIORETENTION BASIN OUTLET STRUCTURE DETAIL
N.T.S.



UNDERDRAIN UPTURN BLOWUP
N.T.S.

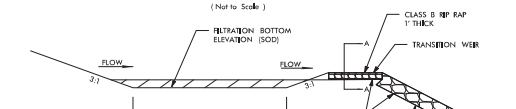
NOTES:
1) PROVIDE WATER TIGHT CONNECTIONS USING WATERSTOP OR COMPRESSION GASKET APPROVED BY ENGINEER ON ALL OUTLET STRUCTURE PENETRATIONS.
2) INSTALL STEPS IN ACCORDANCE WITH STD. 840.66.
3) FOR UNDERDRAIN, USE SOLID (NON–PERFORATED) PIPE THROUGH STRUCTURE WALL AND EXTEND 2 FT. MIN. INTO NO. 57 STONE LAYER.
4) SEE ENGINEERED SOIL MEDIA DETAIL SHEET 2–A.
5) SEE DETAIL THIS SHEET FOR UNDERDRAIN UPTURNED ELBOW/OVERFLOW.
6) NO BEDDING MATERIAL TO BE USED, THEREFORE, DO NOT FOLLOW STANDARD DRAWINGS FOR METHOD OF PIPE INSTALLATION FOR OUTLET PIPE THROUGH EMBANKMENT. SEE DETAIL FOR PIPE INSTALLATION THROUGH EMBANKMENT.
7) ENSURE TRASH RACK OPENS FREELY AND WITHOUT INTERFERENCE.

STATION	STR. #	S (inches)	B (inches)	TOP BOX EL.	CTL. STR. DIMENSIONS W	L	H	TOP BERM EL.	TOP BERM WIDTH	BASIN BOTTOM EL.	BOTTOM SOIL MEDIA EL	BOTTOM STONE EL.	UNDERDRAIN INVERT	UNDERDRAIN OVERFLOW EL.	BOX / OUTLET PIPE INVERT
–Y2B– 16+40	6147	6	6	2040.5	3	3	4.5	2044.0	10	2039	2037	2036	2036.25	2037.50	2036.00

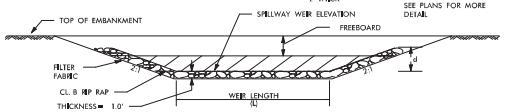
DETAIL K

FILTRATION SPILLWAY WEIR

(Not to Scale)



PROFILE VIEW



SECTION A–A
"TRANSITION BERM CROSS-SECTION"

MINIMUM DIMENSIONS FOR FOREBAY SPILLWAY WEIR

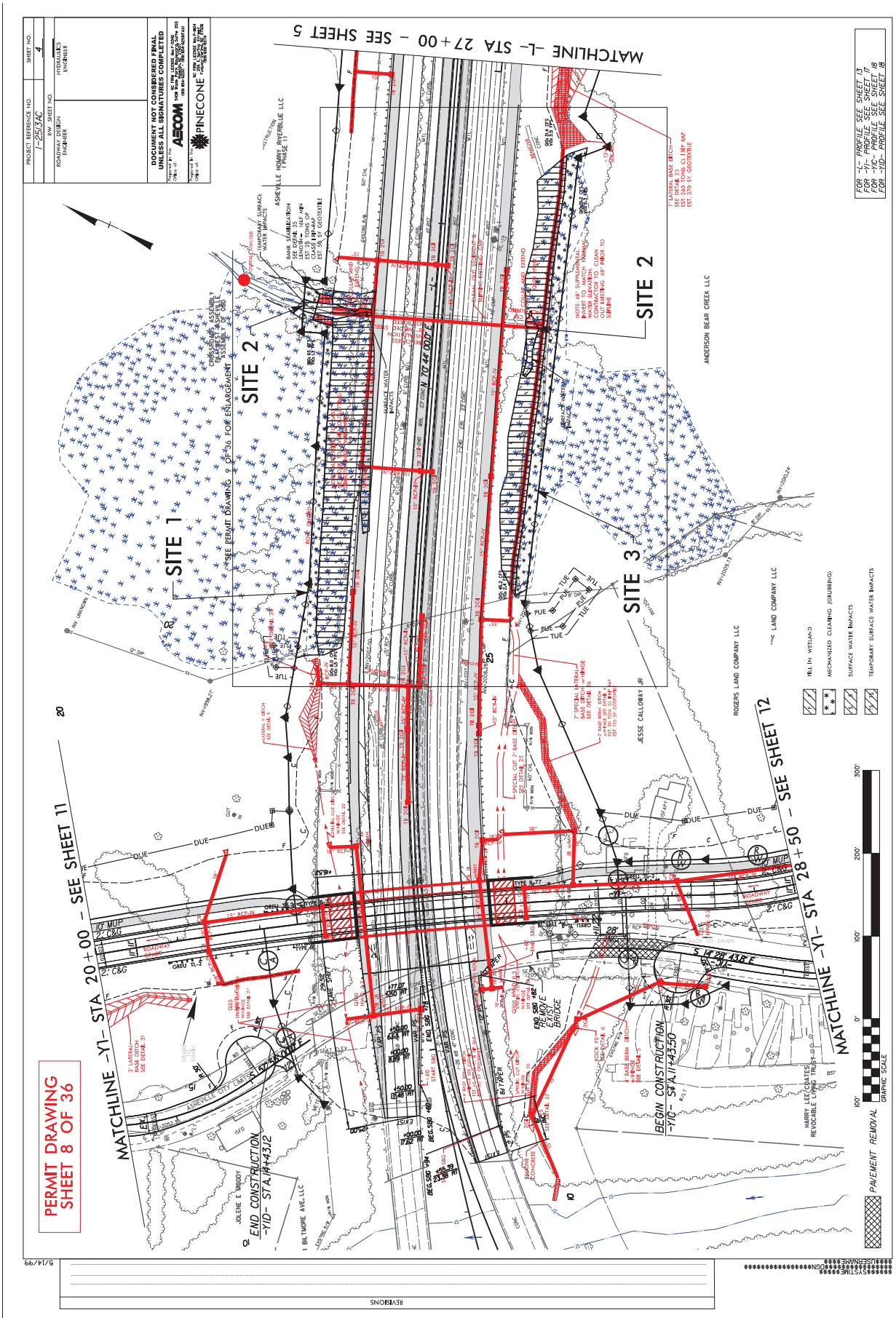
LOCATION	FILTRATION BOTTOM ELEV.	TRANSITION WEIR ELEV.	TRANSITION WEIR LENGTH (L)	WEIR SIDE SLOPES (X:1)	d	TOP OF EMBANKMENT ELEV.
–Y2B– 16+27	2038	2042	9	2	1	2044

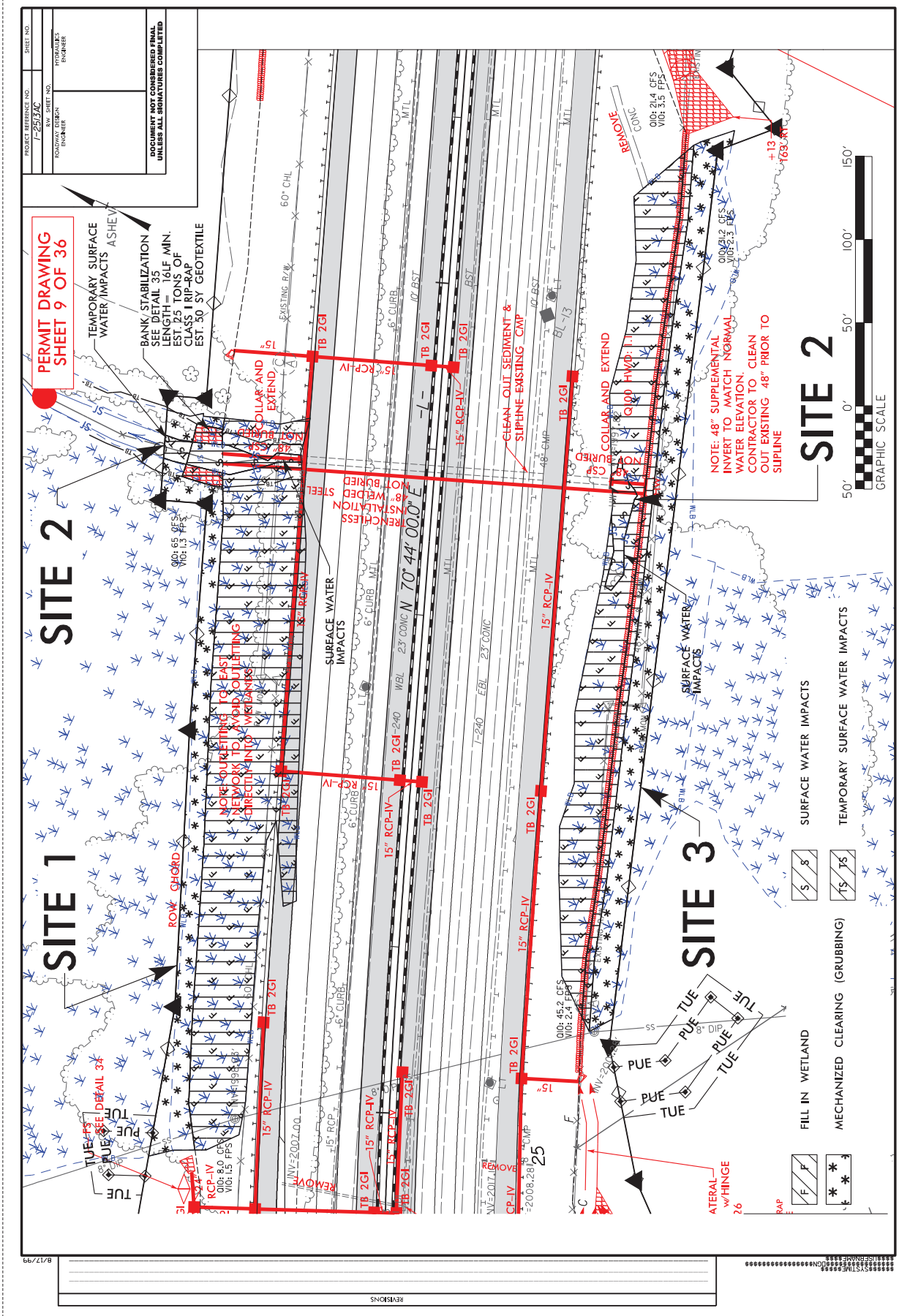
REVISIONS

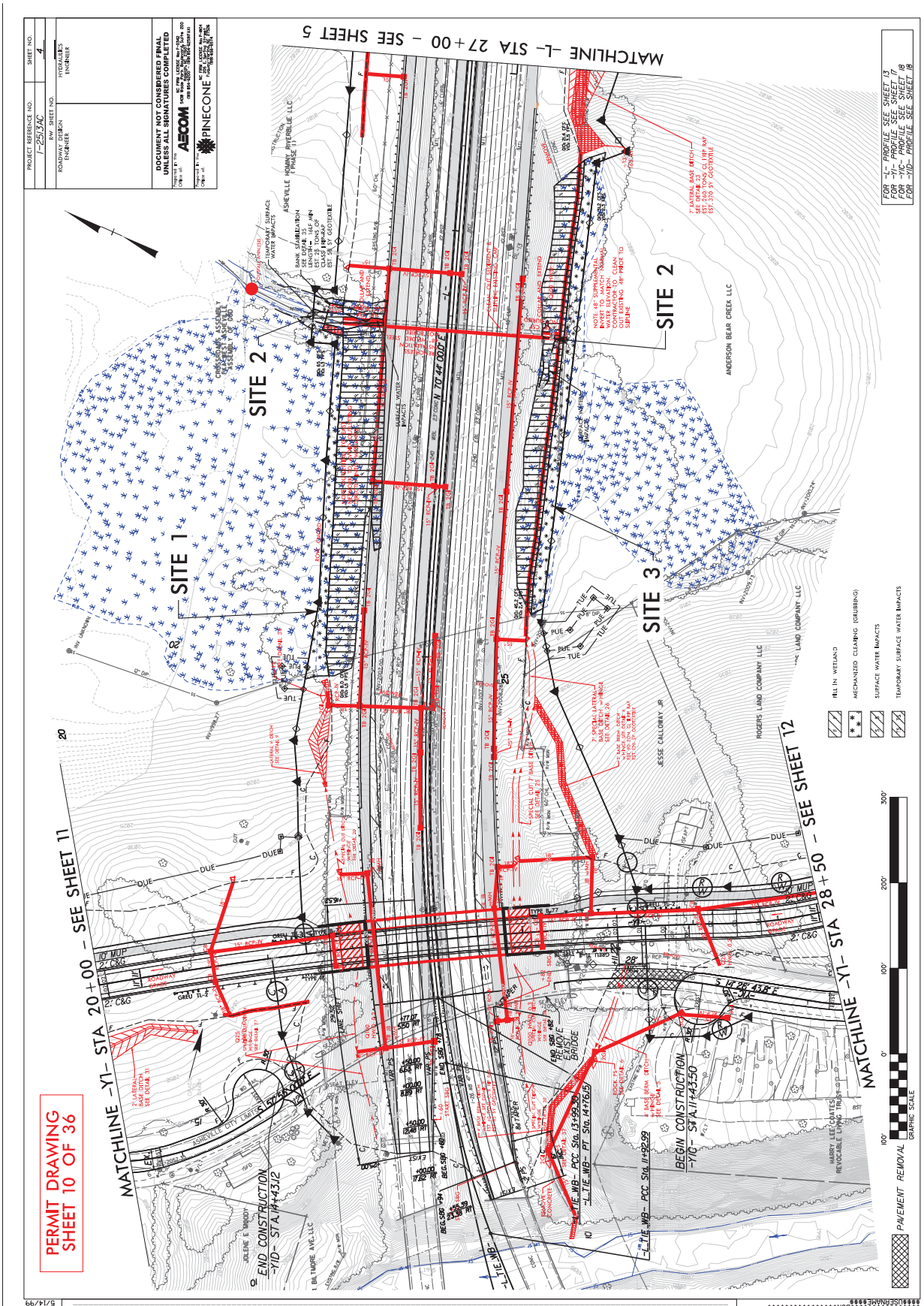
8/17/23

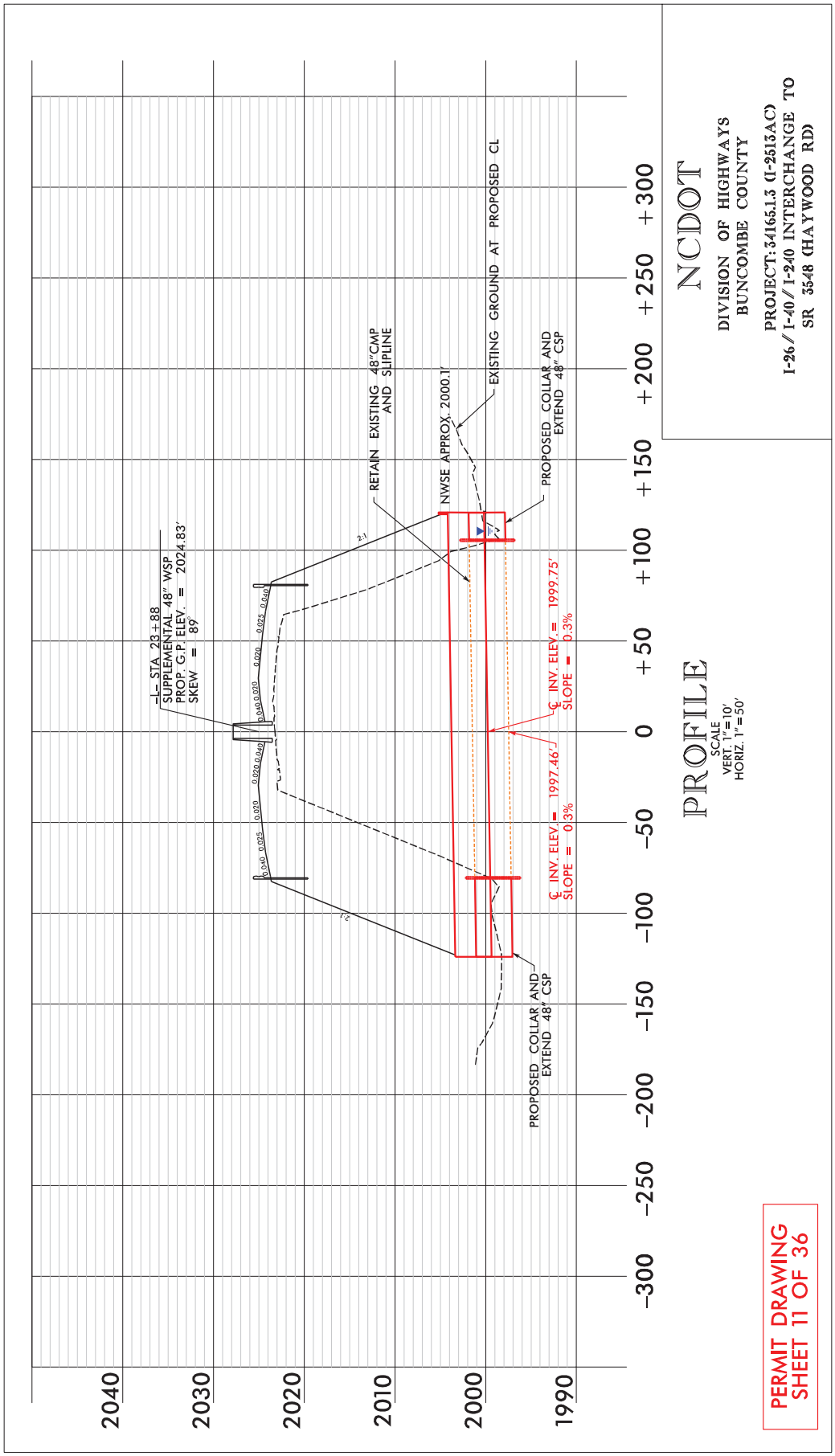
3/13/2023

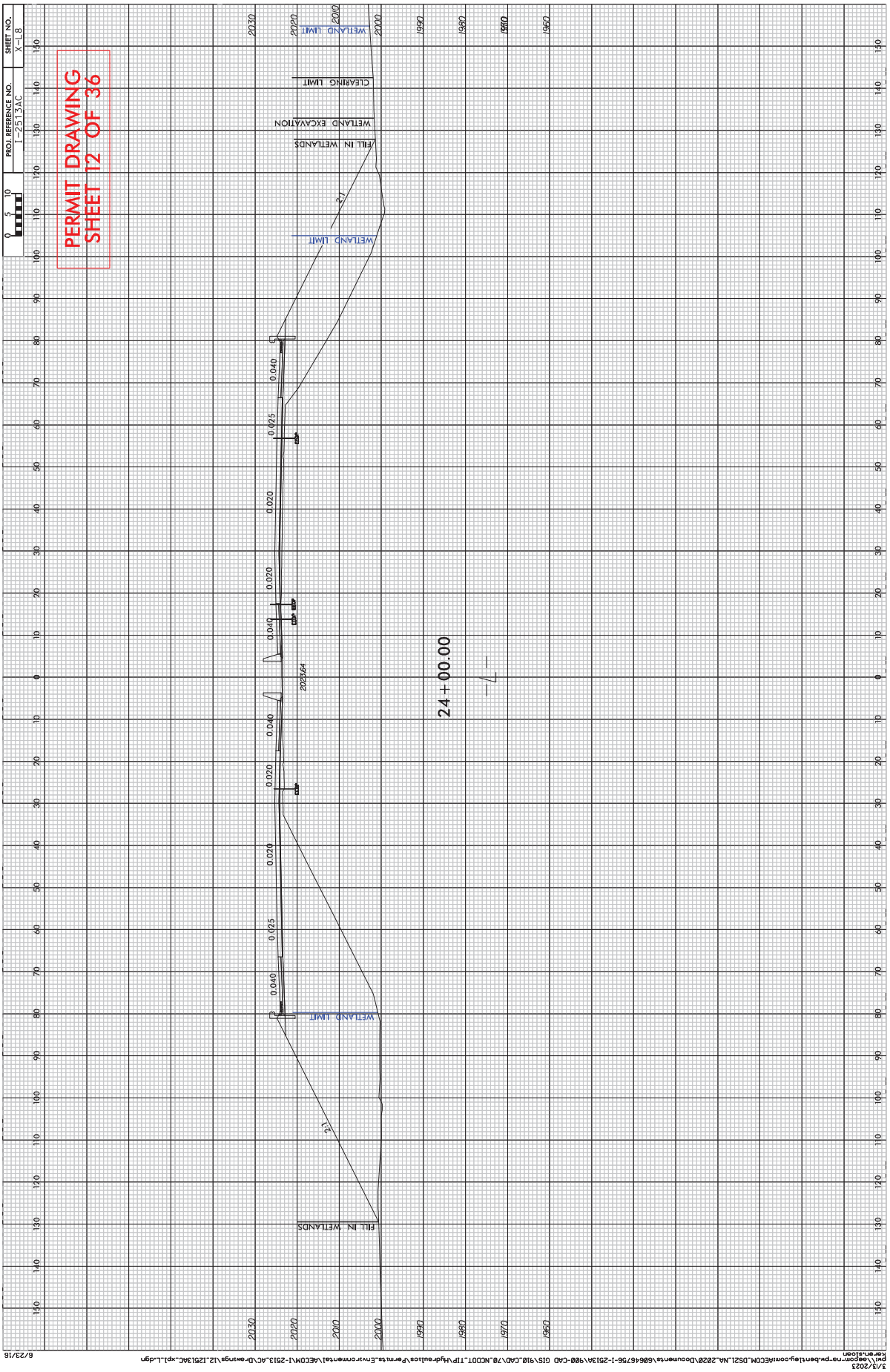
Autodesk Docs://I-2513AC Design Phase/Documents/68646756-I-2513A.900-CAD_GIS\918_CADD_78_NCDOT_TIP\Hydraulics\Permits_Environmental\AECOM\I-2513_ACU-Drawings\87_I-2513A_hyd_det-20-6

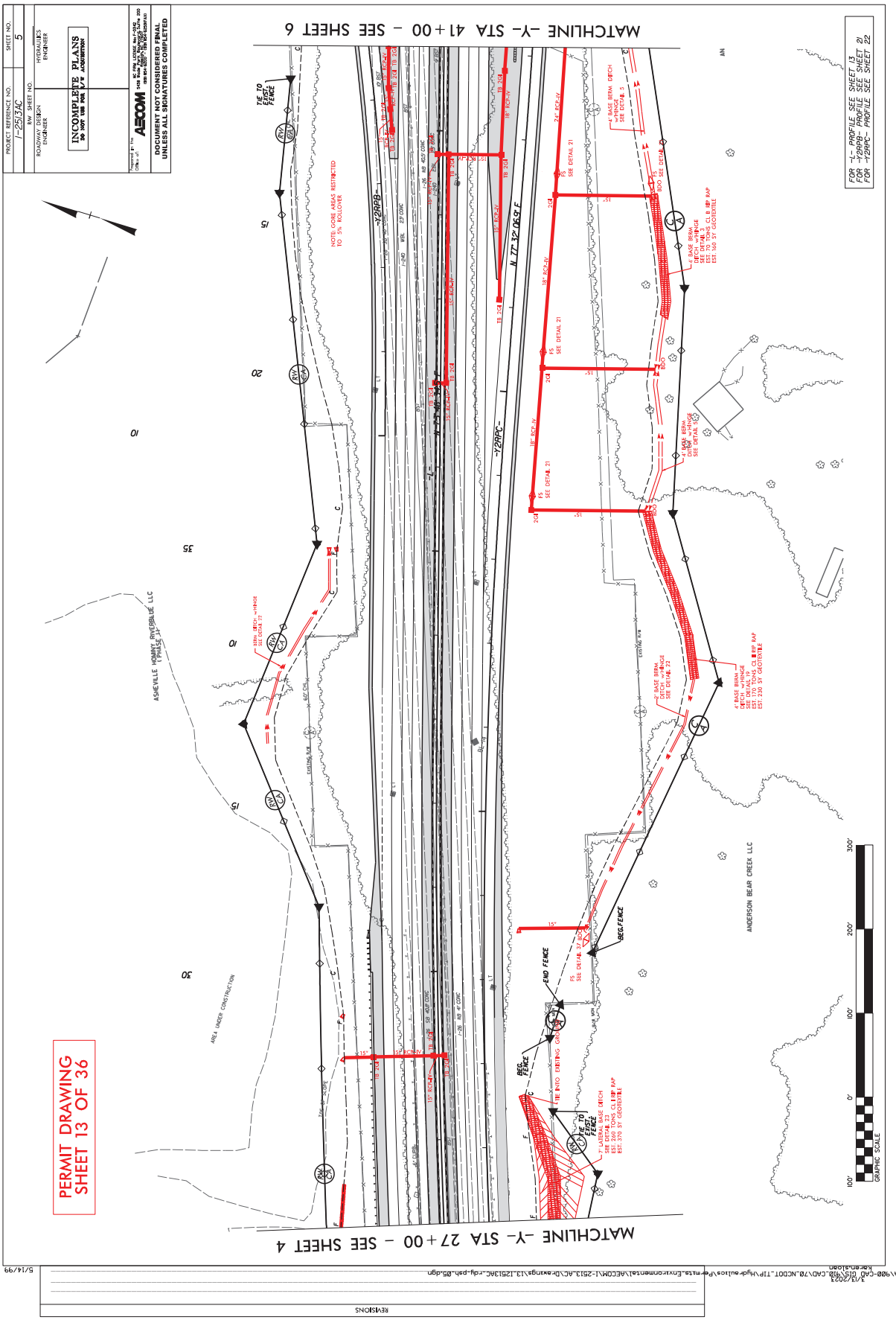

PERMIT DRAWING
SHEET 8 OF 36
MATCHLINE -Y1- STA 20+00 - SEE SHEET 11
MATCHLINE -Y1- STA 27+00 - SEE SHEET 5
MATCHLINE -Y1- STA 28+50 - SEE SHEET 12
SEE PERMIT DRAWING 9 OF 36 FOR ENLARGEMENT
SITE 1
SITE 2
SITE 3
BEGIN CONSTRUCTION -Y1- STA 14+43.50
END CONSTRUCTION -Y1- STA 14+43.12
ASHEVILLE HOMINY RIVERBLUE LLC (PHASE 1)
ANDERSON BEAR CREEK LLC
ROGERS LAND COMPANY LLC
JESSE CALLOWAY JR
HARRY LEE COATES REVOCABLE LIVING TRUST
JOLENE E. WOODY
FILL IN WETLAND
MECHANIZED CLEARING (GRUBBING)
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
PAVEMENT REMOVAL
GRAPHIC SCALE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
AECOM
PINECONE
REVISIONS

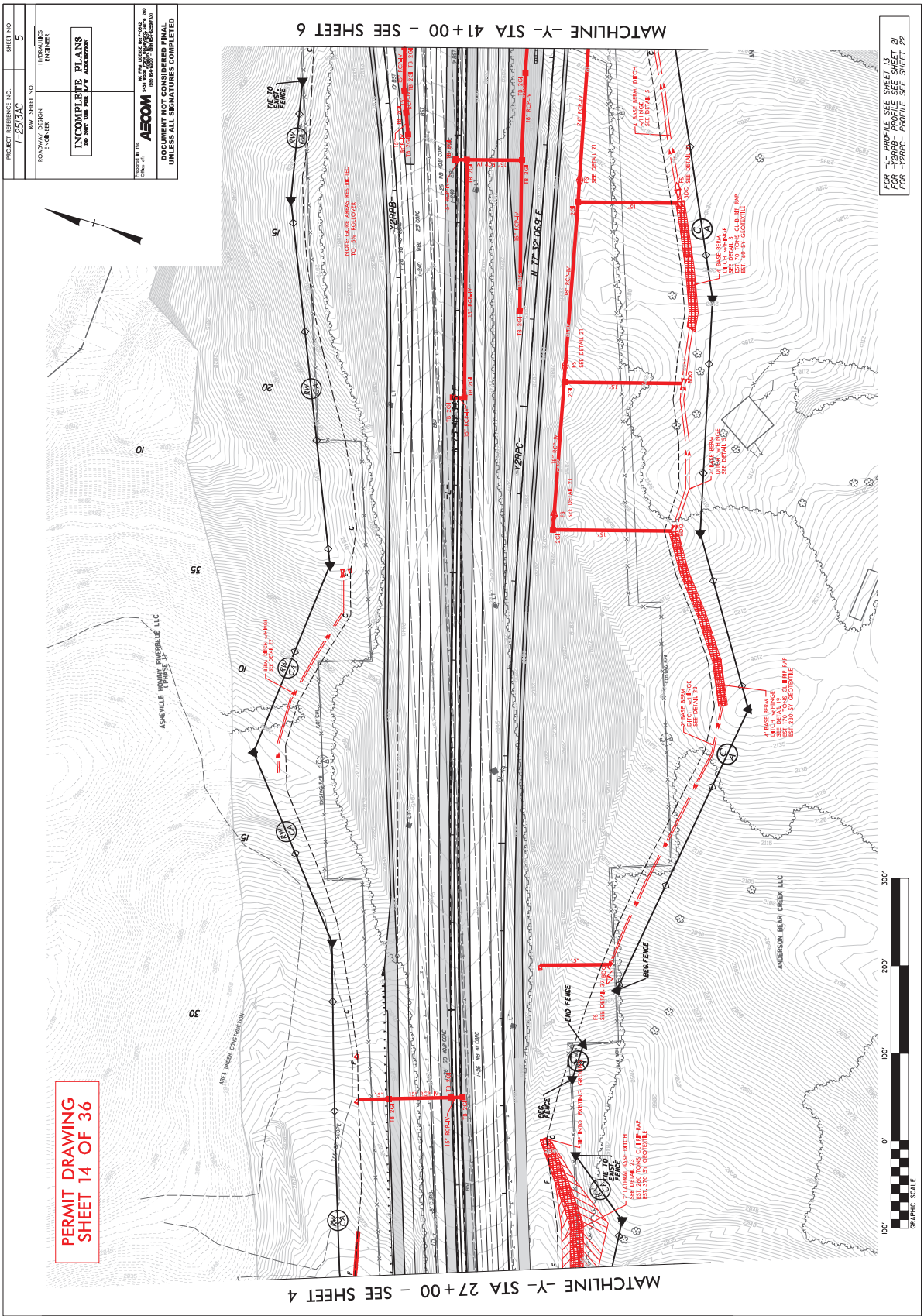

PERMIT DRAWING
SHEET 9 OF 36
SITE 1
SITE 2
SITE 3
TEMPORARY SURFACE WATER IMPACTS
BANK STABILIZATION
SEE DETAIL 35
LENGTH= 16LF MIN.
EST. 25 TONS OF
CLASS I RIP-RAP
EST. 50 SY GEOTEXTILE
SURFACE WATER IMPACTS
N 70° 44' 00.0" E
CLEAN OUT SEDIMENT & SLIPLINE EXISTING CMP
NOTE: 48" SUPPLEMENTAL INVERT TO MATCH NORMAL WATER ELEVATION. CONTRACTOR TO CLEAN OUT EXISTING 48" PRIOR TO SLIPLINE
REMOVE CONC COLLAR AND EXTEND
REMOVE CSP COLLAR AND EXTEND
NOTE: OUTLETTING TO EAST NETWORK TO AVOID OUTLETTING DIRECTLY INTO WETLANDS
TEMPORARY SURFACE WATER IMPACTS
SURFACE WATER IMPACTS
FILL IN WETLAND
MECHANIZED CLEARING (GRUBBING)
GRAPHIC SCALE
50' 0' 50' 100' 150'
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-2514C
SHEET NO.
ROW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
REVISIONS
8/17/99

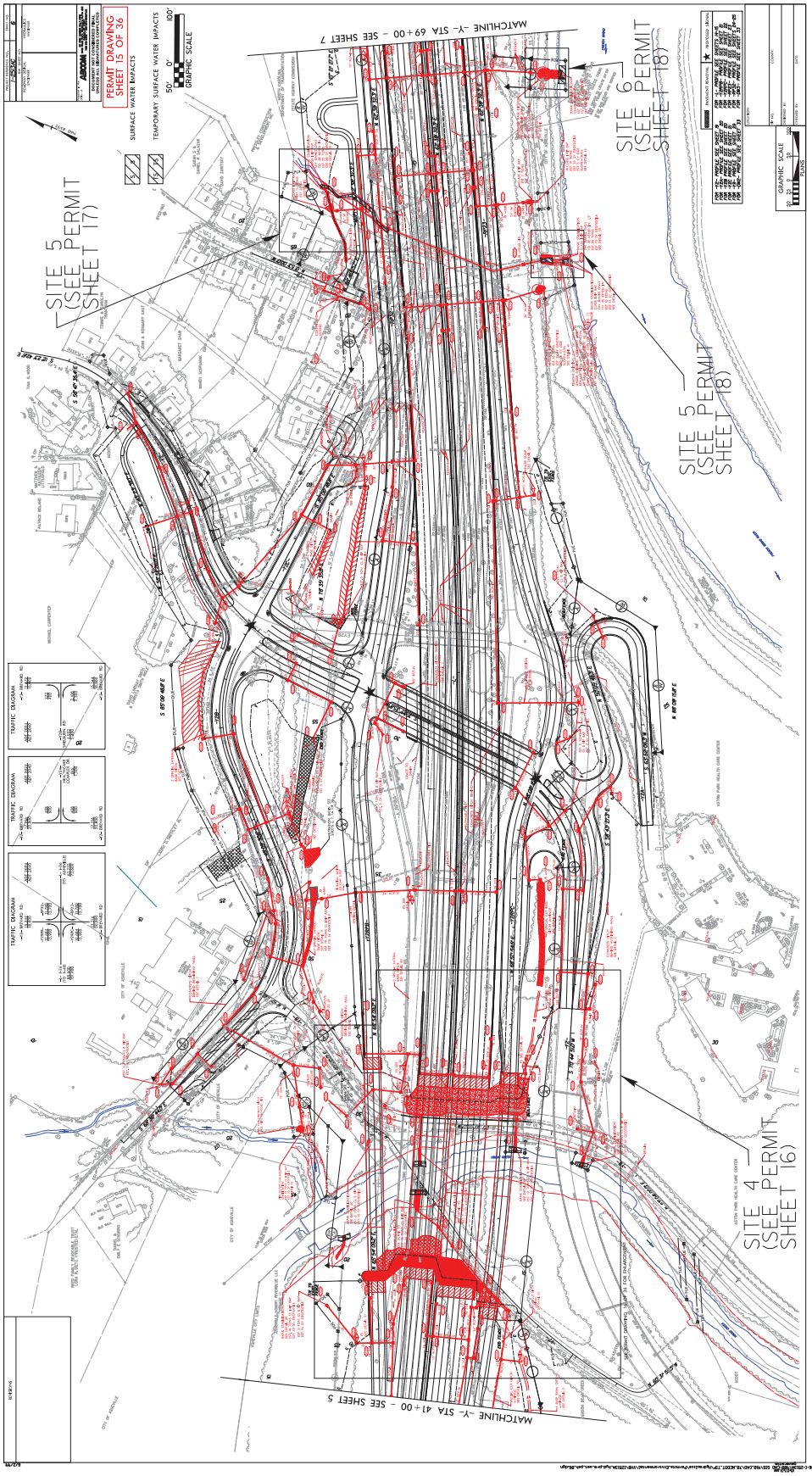

PERMIT DRAWING
SHEET 10 OF 36
MATCHLINE -Y1- STA 20+00 - SEE SHEET 11
MATCHLINE -L- STA 27+00 - SEE SHEET 5
MATCHLINE -Y1- STA 28+50 - SEE SHEET 12
SITE 1
SITE 2
SITE 3
SITE 2
BEGIN CONSTRUCTION -Y1- STA.11+43.50
END CONSTRUCTION -Y1D- STA.14+43.12
-L1E,WB- PCC Sta.13+99.56
-L1E,WB- PT Sta.14+16.69
-L1E,WB- PCC Sta.11+92.99
-L1E,WB-
REMOVE EXIST. BRIDGE
ASHEVILLE HOMINY RIVERBLUE LLC (PHASE 1)
ANDERSON BEAR CREEK LLC
ROGERS LAND COMPANY LLC
JESSE CALLOWAY JR
HARRY LEE COATES REVOCABLE LIVING TRUST
J. BALTIMORE AVE. LLC
JOLENE E. WOODY
FILL IN WETLAND
MECHANIZED CLEARING (GRUBBING)
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
PAVEMENT REMOVAL
GRAPHIC SCALE
FOR -L- PROFILE SEE SHEET 13
FOR -Y1- PROFILE SEE SHEET 17
FOR -Y1C- PROFILE SEE SHEET 18
FOR -Y1D- PROFILE SEE SHEET 16
PROJECT REFERENCE NO. I-2513C
SHEET NO. 4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
AECOM
PINECONE
REVISIONS
5/14/99

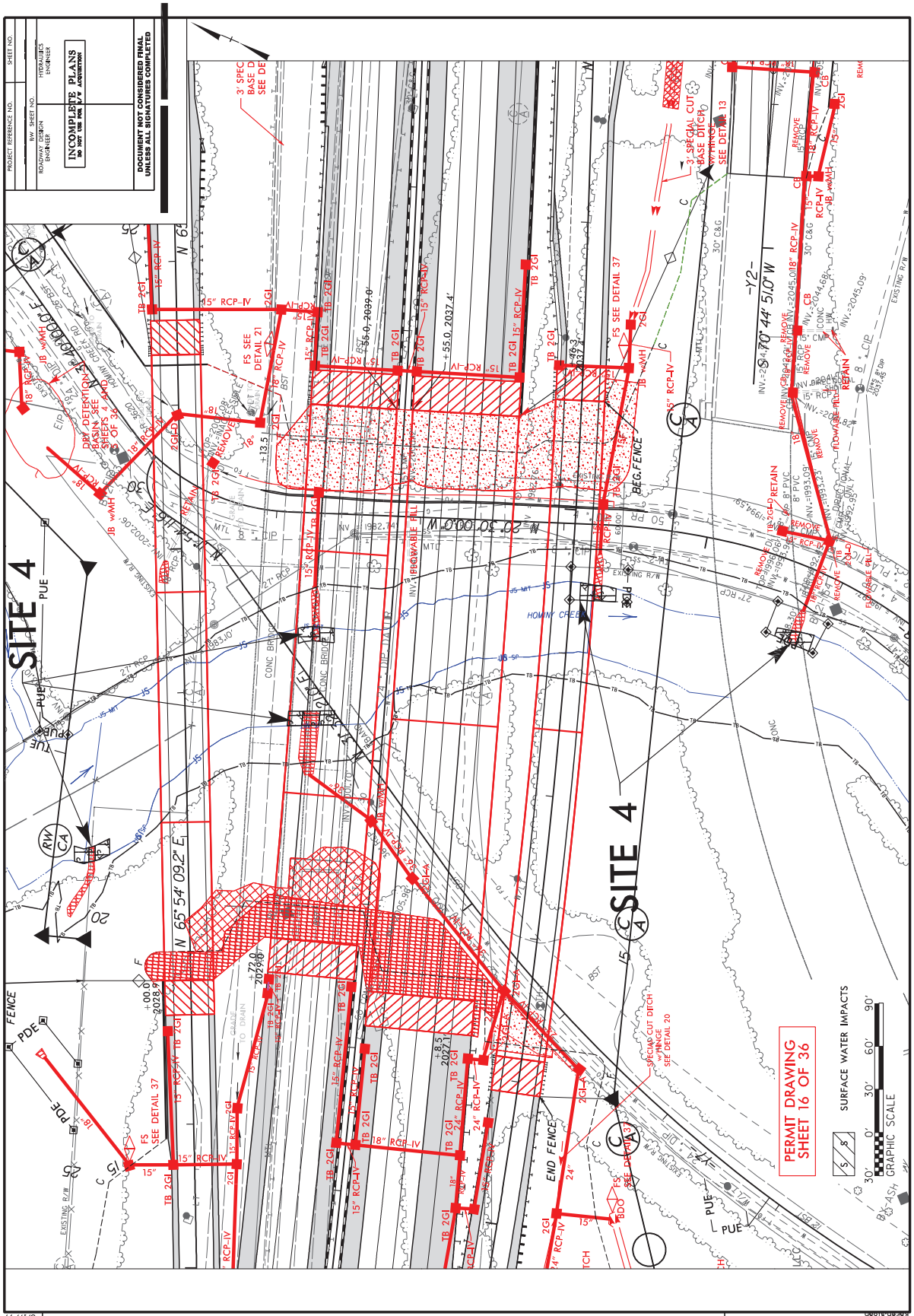

SITES 2 – PROFILE VIEW ALONG STRUCTURE
PERMIT DRAWING
SHEET 11 OF 36
PROFILE
SCALE
VERT. 1"=10'
HORIZ. 1"=50'
NCDOT
DIVISION OF HIGHWAYS
BUNCOMBE COUNTY
PROJECT: 34165.1.3 (I-2513AC)
I-26 / I-40 / I-240 INTERCHANGE TO
SR 3548 (HAYWOOD RD)
-L- STA. 23+88
SUPPLEMENTAL 48" WSP
PROP. G.P. ELEV. = 2024.83'
SKEW = 89°
RETAIN EXISTING 48"CMP AND SLIPLINE
NWSE APPROX. 2000.1'
EXISTING GROUND AT PROPOSED CL
PROPOSED COLLAR AND EXTEND 48" CSP
℄ INV. ELEV. = 1999.75'
SLOPE = -0.3%
℄ INV. ELEV. = 1997.46'
SLOPE = -0.3%
PROPOSED COLLAR AND EXTEND 48" CSP
2040
2030
2020
2010
2000
1990
-300
-250
-200
-150
-100
-50
0
+50
+100
+150
+200
+250
+300


PERMIT DRAWING
SHEET 12 OF 36
SHEET NO.
X-L-8
PROJ. REFERENCE NO.
1-2513AC
0 5 10
WETLAND LIMIT
CLEARING LIMIT
WETLAND EXCAVATION
FILL IN WETLANDS
2:1
0.040
0.025
0.020
202164
24+00.00
6/23/16

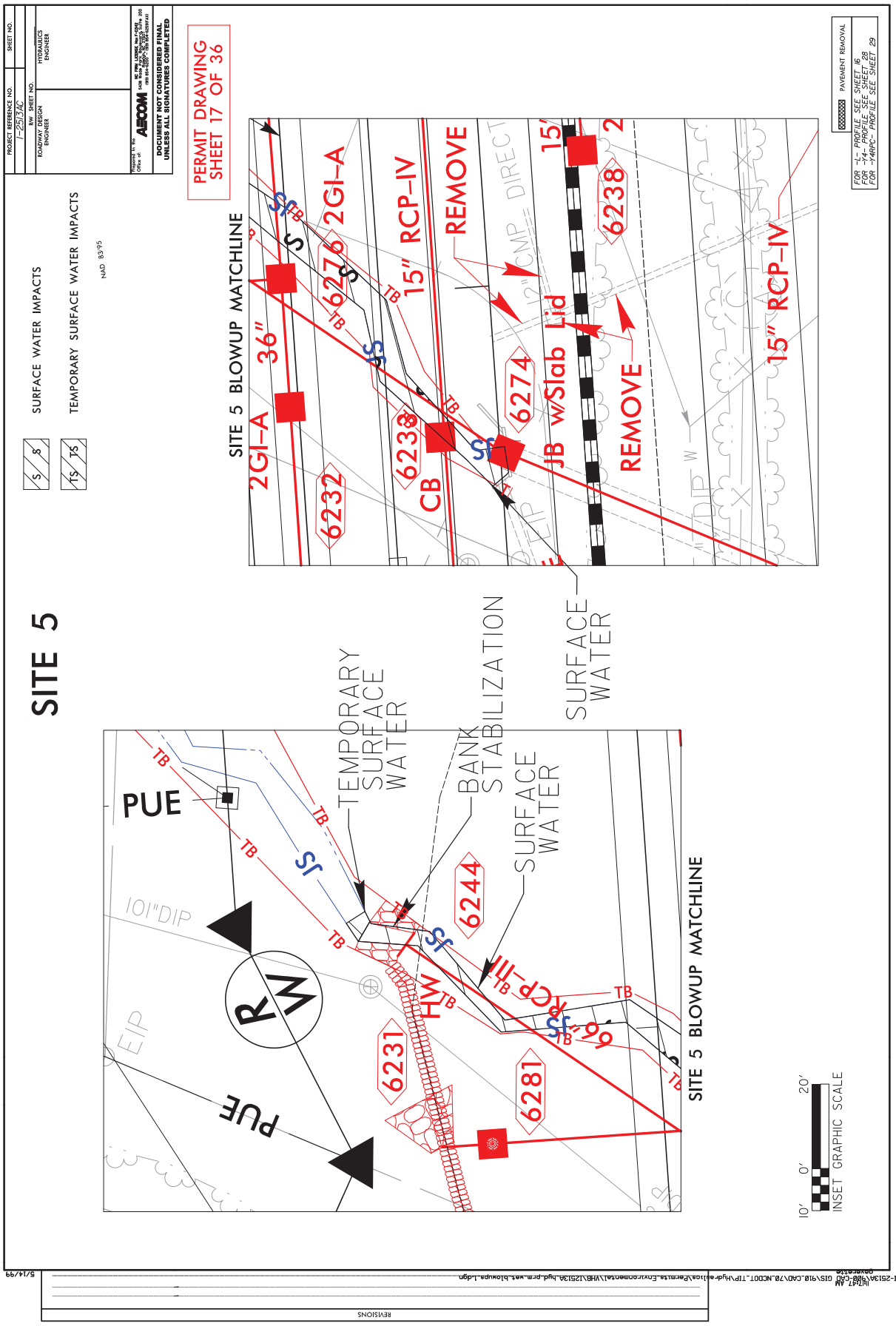

MATCHLINE -Y- STA 41+00 - SEE SHEET 6
MATCHLINE -Y- STA 27+00 - SEE SHEET 4
-Y2RPB-
-Y2RPC-
N 77°32'06" E
ASHEVILLE HOMES RIVERBLUE LLC PHASE 1
ANDERSON BEAR CREEK LLC
AREA UNDER CONSTRUCTION
END FENCE
DEC. FENCE
TIE TO EXIST. FENCE
TIE INTO EXISTING GROUND
FOR -L- PROFILE SEE SHEET 13
FOR -Y2RPB- PROFILE SEE SHEET 21
FOR -Y2RPC- PROFILE SEE SHEET 22
PERMIT DRAWING
SHEET 13 OF 36
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-2513AC
SHEET NO.
5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
REVISIONS
GRAPHIC SCALE
100' 0' 100' 200' 300'
5/14/99
3/13/2023
13A\900-CAD_GIS\910-CAD\70-NCDOT_TIP\Highways\Permits-Environmental\NCDOT\I-2513-AC\Drainage\13-I2513AC-rdy-pah-05.dgn

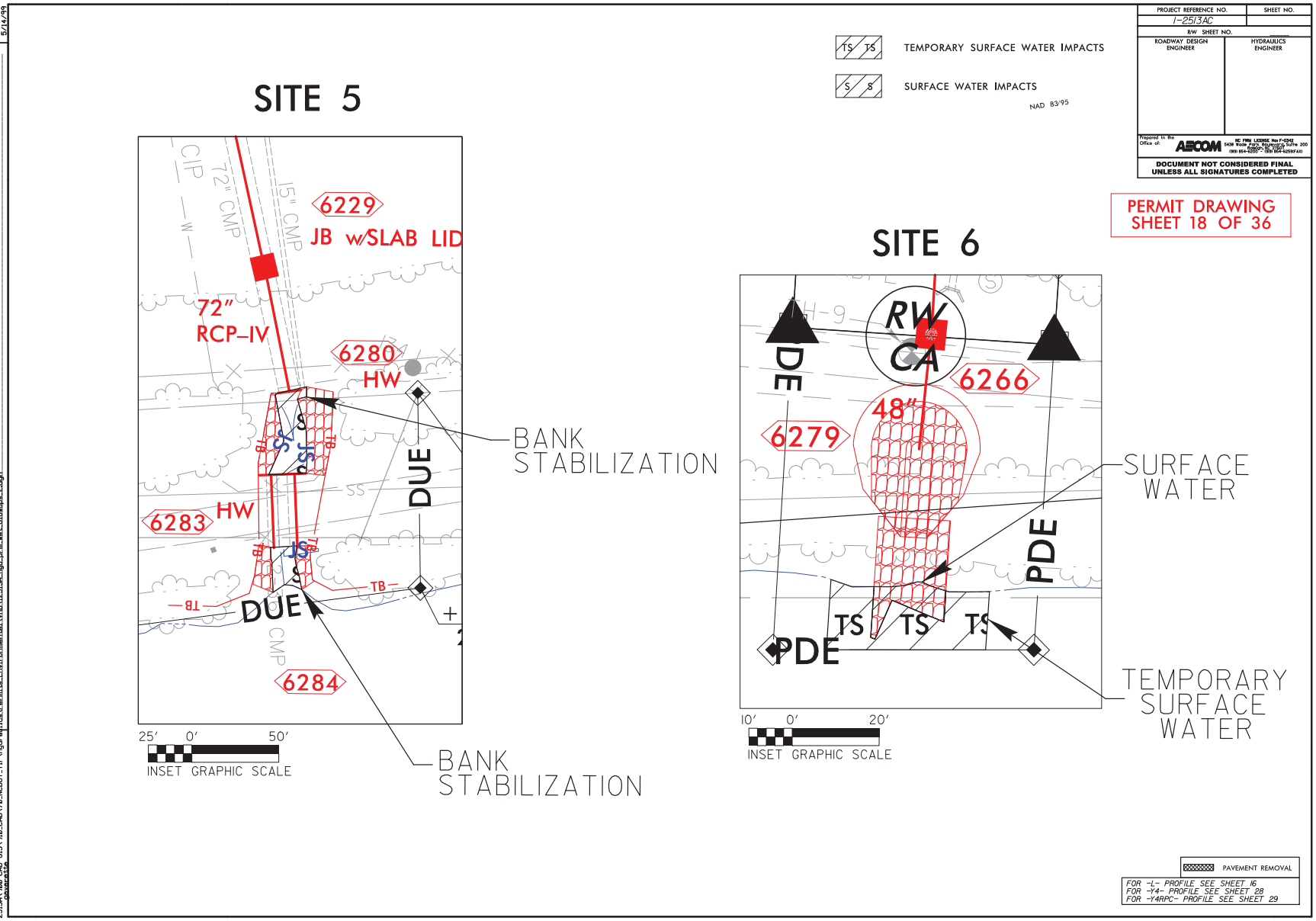

MATCHLINE -Y- STA 41+00 - SEE SHEET 6
MATCHLINE -Y- STA 27+00 - SEE SHEET 4
FOR -L- PROFILE SEE SHEET 13
FOR -Y2PPB- PROFILE SEE SHEET 21
FOR -Y2PPC- PROFILE SEE SHEET 22
PERMIT DRAWING
SHEET 14 OF 36
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-2513AC
SHEET NO.
5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
AECOM
ASHEVILLE HOMES RIVERBLUE LLC
PHASE 1
ANDERSON BEAR CREEK LLC
END FENCE
DES. FENCE
TIE TO EXIST. FENCE
NOTE: CLEAR AREAS RESTRICTED TO -3% ROLLOVER
AREA UNDER CONSTRUCTION
GRAPHIC SCALE
100' 0' 100' 200' 300'
REVISIONS
5/14/99

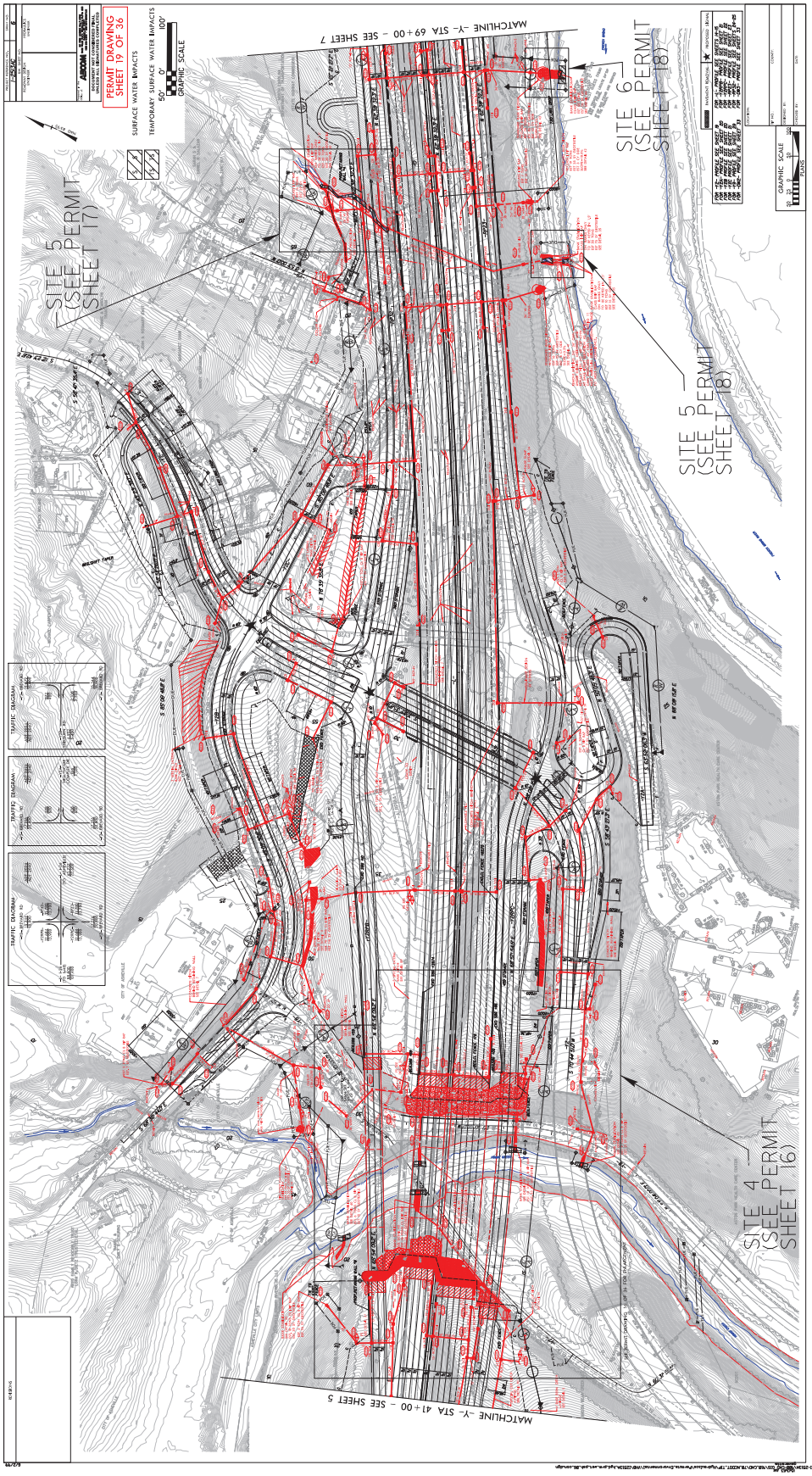

PERMIT DRAWING
SHEET 15 OF 36
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
GRAPHIC SCALE
SITE 5
(SEE PERMIT
SHEET 17)
SITE 6
(SEE PERMIT
SHEET 18)
SITE 5
(SEE PERMIT
SHEET 18)
SITE 4
(SEE PERMIT
SHEET 16)
MATCHLINE -Y- STA 69+00 - SEE SHEET 7
MATCHLINE -Y- STA 41+00 - SEE SHEET 5
TRAFFIC DIAGRAM



3/14/2023 pat.vegecom-fw-pw.bentleysystems.com#ECOM-DS21-NA-20028\Documents\606467564-I-2513A\900-CAD GIS\910-CAD\70-NCDOT-TIP\Hydraulics\Permits-Envircomments\#ECOM\1-2513-#C\Drawings\16-I-2513AC-perm-mst-Site 4.dgn 8/17/99


SITE 5
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
NAD 83/95
PERMIT DRAWING SHEET 17 OF 36
SITE 5 BLOWUP MATCHLINE
2GI-A
36"
6232
6276
2GI-A
15" RCP-IV
REMOVE
CMP DIRECT
6238
6274
JB w/Slab Lid
15" RCP-IV
PAVEMENT REMOVAL
PUE
101"DIP
TEMPORARY SURFACE WATER
BANK STABILIZATION
SURFACE WATER
6244
6231
6281
SITE 5 BLOWUP MATCHLINE
INSET GRAPHIC SCALE
10' 0' 20'


TS TS TEMPORARY SURFACE WATER IMPACTS
S S SURFACE WATER IMPACTS
NAD 83/95
PROJECT REFERENCE NO.
I-2513AC
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
Prepared in the Office of: AECOM
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 18 OF 36
SITE 5
6229
JB w/SLAB LID
72" CMP
15" CMP
CIP
72" RCP-IV
6280
HW
6283
HW
DUE
DUE
6284
CMP
BANK STABILIZATION
BANK STABILIZATION
25' 0' 50'
INSET GRAPHIC SCALE
SITE 6
RW
CA
DE
6266
48"
6279
PDE
PDE
TS TS TS
SURFACE WATER
TEMPORARY SURFACE WATER
10' 0' 20'
INSET GRAPHIC SCALE
PAVEMENT REMOVAL
FOR -L- PROFILE SEE SHEET 16
FOR -Y4- PROFILE SEE SHEET 28
FOR -Y4RPC- PROFILE SEE SHEET 29
REVISIONS
5/14/19


PERMIT DRAWING
SHEET 19 OF 36
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
GRAPHIC SCALE
MATCHLINE -Y- STA 69+00 - SEE SHEET 7
MATCHLINE -Y- STA 41+00 - SEE SHEET 5
SITE 5
(SEE PERMIT
SHEET 17)
SITE 6
(SEE PERMIT
SHEET 18)
SITE 5
(SEE PERMIT
SHEET 18)
SITE 4
(SEE PERMIT
SHEET 16)

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

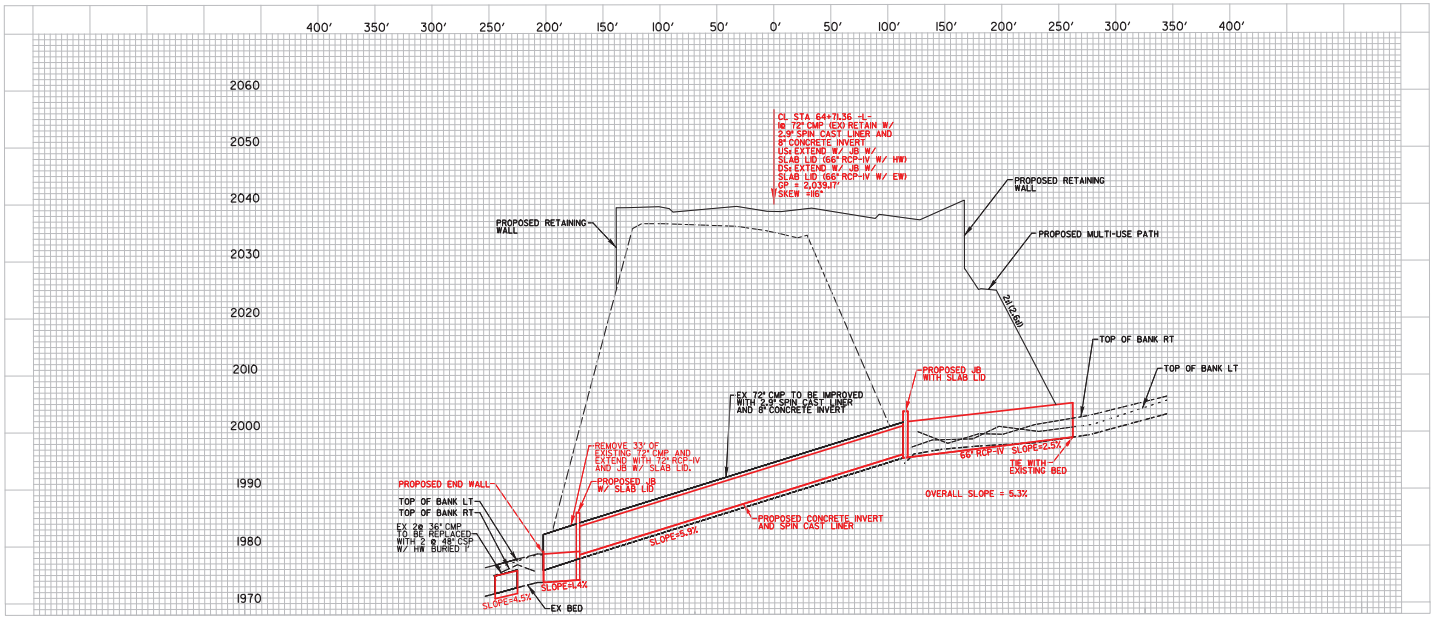
Prepared in the Office of: AECOM — NC FIRM LICENSE No: F-0342, 5438 Wade Park Boulevard, Suite 200, Raleigh, NC 27607, (919) 854-6200 — (919) 854-6259(FAX)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 20 OF 36

NAD 83/96

SITE 5 - PROFILE VIEW ALONG STRUCTURE



PAVEMENT REMOVAL

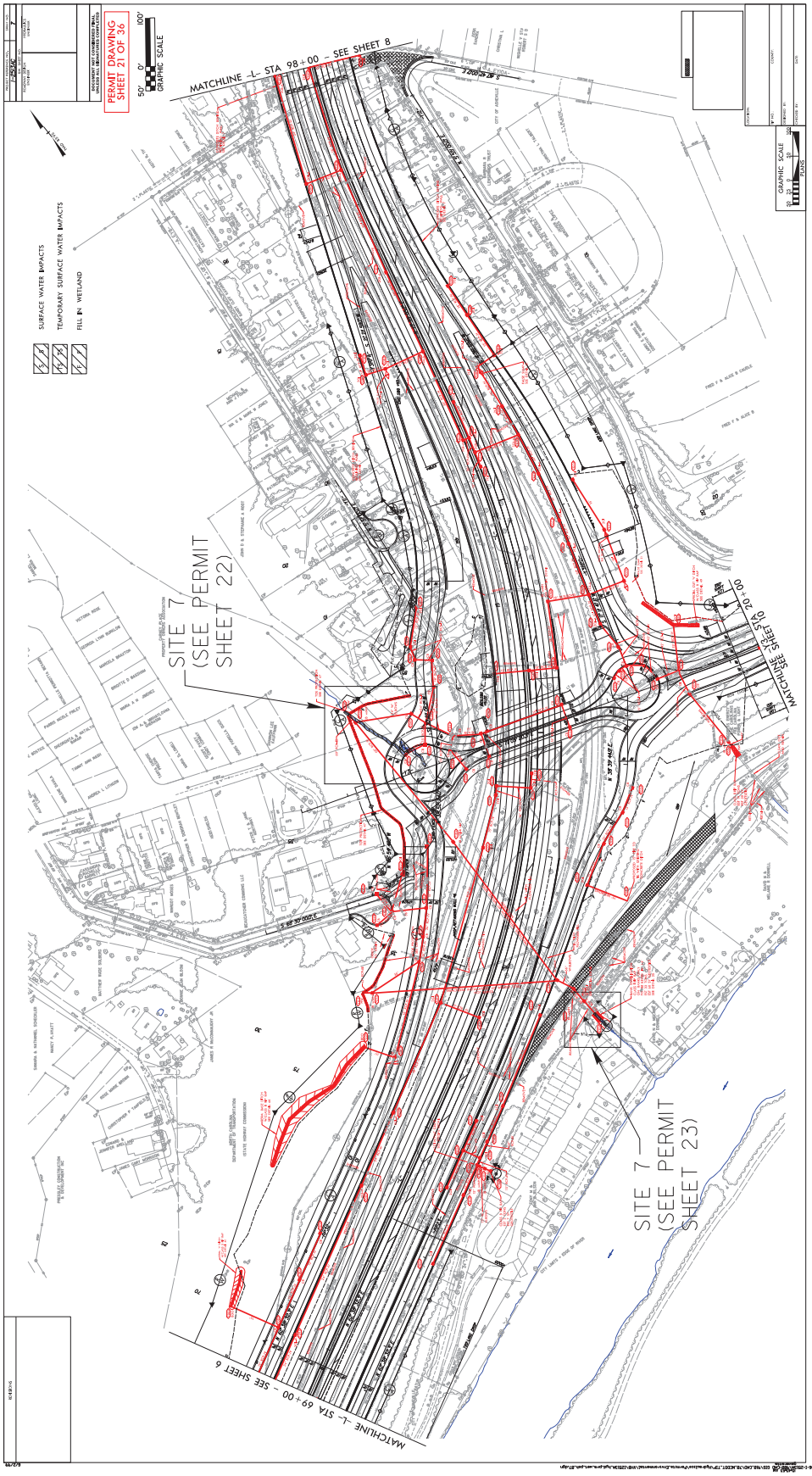
FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26

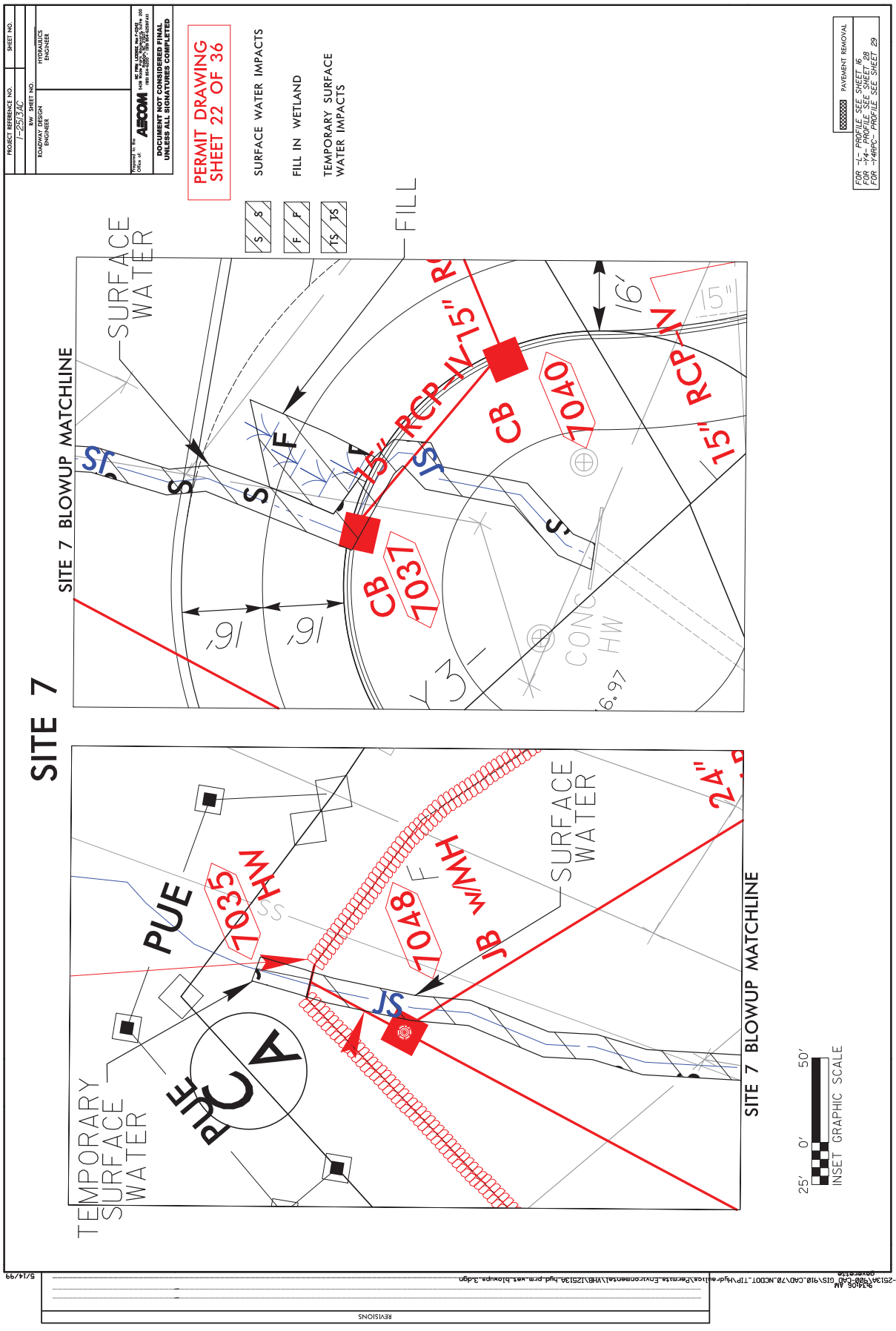
REVISIONS 5/14/19

\900-CAD Utility Coordination\170_NCDOT_TIP\Hydraulics\Permits_Environmental\VHB\12513A_hyd-prm_wet_pipe_profile_UT_to_French8-loaddgn

USER: AN
DESIGN: AN
CHECK: AN
QA/QC:

P-77


PERMIT DRAWING
SHEET 21 OF 36
GRAPHIC SCALE
50' 0' 100'
MATCHLINE -L- STA 98+00 - SEE SHEET 8
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
FILL IN WETLAND
SITE 7
(SEE PERMIT
SHEET 22)
MATCHLINE SEE STA 20+00
SITE 7
(SEE PERMIT
SHEET 23)
MATCHLINE -L- STA 69+00 - SEE SHEET 6


SITE 7
SITE 7 BLOWUP MATCHLINE
SURFACE WATER
PERMIT DRAWING SHEET 22 OF 36
SURFACE WATER IMPACTS
FILL IN WETLAND
TEMPORARY SURFACE WATER IMPACTS
FILL
CB 1037
15" RCP-IV-15"
CB 1040
15" RCP-IV
16'
16'
PUE
1035 HW
1048 F HW/M
JB
SURFACE WATER
TEMPORARY SURFACE WATER
SITE 7 BLOWUP MATCHLINE
PAVEMENT REMOVAL
FOR -L- PROFILE SEE SHEET 16
FOR -Y4- PROFILE SEE SHEET 28
FOR -Y4RPC- PROFILE SEE SHEET 29
25' 0' 50'
INSET GRAPHIC SCALE
PROJECT REFERENCE NO. 7-25134C
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
REVISIONS
5/14/99

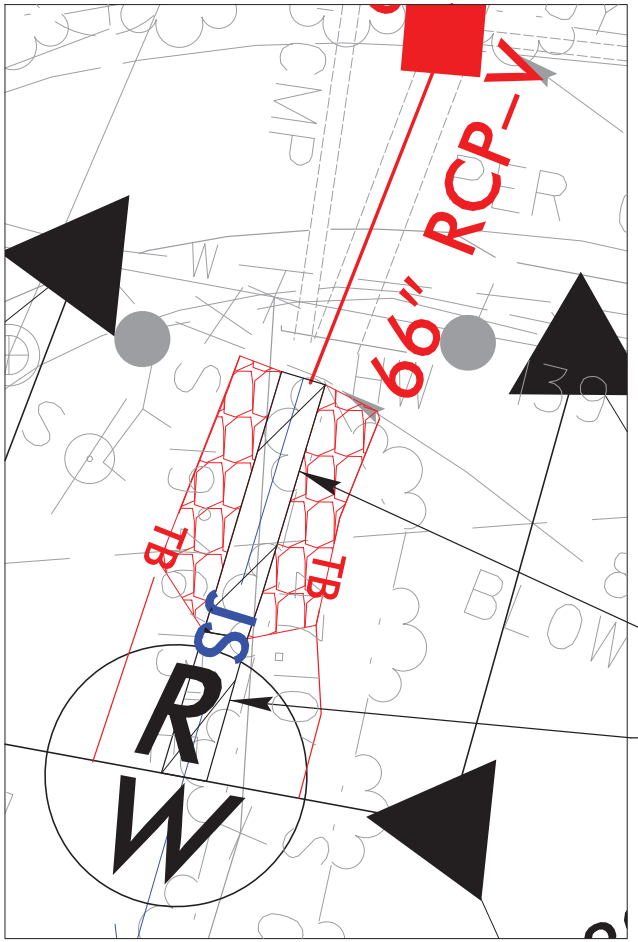
PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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PERMIT DRAWING
SHEET 23 OF 36

SITE 7



TS TS TEMPORARY SURFACE WATER IMPACTS

S S SURFACE WATER IMPACTS

BANK STABILIZATION

TEMPORARY SURFACE WATER

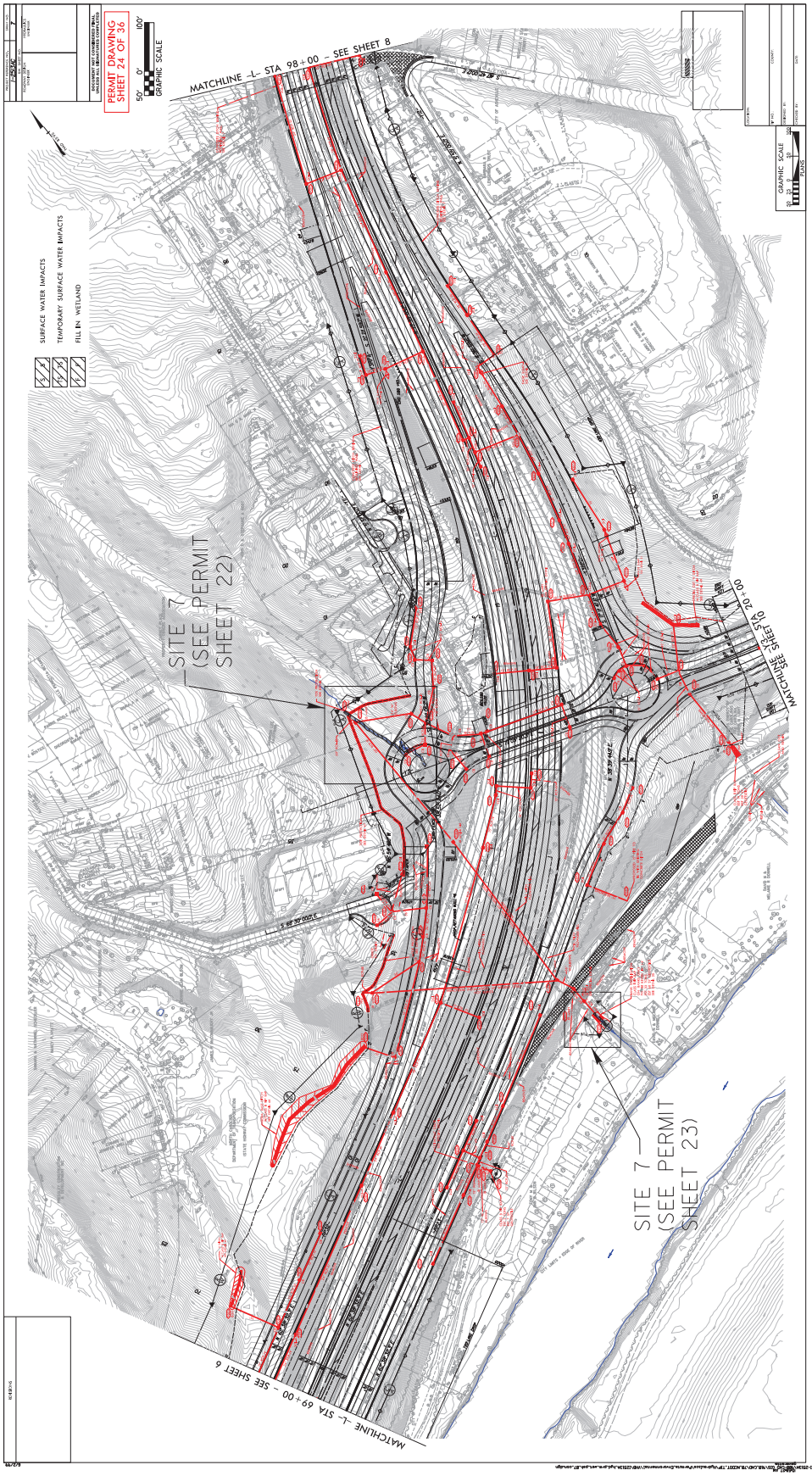
10' 0' 20'
INSET GRAPHIC SCALE

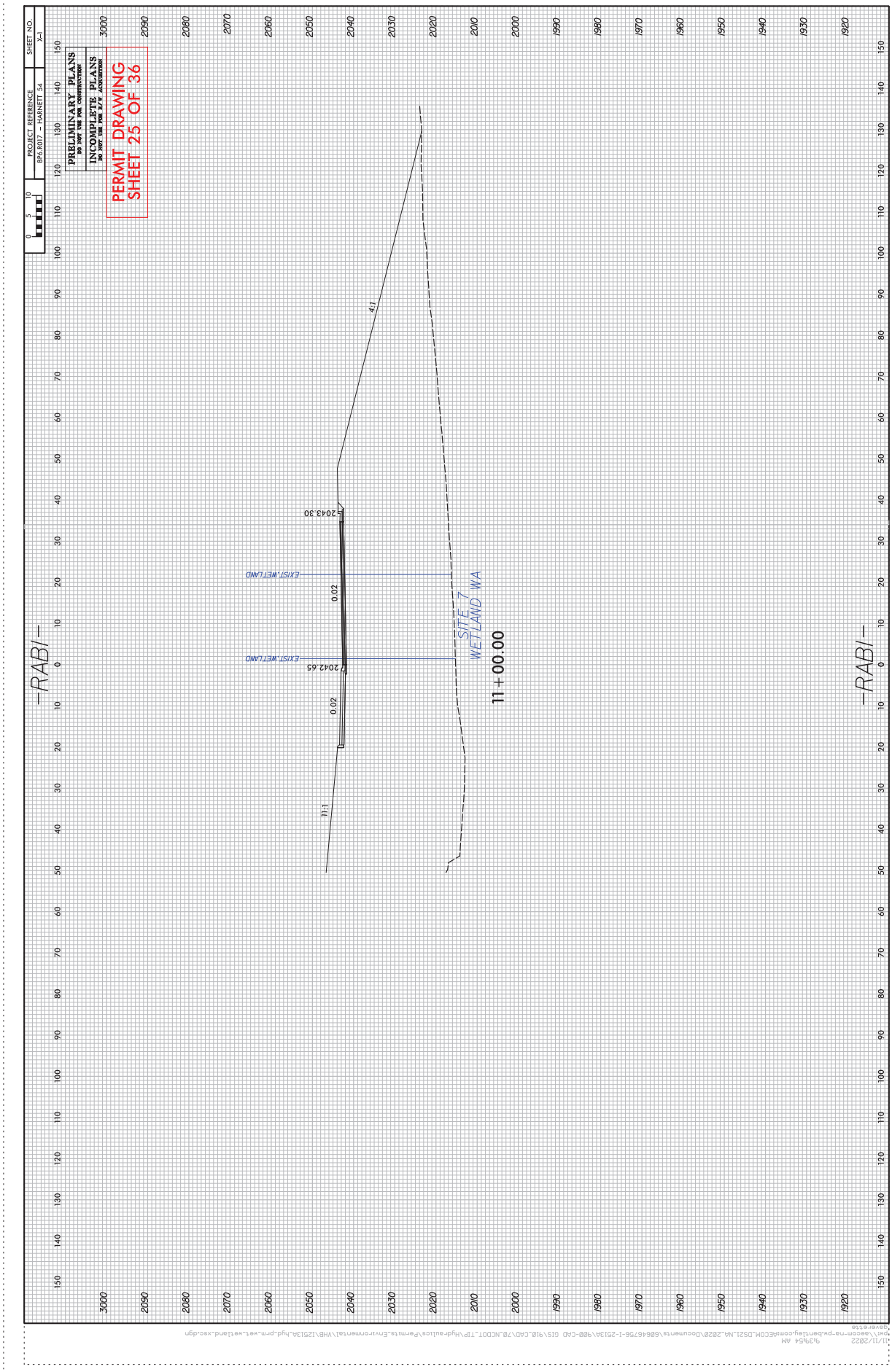
PAVEMENT REMOVAL

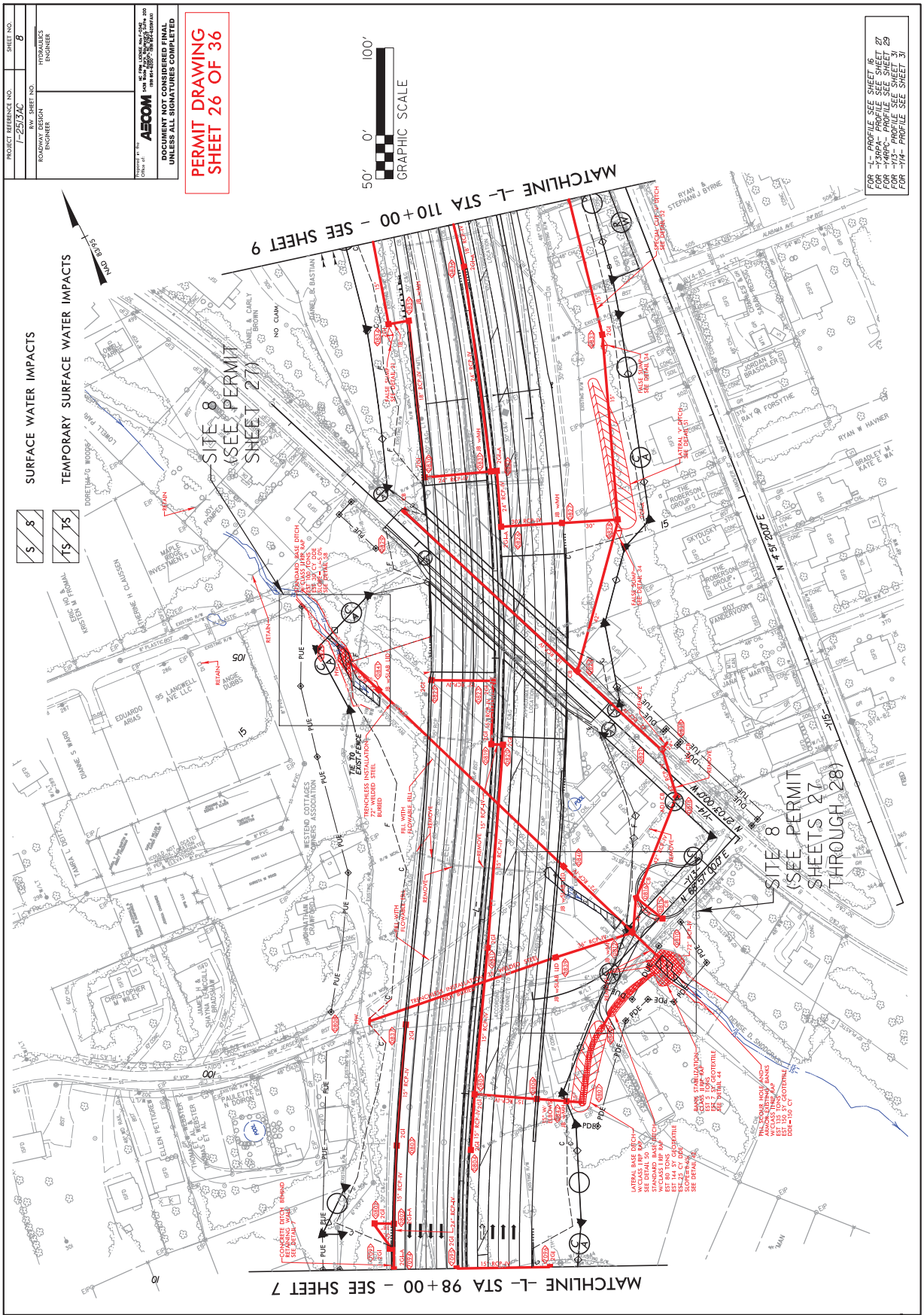
FOR -L- PROFILE SEE SHEET 16
FOR -Y4- PROFILE SEE SHEET 28
FOR -Y4RPC- PROFILE SEE SHEET 29

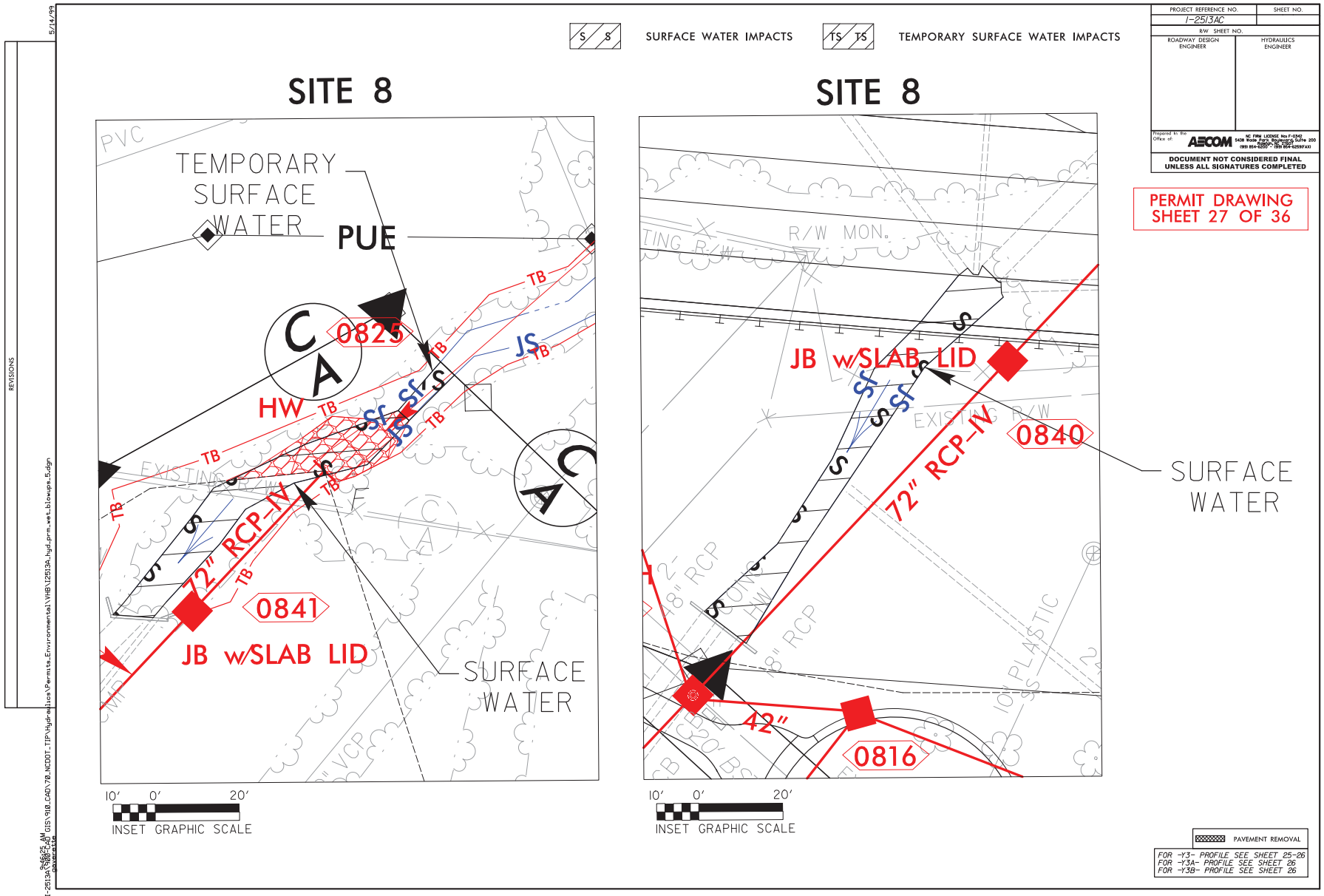
REVISIONS 5/14/13

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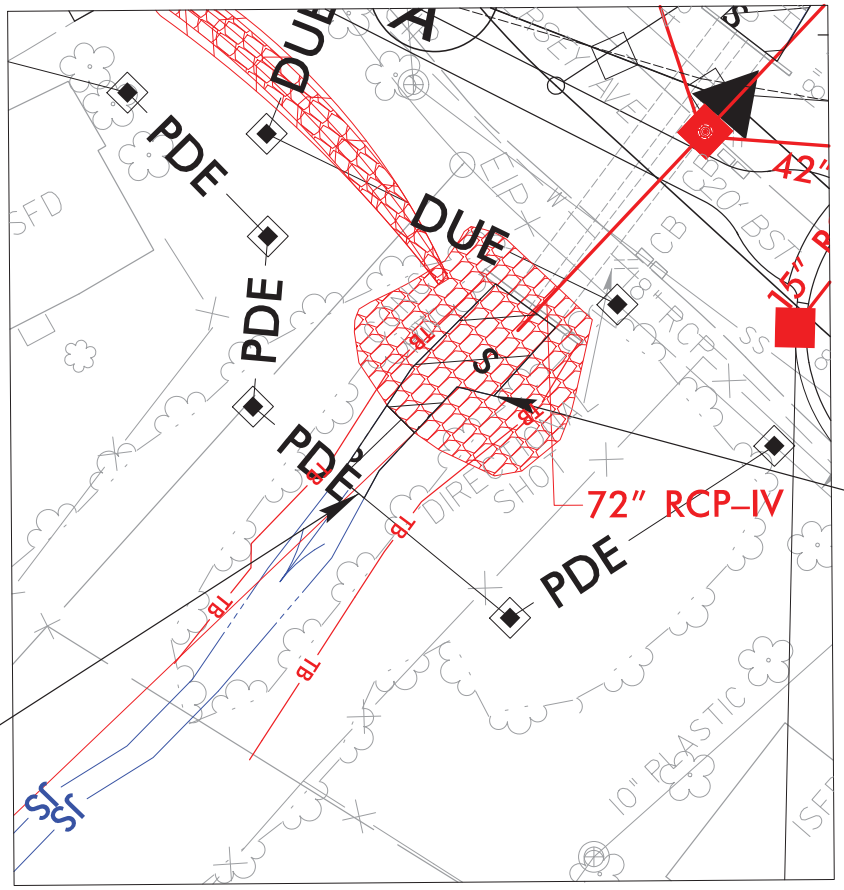

MATCHLINE -L- STA 98+00 - SEE SHEET 8
MATCHLINE -L- STA 69+00 - SEE SHEET 6
MATCHLINE SEE STA 20+00
SITE 7 (SEE PERMIT SHEET 22)
SITE 7 (SEE PERMIT SHEET 23)
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
FILL IN WETLAND
PERMIT DRAWING SHEET 24 OF 36
GRAPHIC SCALE
50' 0' 100'


PERMIT DRAWING
SHEET 25 OF 36
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PROJECT REFERENCE
BP6.8017 — HARNETT 54
SHEET NO.
X-1
0
5
10
-RAB/-
-RAB/-
11+00.00
SITE 7
WETLAND WA
EXIST. WETLAND
EXIST. WETLAND
2042.65
2043.30
0.02
0.02
4:1
1:1


PERMIT DRAWING
SHEET 26 OF 36
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
AECOM
PROJECT REFERENCE NO. 1-25134C
SHEET NO. 8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
GRAPHIC SCALE
50' 0' 100'
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
S/8
TS/8
SITE 8 (SEE PERMIT SHEET 27)
SITE 8 (SEE PERMIT SHEETS 27 THROUGH 28)
MATCHLINE -L- STA 110+00 - SEE SHEET 9
MATCHLINE -L- STA 98+00 - SEE SHEET 7
FOR -L- PROFILE SEE SHEET 16
FOR -SRPC- PROFILE SEE SHEET 27
FOR -YARPC- PROFILE SEE SHEET 31
FOR -Y13- PROFILE SEE SHEET 31
FOR -Y14- PROFILE SEE SHEET 31
ROW REV. APRIL 5, 2023 PARCEL 93 AND 94 CHANGED TO TOTAL TAKE
ROW REV. APRIL 5, 2023 PARCEL WIDENED AS NOTED TO PARCEL
ROW REV. APRIL 5, 2023 PILE ADDED TO PARCEL 95 FOR OH UTILITY
REVISIONS
5/14/99


S S SURFACE WATER IMPACTS
TS TS TEMPORARY SURFACE WATER IMPACTS
SITE 8
TEMPORARY SURFACE WATER
PUE
0825
HW
72" RCP-IV
0841
JB w/SLAB LID
SURFACE WATER
INSET GRAPHIC SCALE
SITE 8
JB w/SLAB LID
72" RCP-IV
0840
SURFACE WATER
42"
0816
INSET GRAPHIC SCALE
PROJECT REFERENCE NO. I-2513AC
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
AECOM
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 27 OF 36
PAVEMENT REMOVAL
FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26
REVISIONS
5/14/13

SITE 8



PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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PERMIT DRAWING SHEET 28 OF 36

S S SURFACE WATER IMPACTS

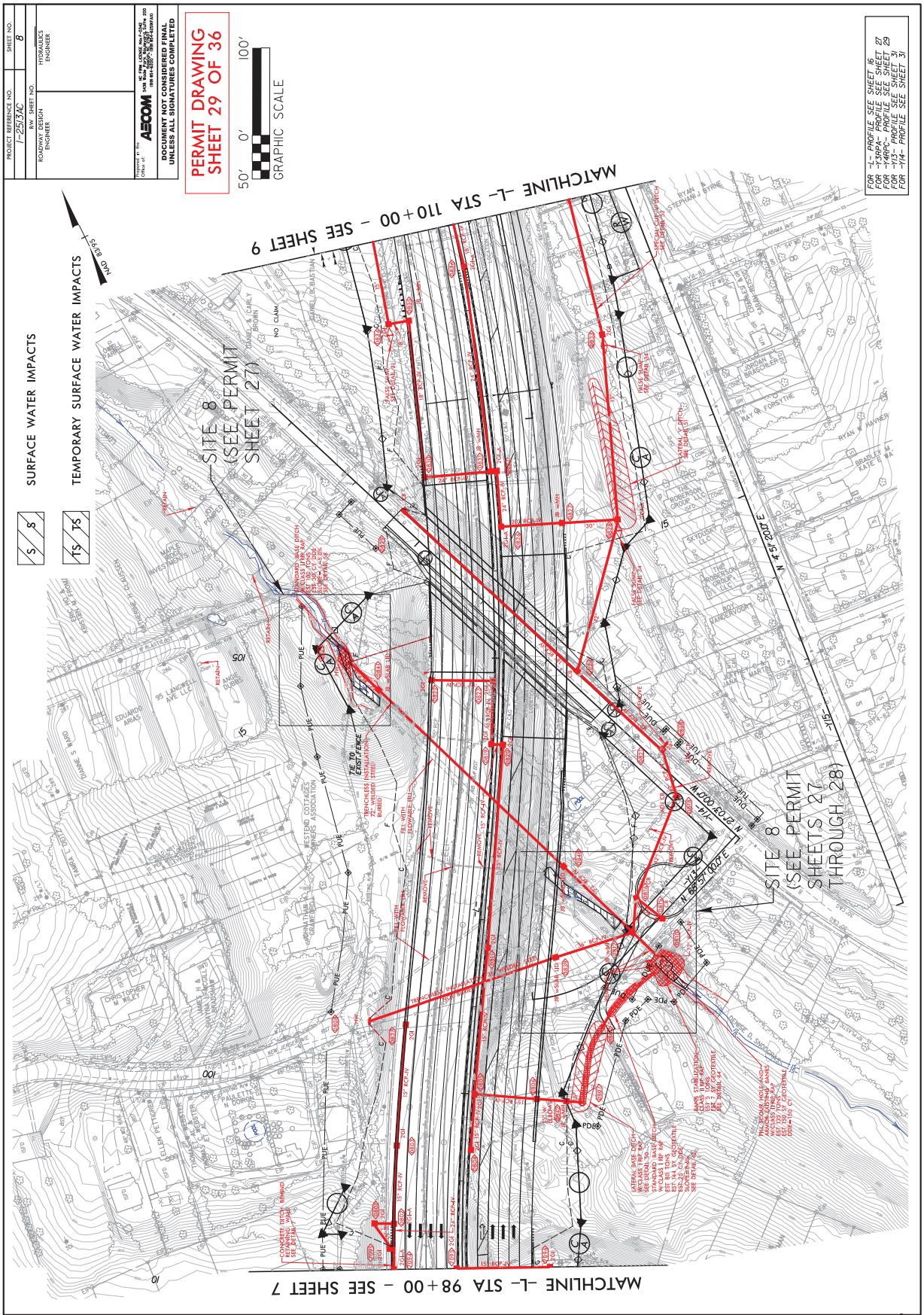
TS TS TEMPORARY SURFACE WATER IMPACTS

PAVEMENT REMOVAL

FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26

REVISIONS 5/14/13

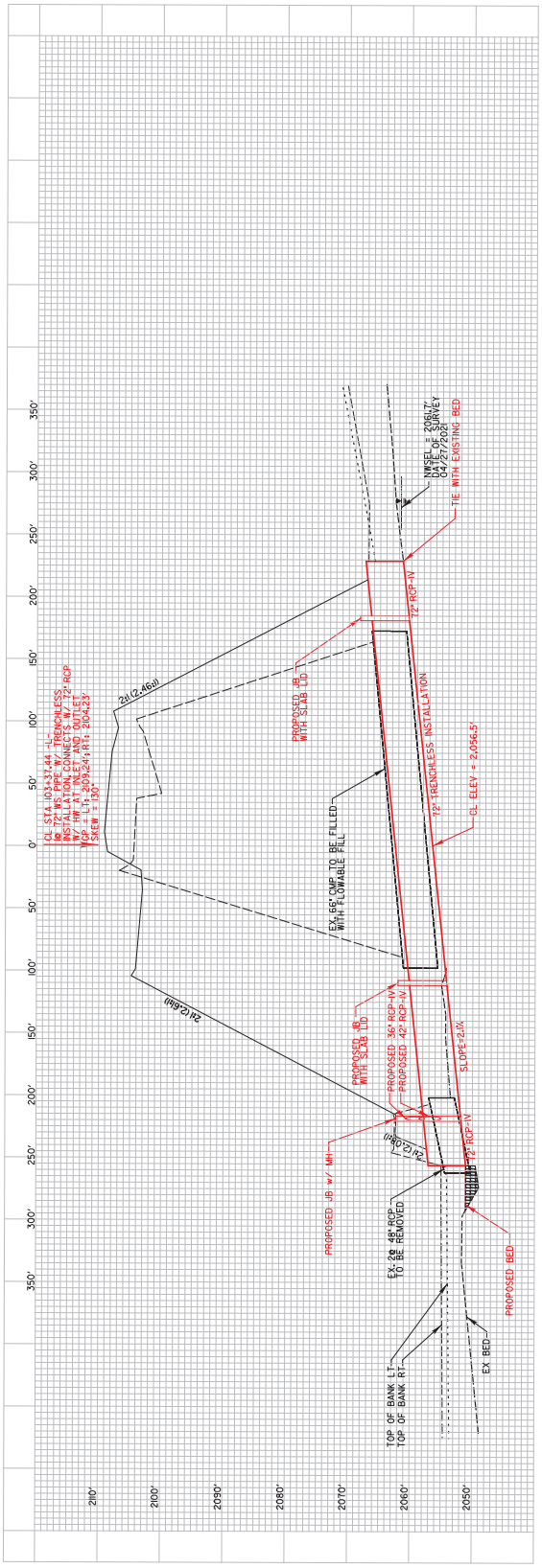
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PERMIT DRAWING
SHEET 29 OF 36
GRAPHIC SCALE
50' 0' 100'
PROJECT REFERENCE NO.
1-25134C
SHEET NO.
8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
AECOM
SURFACE WATER IMPACTS
TEMPORARY SURFACE WATER IMPACTS
S 8
TS 75
NAD 83/93
MATCHLINE -L- STA 110+00 - SEE SHEET 9
MATCHLINE -L- STA 98+00 - SEE SHEET 7
SITE 8 (SEE PERMIT SHEET 27)
SITE 8 (SEE PERMIT SHEETS 27 THROUGH 28)
FOR -L- PROFILE SEE SHEET 16
FOR -L3PAC- PROFILE SEE SHEET 29
FOR -L4PPC- PROFILE SEE SHEET 31
FOR -L13- PROFILE SEE SHEET 31
FOR -L14- PROFILE SEE SHEET 31
REVISIONS
ROW REV. APRIL 5, 2023 PARCEL 93 AND 94 CHANGED TO TOTAL TAKE
ROW REV. APRIL 5, 2023 PARCEL 95 ADDED TO PARCEL 95 FOR OH UTILITY
5/14/99

PROJECT REFERENCE NO. 7-25134C
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
Prepared for the Office of:
AECOM 1600 RE-PNG STREET, SUITE 17-0625 RALEIGH, NORTH CAROLINA 27601-2538 919-854-6200 FAX 919-854-6259
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 30 OF 36

SITE 8 - PROFILE VIEW ALONG STRUCTURE



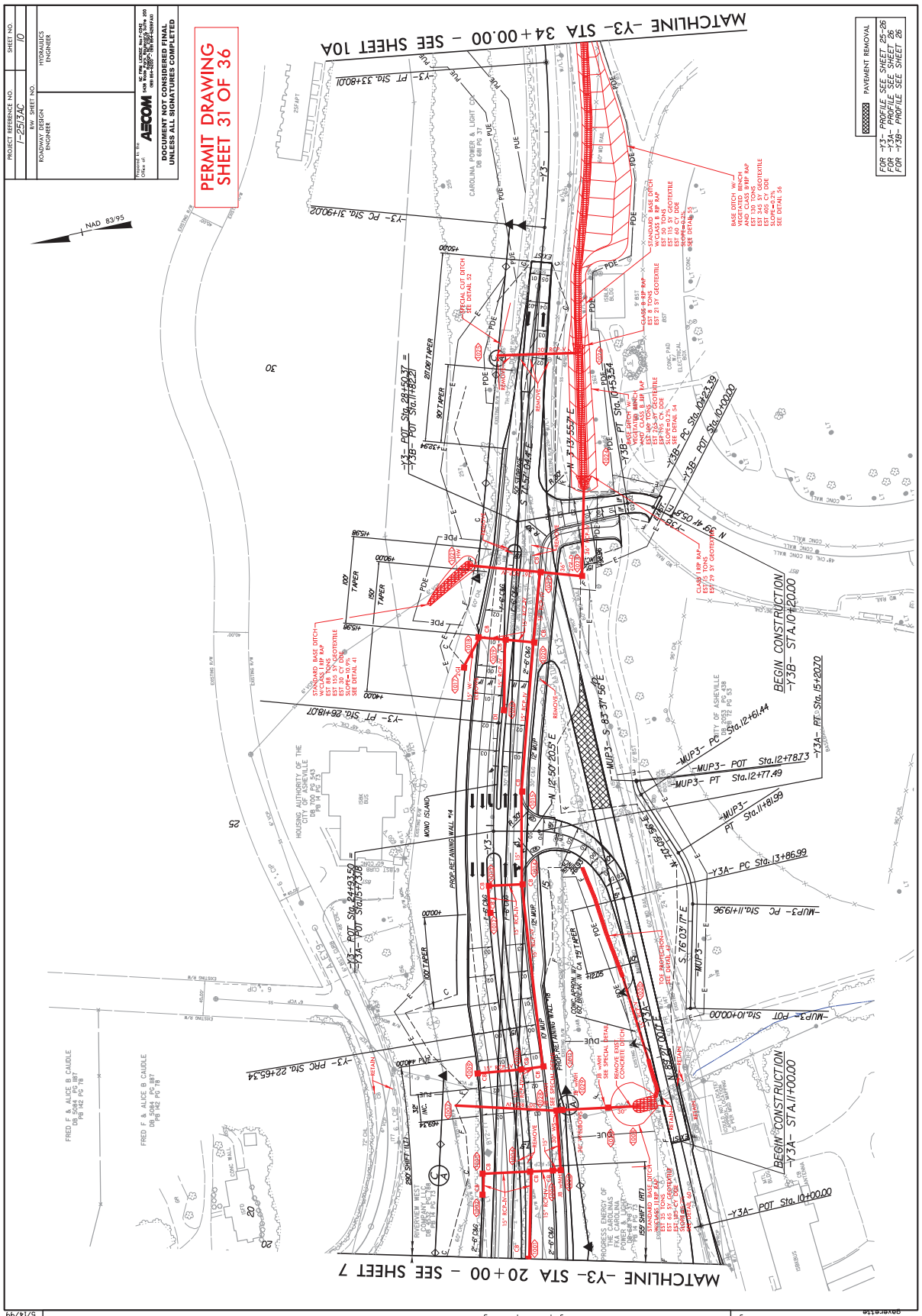
PAVEMENT REMOVAL
PAVEMENT REMOVAL

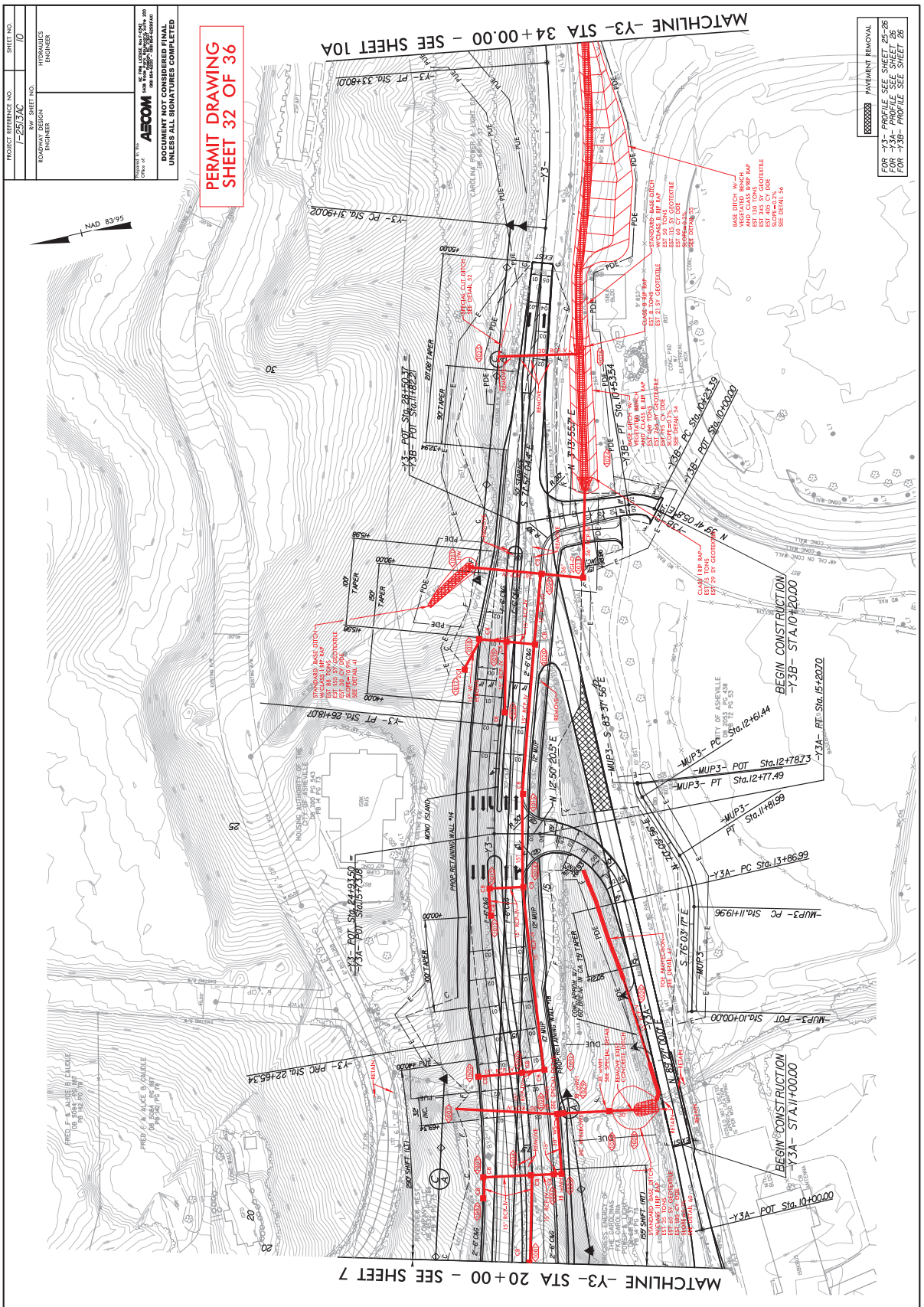
FOR -L1- PROFILE SEE SHEET 25-26
FOR -L1A- PROFILE SEE SHEET 26
FOR -L1B- PROFILE SEE SHEET 26
FOR -L2- PROFILE SEE SHEET 26

REVISIONS

5/14/99

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PERMIT DRAWING
SHEET 31 OF 36
PAVEMENT REMOVAL
FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26
MATCHLINE -Y3- STA 34+00.00 - SEE SHEET 10A
MATCHLINE -Y3- STA 20+00 - SEE SHEET 7
BEGIN CONSTRUCTION -Y3B- STA.10+20.00
BEGIN CONSTRUCTION -Y3A- STA.11+00.00
-Y3- PT Sta. 33+80.01
-Y3- PC Sta. 31+90.02
-Y3- POT Sta. 28+50.37 = -Y3B- POT Sta.11+82.21
-Y3- PT Sta. 26+18.01
-Y3- PRC Sta. 22+65.34
-Y3- POT Sta. 24+93.50 = -Y3A- POT Sta.15+70.08
-Y3B- PT Sta.10+53.54
-Y3B- PC Sta.10+23.39
-Y3B- POT Sta.10+00.00
-Y3A- PT Sta.15+20.70
-MUP3- PC Sta.12+61.44
-MUP3- POT Sta.12+78.73
-MUP3- PT Sta.12+77.49
-MUP3- PT Sta.11+81.99
-Y3A- PC Sta.13+86.99
-MUP3- PC Sta.11+19.96
-MUP3- POT Sta.10+00.00
-Y3A- POT Sta.10+00.00
N 39°41'05"W
N 3°19'55"E
S 17°57'04"E
N 12°50'20.5"E
S 83°37'56"E
N 20°58'56"E
S 76°03'37"E
N 88°22'00"E
PROJECT REFERENCE NO. I-2513AC
R/W SHEET NO. 10
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/95
REVISIONS
5/14/99



PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

AECOM 1600 RE-PING STREET, SUITE 2-200 RALEIGH, NC 27609 (919) 854-6200 FAX (919) 854-6259

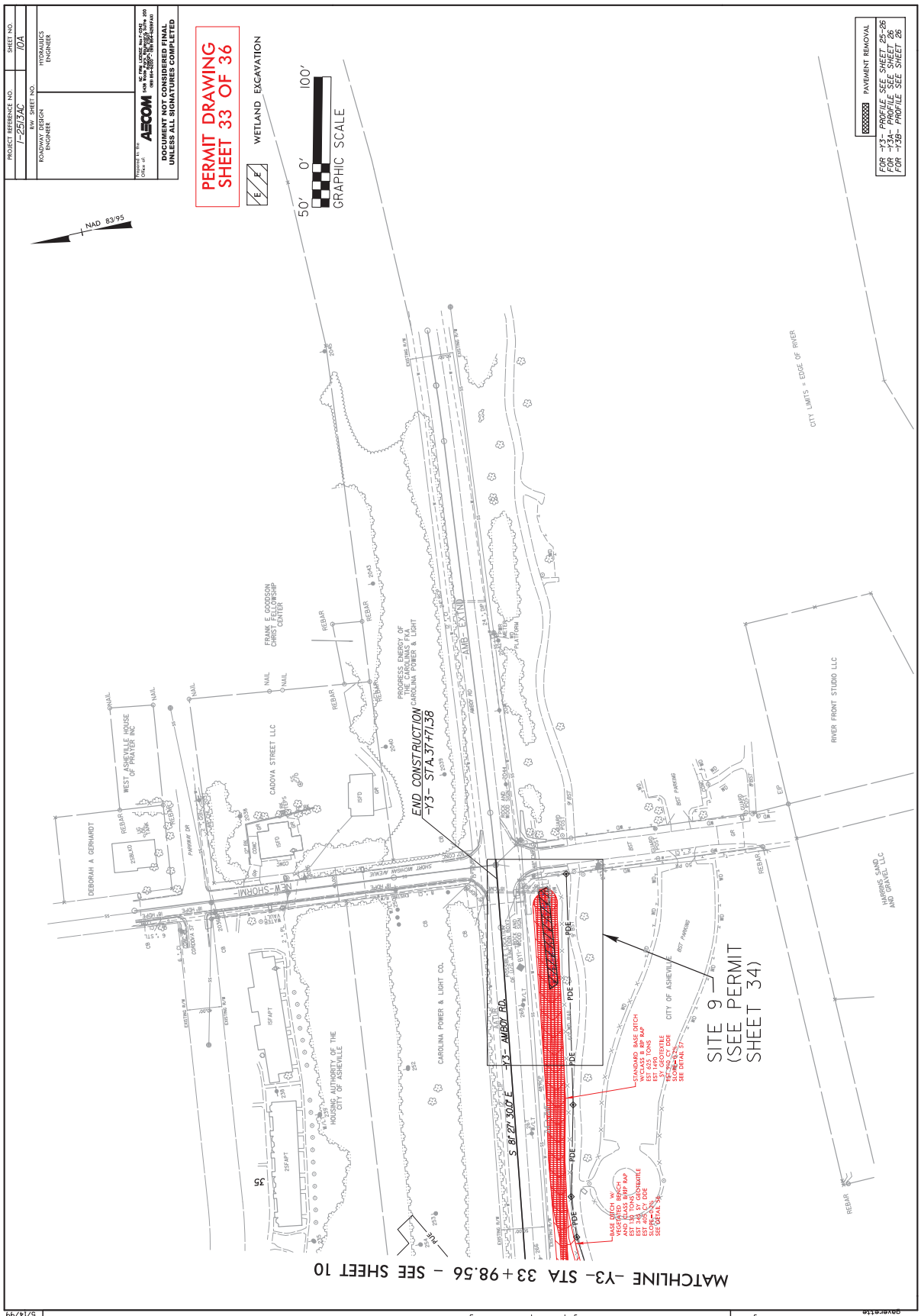
Prepared for the Office of:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS

5/14/99

56-I-2513A\808-CAD\GIS\910_CAD\70_NCDOT_TIP\Highways\Permits_Environmental\VHB\I2513A_hyd-prm_wet-psh_10_conn.dgn 4:34:21 AM


PERMIT DRAWING
SHEET 33 OF 36
WETLAND EXCAVATION
GRAPHIC SCALE
50' 0' 100'
NAD 83/95
PAVEMENT REMOVAL
FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26
PROJECT REFERENCE NO. 7-25134C
R/W SHEET NO. 10A
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
END CONSTRUCTION -Y3- STA 37+71.38
-Y3- AMBOY RD.
S 81° 27' 30" E
SITE 9
(SEE PERMIT SHEET 34)
MATCHLINE -Y3- STA 33+98.56 - SEE SHEET 10
DEBORAH A GERHARDT
WEST ASHEVILLE HOUSE OF PRAYER INC
CADOVA STREET LLC
FRANK E COOSON CHRISTIAN FELLOWSHIP CENTER
PROGRESS ENERGY OF THE CAROLINAS FKA CAROLINA POWER & LIGHT
CAROLINA POWER & LIGHT CO.
HOUSING AUTHORITY OF THE CITY OF ASHEVILLE
CITY OF ASHEVILLE
RIVER FRONT STUDIO LLC
HARRINS SAND AND GRAVEL LLC
CITY LIMITS = EDGE OF RIVER
AMBOY RD. - EXTN
NEW SHOHMI
SHORT MONTREAT AVENUE
CORDOVA ST
AMBOY DR
STANDARD BASE DITCH W/ CLASS B RIP RAP
EST 1490 SQ YDS
EST 1490 TONS
EST 745 CY DDE
SEE DETAIL 37
BASE DITCH W/ VEGETATED MATTING AND CLASS B RIP RAP
EST 130 TONS
EST 65 CY DDE
SEE DETAIL 38
REVISIONS
5/14/99

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

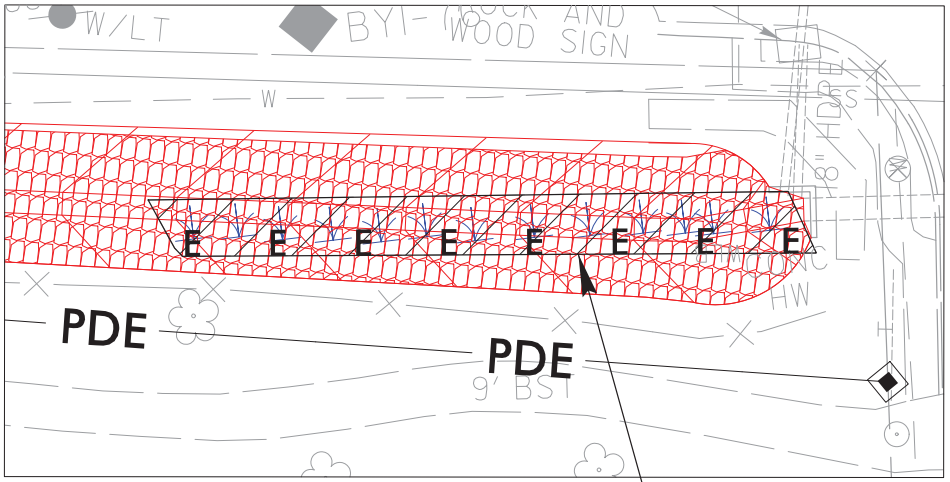
Prepared in the Office of: AECOM — NC FIRM LICENSE No: F-0342 — 5438 Wade Park Boulevard, Suite 200, Raleigh, NC 27607 — (919) 854-6200 — (919) 854-6259(FAX)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 34 OF 36

SITE 9

E E WETLAND EXCAVATION



PAVEMENT REMOVAL

FOR -L- PROFILE SEE SHEET 16
FOR -Y4- PROFILE SEE SHEET 28
FOR -Y4RPC- PROFILE SEE SHEET 29

REVISIONS 5/14/19

56-I-2513A\Design\GIS\918_CADD\70_NCDOT_TIP\Hydraulics\Permits_Environmental\WBS\125139_hyd_prm_wet_blowups_7.dgn 10:18:58 AM 5/14/2019 jdavis


PERMIT DRAWING
SHEET 35 OF 36
WETLAND EXCAVATION
GRAPHIC SCALE
50' 0' 100'
NAD 83/95
PAVEMENT REMOVAL
FOR -Y3- PROFILE SEE SHEET 25-26
FOR -Y3A- PROFILE SEE SHEET 26
FOR -Y3B- PROFILE SEE SHEET 26
PROJECT REFERENCE NO. 7-25134C
SHEET NO. 10A
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
AECOM
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
END CONSTRUCTION -Y3- STA 37+71.38
-Y3- AMBOY RD
S 81° 27' 30" E
SITE 9
(SEE PERMIT SHEET 34)
MATCHLINE -Y3- STA 33+98.56 - SEE SHEET 10
WEST ASHEVILLE HOUSE OF PRAYER INC
CADOVA STREET LLC
PRAISE CHURCH OF GOD FLOOR SAW CENTER
PROGRESS ENERGY OF SOUTH CAROLINA, INC
DUKE POWER & LIGHT CO
HOUSING AUTHORITY OF THE CITY OF ASHEVILLE
CITY OF ASHEVILLE
RIVER FRONT STUDIO LLC
HARRIS SAND AND GRAVEL LLC
DEBORAH A DERHARO
REVISIONS
5/14/99
-25134\900_RAD_DIS\910_CADD\7.0_NCDOT_TIP\Hydraulics\Permits-Environmental\VHB\25134-hyd-prm-wet-pshl-10A-Dutch-conn.dgn

WETLAND AND SURFACE WATER IMPACTS SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	19+73 to 24+09 -L- LT	Roadway Fill	0.45			0.14						
2	23+23 to 24+04 L RT/LT	Roadway Fill						0.03		148		
		(2) 48" CMP/WSP							0.01		36	
		Bank Stabilization	< 0.01									
3	20+56 to 26+05 -L- LT	Roadway Fill	0.24			0.17						
		Toe Protection	0.06									
4	43+90 to 46+71 -L- RT/LT	Bank Stabilization							0.02	32	93	
5	64+23 to 66+24 -L- RT/LT	2 @ 48" CSP						< 0.01		11		
		1 @ 72" / 2 @ 48" CSP						< 0.01		24		
		Roadway Fill						0.02		168		
		Bank Stabilization						< 0.01	< 0.01	11	4	
6	67+91 to 68+29 -L- RT	Bank Stabilization							0.01	17	37	
7	82+92 to 84+13 -L- LT	Roadway FIII	< 0.01					0.02	< 0.01	208	11	
	78+23 to 78+35 -L- RT	Bank Stabilization						< 0.01	< 0.01	24	13	
8	101+43 to 105+28 -L- RT/LT	Roadway Fill						0.04	< 0.01	217	30	
9	36+97 to 37+71 -Y3- RT	Ditch Excavation			0.03							
TOTALS*:			0.76		0.03	0.31		0.12	0.05	860	224	0

*Rounded totals are sum of actual impacts

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
06/02/2023
BUNCOMBE
I-2513
34165.1.2
SHEET 36 OF 36

Revised 2018 Feb

P-93

CONTRACT:

TIP PROJECT: I-2513AC

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

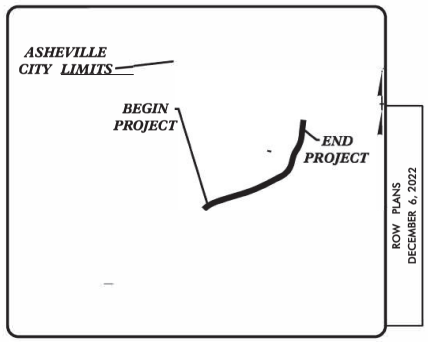
BUNCOMBE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-2513AC	1	

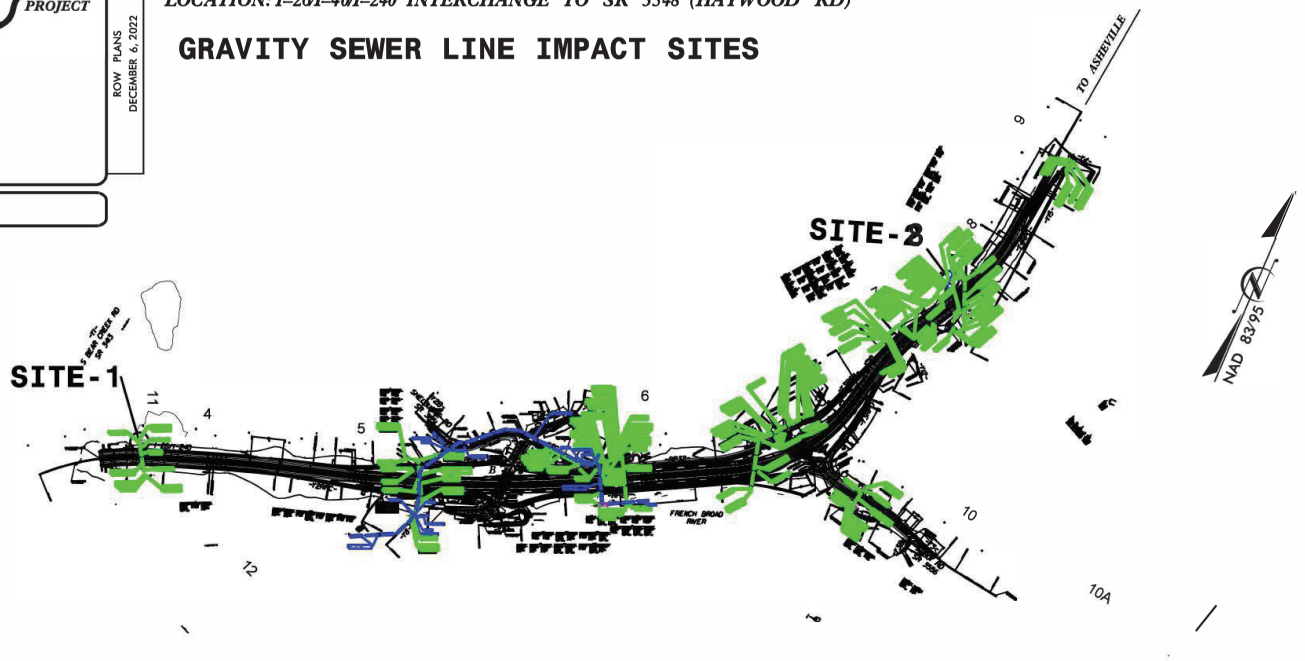
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34165.1.13		P.E.
34165.2.18		RW
34165.2.19		UTIL.
34165.3.8		CONST.

LOCATION: I-26/I-40/I-240 INTERCHANGE TO SR 3548 (HAYWOOD RD)

GRAVITY SEWER LINE IMPACT SITES



VICINITY MAP



THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES

THIS PROJECT IS LOCATED WITHIN THE CITY LIMITS OF THE CITY OF ASHEVILLE

CLEARING ON THIS PROJECT WILL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

A DESIGN EXCEPTIONS REQUIRED FOR HORIZONTAL SSD ON -L-

A DESIGN EXCEPTION IS REQUIRED FOR MINIMUM HORIZONTAL RADIUS ON -Y2-

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 50 25 0 50 100

PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2024 = NA
ADT 2040 = 101,400
K = 9 %
D = 55 %
T = 10 % *
V = 60 MPH
* TTST = 5% DUAL 5%
FUNC CLASS = INTERSTATE

STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-2513AC = 1.623 MI
LENGTH STRUCTURE TIP PROJECT I-2513AC = 0.119 MI
TOTAL LENGTH TIP PROJECT I-2513AC = 1.742 MI

AECOM
NC FIRM LICENSE No: F-0342
5438 Wade Park Blvd, Suite 200
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259(FAX)

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: DECEMBER 6, 2022

LETTING DATE: FEBRUARY 20, 2024

JOHN SLOAN, P.E. — PROJECT ENGINEER
ED EDENS, PE — PROJECT DESIGN ENGINEER
KEVIN E. MOORE, P.E. — NCDOT CONTACT

HYDRAULICS ENGINEER

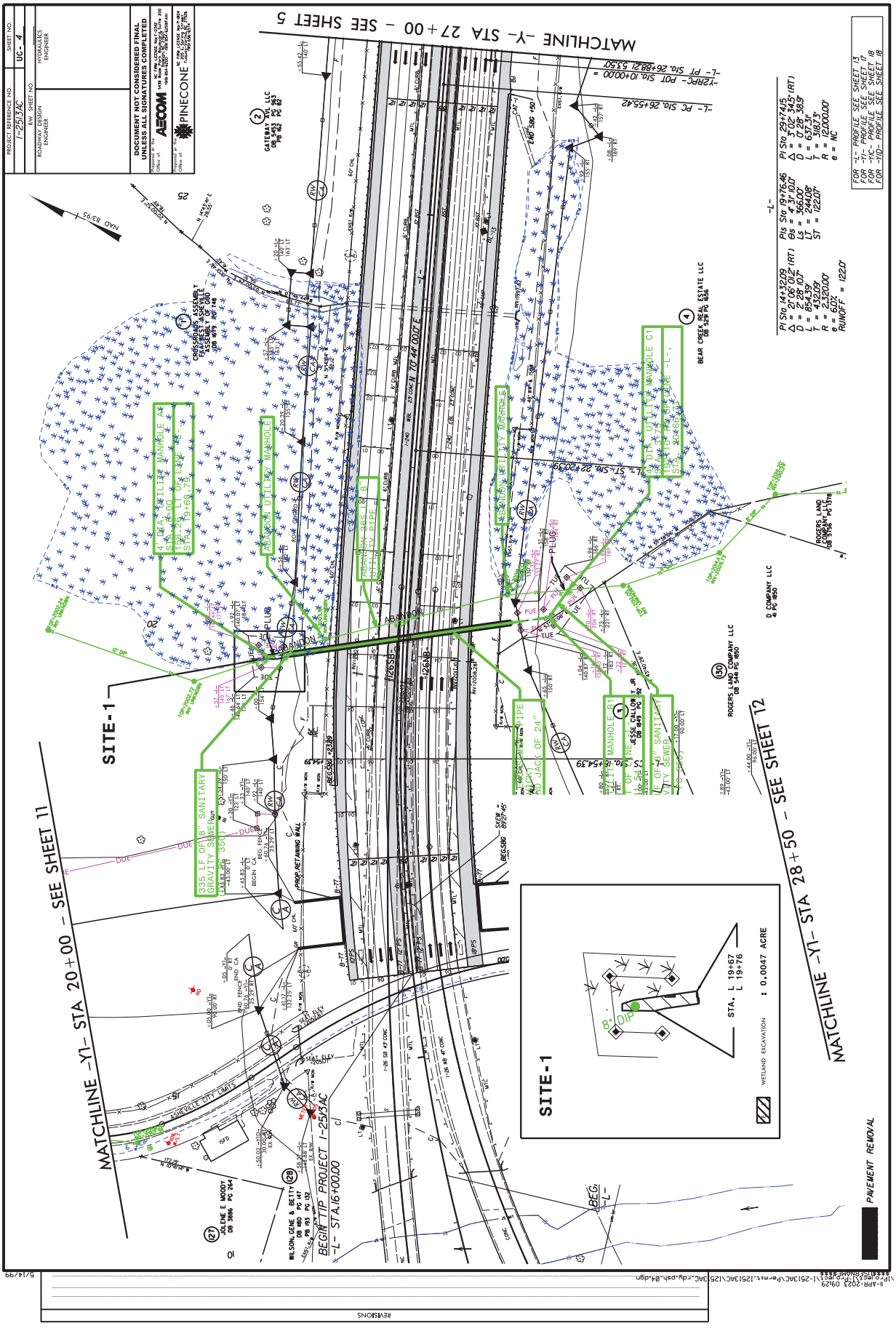
SIGNATURE: P.E.

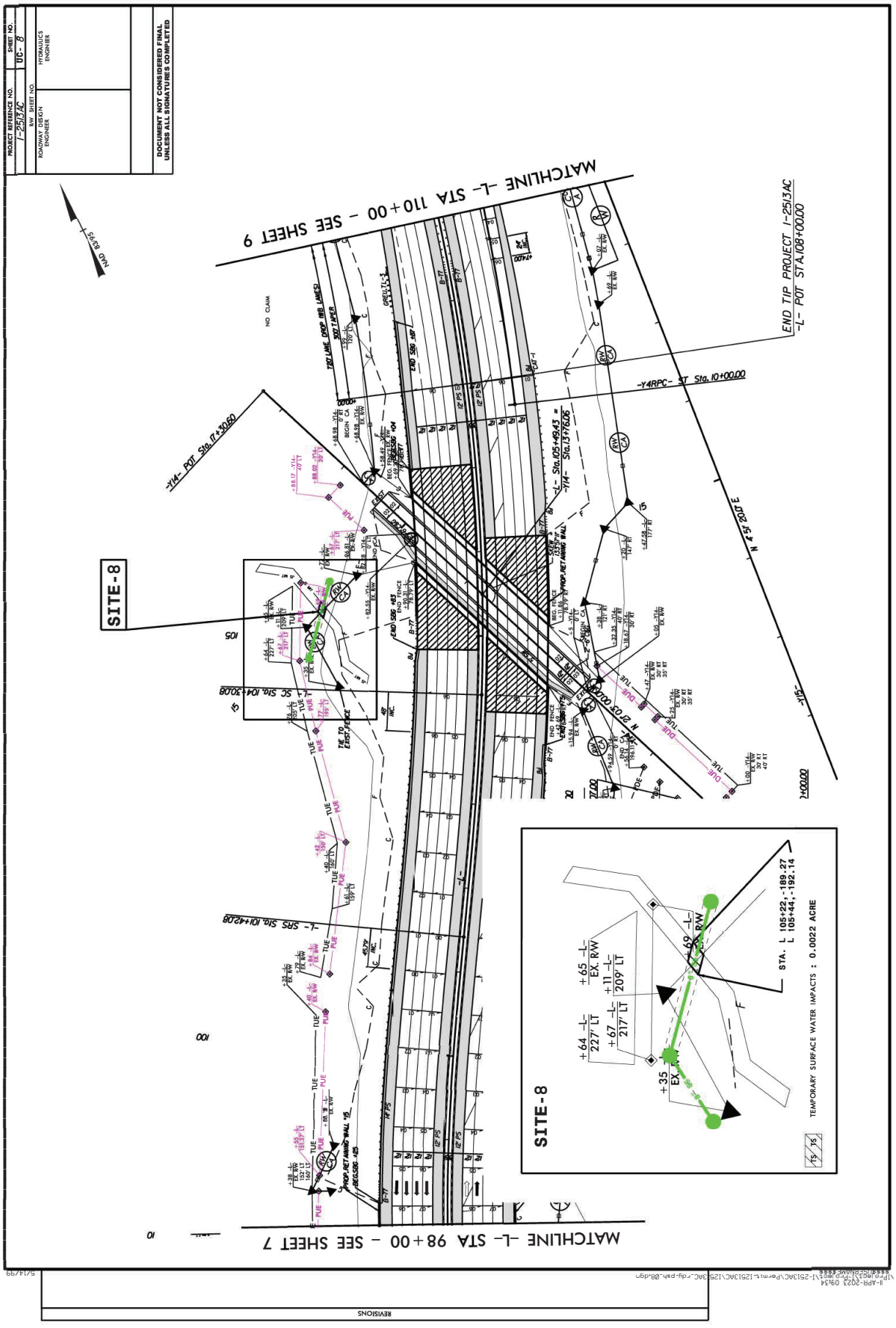
ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

11-APR-2023 09:26
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$$$$USERNAME$$$$
09.28.09


MATCHLINE -Y1- STA 20+00 - SEE SHEET 11
MATCHLINE -Y1- STA 28+50 - SEE SHEET 12
MATCHLINE -Y- STA 27+00 - SEE SHEET 5
BEGIN TIP PROJECT I-2513AC
-L- STA.16+00.00
SITE-1
SITE-1
STA. L 19+67
L 19+76
: 0.0047 ACRE
WETLAND EXCAVATION
PAVEMENT REMOVAL
ASHEVILLE CITY LIMITS
-L- PC Sta. 26+55.42
-L- PT Sta. 26+88.21
-Y2PC- POT Sta. 10+00.00
-L- PI Sta 22+20.39
PI Sta 14+32.09
Δ = 21°28'02" (RT)
D = 21°28'00"
L = 854.39
T = 432.09
R = 2,320.00'
e = 6.0%
RUNOFF = 122.0'
PI Sta 19+76.46
Δ = 21°28'00"
D = 16°00'00"
L = 244.08'
ST = 122.07'
PI Sta 29+74.15
Δ = 7°28'38" (RT)
D = 3°30'00"
L = 637.31'
T = 318.73'
R = 1,700.00'
e = NC
FOR -L- PROFILE SEE SHEET 13
FOR -Y1- PROFILE SEE SHEET 18
FOR -Y1D- PROFILE SEE SHEET 18
NAD 83'95
REVISIONS
PROJECT REFERENCE NO. I-2513AC
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
SHEET NO. UC-4
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
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5/14/99


PROJECT REFERENCE NO.
I-2513AC
SHEET NO.
10- 8
R/W SHEET NO.
ROADWAY DSIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
MATCHLINE -L- STA 110+00 - SEE SHEET 9
MATCHLINE -L- STA 98+00 - SEE SHEET 7
END TIP PROJECT I-2513AC
-L- POT STA.108+00.00
-Y4RPC- ST Sta. 10+00.00
-Y14- POT Sta. 17+30.60
-L- Sta.105+49.43 = -Y14- Sta.13+76.06
N 87° 50' 20.01" E
SITE-8
-L- SC Sta. 104+30.08
-L- SRS Sta. 101+42.08
105
100
SITE-8
+64 -L- 227' LT
+67 -L- 217' LT
+65 -L- EX. R/W
+11 -L- 209' LT
+89 -L- EX. R/W
+35 EX. R/W
STA. L 105+22, -189.27
L 105+44, -192.14
TEMPORARY SURFACE WATER IMPACTS : 0.0022 ACRE
REVISIONS

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: 404 Permanent Fill In Wetlands (ac)	CAMA Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	404 Hand Clearing in Wetlands (ac)	CAMA Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Temporary Channel Impacts (ft)	Temporary Wetland Impacts *** (ac)
1	-L-19+67~L19+76	Prop. Sewer Pipe 8"				<0.01*								
8	-L-105+22~L105+44	Prop. Sewer Pipe 8"									<0.01**		10	
TOTALS:						<0.01			0.00	0.00	<0.01	0	10	0.00

* Temporary Excavation
* Excavation will be set to the side and then place back into the hole.

***includes temporary fill or excavation for dewatering and stream work

ATN Revised 3/31/05

NC DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

BUNCOMBE COUNTY
WBS - 38824.1.2
(I-2513AC)

SHEET 4/6/2023 Jong-Tae Yoon, PE

County: BUNCOMBE

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 & GRUBBING	3 ACR		
0005	0015000000-N	205	SEALING ABANDONED WELLS	1 EA		
0006	0022000000-E	225	UNCLASSIFIED EXCAVATION	807,290 CY		
0007	0036000000-E	225	UNDERCUT EXCAVATION	53,055 CY		
0008	0106000000-E	230	BORROW EXCAVATION	217,300 CY		
0009	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	16 EA		
0010	0134000000-E	240	DRAINAGE DITCH EXCAVATION	8,550 CY		
0011	0141000000-E	240	BERM DITCH CONSTRUCTION	2,125 LF		
0012	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	67,050 SY		
0013	0163000000-E	250	REMOVAL OF EXISTING CONCRETE PAVEMENT	76,460 SY		
0014	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	10,020 SY		
0015	0185000000-E	250	BREAKING OF EXISTING CONCRETE PAVEMENT	26,520 SY		
0016	0192000000-N	260	PROOF ROLLING	60 HR		
0017	0194000000-E	265	SELECT GRANULAR MATERIAL, CLASS III	2,600 CY		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	3,350 SY		
0019	0199000000-E	SP	TEMPORARY SHORING	35,430 SF		
0020	0223000000-E	275	ROCK PLATING	640 SY		
0021	0234000000-E	SP	GENERIC GRADING ITEM LIGHTWEIGHT AGGREGATE	10,000 CY		
0022	0241000000-E	SP	GENERIC GRADING ITEM GEOTEXTILE FOR LIGHTWEIGHT AGGREGATE	2,000 SY		
0023	0248000000-N	SP	GENERIC GRADING ITEM TYPE 1 BRIDGE APPROACH FILL, STATION 19+17.50 -Y2RPB-	Lump Sum	L.S.	
0024	0248000000-N	SP	GENERIC GRADING ITEM TYPE 1 BRIDGE APPROACH FILL, STATION 28+46.00 -Y2RPC-	Lump Sum	L.S.	
0025	0248000000-N	SP	GENERIC GRADING ITEM TYPE 1 BRIDGE APPROACH FILL, STATION 45+44.00 -L- RT	Lump Sum	L.S.	
0026	0248000000-N	SP	GENERIC GRADING ITEM TYPE 1 BRIDGE APPROACH FILL, STATION 45+58.00 -L- LT	Lump Sum	L.S.	
0027	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 105+49.43 -L- LT	Lump Sum	L.S.	
0028	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 105+49.43 -L- RT	Lump Sum	L.S.	
0029	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 19+17.50 -Y2RPB-	Lump Sum	L.S.	
0030	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 22+70.15 -Y2-	Lump Sum	L.S.	
0031	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 83+50.80 -L- LT	Lump Sum	L.S.	
0032	0248000000-N	SP	GENERIC GRADING ITEM TYPE 2 BRIDGE APPROACH FILL, STATION 83+50.80 -L- RT	Lump Sum	L.S.	

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0033	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	5,008 TON		
0034	0321000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	17,651 SY		
0035	0342000000-E	310	**" SIDE DRAIN PIPE (30")	208 LF		
0036	0342000000-E	310	**" SIDE DRAIN PIPE (36")	324 LF		
0037	0342000000-E	310	**" SIDE DRAIN PIPE (42")	528 LF		
0038	0342000000-E	310	**" SIDE DRAIN PIPE (48")	188 LF		
0039	0342000000-E	310	**" SIDE DRAIN PIPE (66")	36 LF		
0040	0343000000-E	310	15" SIDE DRAIN PIPE	2,740 LF		
0041	0344000000-E	310	18" SIDE DRAIN PIPE	1,936 LF		
0042	0345000000-E	310	24" SIDE DRAIN PIPE	596 LF		
0043	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (15")	6 EA		
0044	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (18")	6 EA		
0045	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (24")	4 EA		
0046	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (30")	2 EA		
0047	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (36")	2 EA		
0048	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (42")	6 EA		
0049	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (48")	2 EA		

County: **BUNCOMBE**

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0050	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (66")	2 EA		
0051	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	96 LF		
0052	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	20 LF		
0053	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	336 LF		
0054	0420000000-E	310	66" RC PIPE CULVERTS, CLASS III	32 LF		
0055	0426000000-E	310	72" RC PIPE CULVERTS, CLASS III	160 LF		
0056	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	172 LF		
0057	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (72")	228 LF		
0058	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	9,256 LF		
0059	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	8,364 LF		
0060	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	2,056 LF		
0061	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	1,580 LF		
0062	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	1,124 LF		
0063	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	436 LF		
0064	0449000000-E	310	**" RC PIPE CULVERTS, CLASS V (30")	92 LF		
0065	0449000000-E	310	**" RC PIPE CULVERTS, CLASS V (66")	32 LF		
0066	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (48", 0.109")	72 LF		

County: **BUNCOMBE**

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0067	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	1,220 LF		
0068	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	1,076 LF		
0069	0594000000-E	310	24" CS PIPE CULVERTS, 0.064" THICK	164 LF		
0070	0600000000-E	310	30" CS PIPE CULVERTS, 0.079" THICK	100 LF		
0071	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	10 EA		
0072	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	18 EA		
0073	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (15", 0.375")	56 LF		
0074	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (36", 0.532")	116 LF		
0075	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (42", 0.625")	95 LF		
0076	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (48", 0.625")	130 LF		
0077	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (60", 0.844")	178 LF		
0078	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (72", 1.000")	148 LF		
0079	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (36", 0.532")	116 LF		
0080	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (42", 0.625")	95 LF		
0081	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (48", 0.625")	130 LF		

County: **BUNCOMBE**

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0082	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (60", 0.844")	178 LF		
0083	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (72", 1.000")	148 LF		
0084	0986000000-E	SP	GENERIC PIPE ITEM 15" SEALED POLYPROPYLENE PIPE	56 LF		
0085	0986000000-E	SP	GENERIC PIPE ITEM 18" SEALED POLYPROPYLENE PIPE	500 LF		
0086	0986000000-E	SP	GENERIC PIPE ITEM 18" SEALED XP	4,940 LF		
0087	0986000000-E	SP	GENERIC PIPE ITEM 24" SEALED XP	1,072 LF		
0088	0986000000-E	SP	GENERIC PIPE ITEM 30" SEALED XP	648 LF		
0089	0986000000-E	SP	GENERIC PIPE ITEM 36" SEALED XP	208 LF		
0090	0986000000-E	SP	GENERIC PIPE ITEM 42" SEALED XP	904 LF		
0091	0986000000-E	SP	GENERIC PIPE ITEM 48" PIPE REHABILITATION CIPP LINER	188 LF		
0092	0986000000-E	SP	GENERIC PIPE ITEM 48" SEALED XP	116 LF		
0093	0986000000-E	SP	GENERIC PIPE ITEM 6" HDPE NONPERFORATED	15 LF		
0094	0986000000-E	SP	GENERIC PIPE ITEM 6" HDPE PERFORATED	90 LF		
0095	0986000000-E	SP	GENERIC PIPE ITEM 72" PIPE REHABILITATION CIPP LINER	283 LF		
0096	0992000000-E	SP	GENERIC PIPE ITEM 6" CLEANOUT	4 EA		
0097	0992000000-E	SP	GENERIC PIPE ITEM 6" CLEANOUT CAP (THREADED)	4 EA		
0098	0992000000-E	SP	GENERIC PIPE ITEM 6" HDPE 45-DEGREE BEND	1 EA		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0099	0992000000-E	SP	GENERIC PIPE ITEM 6" X 6" X 6" HDPE TEE	1 EA		
0100	0995000000-E	340	PIPE REMOVAL	14,951 LF		
0101	1000000000-E	462	6" SLOPE PROTECTION	310 SY		
0102	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0103	1099500000-E	505	SHALLOW UNDERCUT	1,000 CY		
0104	1099700000-E	505	CLASS IV SUBGRADE STABILIZATION	102,500 TON		
0105	1110000000-E	510	STABILIZER AGGREGATE	500 TON		
0106	1112000000-E	505	GEOTEXTILE FOR SUBGRADE STABILIZATION	226,350 SY		
0107	1121000000-E	520	AGGREGATE BASE COURSE	35,100 TON		
0108	1220000000-E	545	INCIDENTAL STONE BASE	500 TON		
0109	1275000000-E	600	PRIME COAT	5,100 GAL		
0110	1330000000-E	607	INCIDENTAL MILLING	4,000 SY		
0111	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	37,800 TON		
0112	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	39,300 TON		
0113	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	16,700 TON		
0114	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	23,100 TON		
0115	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	5,920 TON		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0116	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	5,357 TON		
0117	1841000000-E	665	GENERIC PAVING ITEM MILLED RUMBLE STRIPS (ASPHALT CONCRETE), (16")	38,990 LF		
0118	1847000000-E	710	*****" PORT CEM CONC PAVEMENT, THROUGH LANES (WITH DOWELS) (11")	79,310 SY		
0119	1891000000-E	SP	GENERIC PAVING ITEM NEXT GENERATION CONCRETE SURFACE (NGCS) GRINDING	79,310 SY		
0120	1920000000-E	724	NONWOVEN GEOTEXTILE INTERLAYER	79,310 SY		
0121	2022000000-E	815	SUBDRAIN EXCAVATION	558 CY		
0122	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	1,660 SY		
0123	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	279 CY		
0124	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	1,660 LF		
0125	2070000000-N	815	SUBDRAIN PIPE OUTLET	4 EA		
0126	2077000000-E	815	6" OUTLET PIPE	24 LF		
0127	2099000000-E	816	SHOULDER DRAIN	31,770 LF		
0128	2110000000-E	816	4" SHOULDER DRAIN PIPE	31,770 LF		
0129	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	540 LF		
0130	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	10 EA		
0131	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	21 EA		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0132	2209000000-E	838	ENDWALLS	26.8 CY		
0133	2220000000-E	838	REINFORCED ENDWALLS	27.2 CY		
0134	2253000000-E	840	PIPE COLLARS	3.716 CY		
0135	2275000000-E	SP	FLOWABLE FILL	721 CY		
0136	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	556 EA		
0137	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	202.717 CY		
0138	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	723 LF		
0139	2354000000-N	840	FRAME WITH GRATE, STD 840.22	2 EA		
0140	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	10 EA		
0141	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	13 EA		
0142	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	86 EA		
0143	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	9 EA		
0144	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	5 EA		
0145	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	10 EA		
0146	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	52 EA		
0147	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	58 EA		
0148	2396000000-N	840	FRAME WITH COVER, STD 840.54	50 EA		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0149	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	255 EA		
0150	2440000000-N	852	CONCRETE TRANSITIONAL SECTION FOR CATCH BASIN	6 EA		
0151	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	8 EA		
0152	2472000000-N	840	GENERIC DRAINAGE ITEM FRAME WITH COVER, STD 840.55	6 EA		
0153	2472000000-N	840	GENERIC DRAINAGE ITEM STEEL FRAME WITH FRAME AND TWO GRATES STD. 840.39	3 EA		
0154	2473000000-N	SP	GENERIC DRAINAGE ITEM DE-WATERING	2 EA		
0155	2473000000-N	SP	GENERIC DRAINAGE ITEM RESILIENT CONNECTOR	278 EA		
0156	2473000000-N	SP	GENERIC DRAINAGE ITEM TB CONTRACTOR DESIGNED MASONARY DRAINAGE STRUCTURES	46 EA		
0157	2473000000-N	SP	GENERIC DRAINAGE ITEM TRASH RACK (ORIFICE)	2 EA		
0158	2473000000-N	SP	GENERIC DRAINAGE ITEM TRASH RACK (RISER)	2 EA		
0159	2484000000-E	SP	GENERIC DRAINAGE ITEM PRE-INSTALLATION INSPECTION	471 LF		
0160	2492000000-E	SP	GENERIC DRAINAGE ITEM WASHED COARSE AGGREGATE (STD SIZE #57)	35 TON		
0161	2495000000-E	SP	GENERIC DRAINAGE ITEM ENGINEERED SOIL MEDIA	53 CY		
0162	2535000000-E	846	**" X **" CONCRETE CURB (8" X 18")	450 LF		
0163	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	2,740 LF		
0164	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	17,590 LF		
0165	2556000000-E	846	SHOULDER BERM GUTTER	3,880 LF		

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0166	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	2,250 LF		
0167	2591000000-E	848	4" CONCRETE SIDEWALK	9,330 SY		
0168	2605000000-N	848	CONCRETE CURB RAMPS	33 EA		
0169	2612000000-E	848	6" CONCRETE DRIVEWAY	170 SY		
0170	2619000000-E	850	4" CONCRETE PAVED DITCH	3,460 SY		
0171	2627000000-E	852	4" CONCRETE ISLAND COVER	2,740 SY		
0172	2647000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (SURFACE MOUNTED)	2,020 SY		
0173	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (I, SINGLE SLOPE)	1,560 LF		
0174	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	1,180 LF		
0175	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	1,040 LF		
0176	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	12 EA		
0177	2717200000-E	854	MEDIAN HAZARD PROTECTION	3,190 LF		
0178	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	14,370 LF		
0179	2738000000-E	SP	GENERIC PAVING ITEM 12" CONCRETE TRUCK APRON	1,250 SY		
0180	2738000000-E	SP	GENERIC PAVING ITEM STAMPED CONCRETE MEDIAN ISLAND	530 SY		
0181	2752000000-E	SP	GENERIC PAVING ITEM CONCRETE CAP FOR SINGLE FACED BARRIER FILL	480 LF		
0182	2753000000-E	846	GENERIC PAVING ITEM 3" ROLLED CONCRETE CURB	870 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0183	2800000000-N	858	ADJUSTMENT OF CATCH BASINS	3 EA		
0184	2815000000-N	858	ADJUSTMENT OF DROP INLETS	12 EA		
0185	2830000000-N	858	ADJUSTMENT OF MANHOLES	1 EA		
0186	2860000000-N	859	CONVERT EXISTING CATCH BASIN TO JUNCTION BOX	1 EA		
0187	2905000000-N	859	CONVERT EXISTING DROP INLET TO JUNCTION BOX	1 EA		
0188	2910000000-N	SP	CONVERT EXISTING TRAFFIC BEARING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	7 EA		
0189	2950000000-N	859	CONVERT EXISTING JUNCTION BOX TO DROP INLET	2 EA		
0190	2995000000-N	SP	GENERIC DRAINAGE ITEM CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX	9 EA		
0191	3345000000-E	864	REMOVE & RESET EXISTING GUARDRAIL	100 LF		
0192	3360000000-E	863	REMOVE EXISTING GUARDRAIL	25,810 LF		
0193	3387000000-N	862	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********* (THRIE-BEAM)	2 EA		
0194	3420000000-E	SP	GENERIC GUARDRAIL ITEM STEEL BEAM GUARDRAIL, SHOP CURVED, WEATHERING	600 LF		
0195	3420000000-E	SP	GENERIC GUARDRAIL ITEM STEEL BEAM GUARDRAIL, WEATHERING	8,775 LF		
0196	3420000000-E	SP	GENERIC GUARDRAIL ITEM WOOD RUB RAIL	625 LF		
0197	3435000000-N	SP	GENERIC GUARDRAIL ITEM ADDITIONAL GUARDRAIL POSTS, WEATHERING	10 EA		
0198	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL ANCHOR UNITS, TYPE B-77, POWDER COATED GALVANIZED	41 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0199	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL ANCHOR UNITS, TYPE III, POWDER COATED GALVANIZED	2 EA		
0200	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL END UNITS, TYPE AT-1, POWDER COATED GALVANIZED	1 EA		
0201	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL END UNITS, TYPE CAT-1, POWDER COATED GALVANIZED	14 EA		
0202	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL END UNITS, TYPE TL-2, POWDER COATED GALVANIZED	8 EA		
0203	3435000000-N	SP	GENERIC GUARDRAIL ITEM GUARDRAIL END UNITS, TYPE TL-3, POWDER COATED GALVANIZED	8 EA		
0204	3435000000-N	SP	GENERIC GUARDRAIL ITEM IMPACT ATTENUATOR UNITS, TYPE TL-3, POWDER COATED GALVANIZED	2 EA		
0205	3435000000-N	SP	GENERIC GUARDRAIL ITEM STEEL BEAM GUARDRAIL TERMINAL SECTIONS, WEATHERING	4 EA		
0206	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	16,600 LF		
0207	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	1,020 EA		
0208	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	310 EA		
0209	3557000000-E	866	ADDITIONAL BARBED WIRE	400 LF		
0210	3575000000-E	SP	GENERIC FENCING ITEM 54" SHARED-USE PATH SAFETY RAIL	710 LF		
0211	3578000000-N	SP	GENERIC FENCING ITEM BOLLARDS	11 EA		
0212	3579000000-N	866	GENERIC FENCING ITEM BLACK VINYL COATED METAL LINE POSTS FOR 48" CHAIN LINK FENCE	570 EA		
0213	3579000000-N	866	GENERIC FENCING ITEM BLACK VINYL COATED METAL TERMINAL POSTS FOR 48" CHAIN LINK FENCE	50 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0214	3580000000-E	866	GENERIC FENCING ITEM BLACK VINYL COATED CHAIN LINK FENCE, 48" FABRIC	6,730 LF		
0215	3595000000-E	869	RELAPPING GUARDRAIL	1,360 LF		
0216	3628000000-E	876	RIP RAP, CLASS I	1,650 TON		
0217	3635000000-E	876	RIP RAP, CLASS II	1,020 TON		
0218	3649000000-E	876	RIP RAP, CLASS B	1,815 TON		
0219	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	10,750 SY		
0220	4025000000-E	901	CONTRACTOR FURNISHED, TYPE *** SIGN (A)	815.1 SF		
0221	4025000000-E	901	CONTRACTOR FURNISHED, TYPE *** SIGN (B)	71.5 SF		
0222	4025000000-E	901	CONTRACTOR FURNISHED, TYPE *** SIGN (D)	57.75 SF		
0223	4025000000-E	901	CONTRACTOR FURNISHED, TYPE *** SIGN (F)	187.65 SF		
0224	4025000000-E	901	CONTRACTOR FURNISHED, TYPE *** SIGN (OVERLAY)	88.85 SF		
0225	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	8 CY		
0226	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	2 CY		
0227	4057000000-E	SP	OVERHEAD FOOTING	216 CY		
0228	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	5,902 LB		
0229	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	3,541 LB		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0230	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	5,032 LF		
0231	4079000000-N	903	SUPPORTS, BARRIER (SMALL)	7 EA		
0232	4080000000-N	903	SUPPORTS, BARRIER (LARGE)	1 EA		
0233	4082000000-E	903	SUPPORTS, WOOD	1,705 LF		
0234	4096000000-N	904	SIGN ERECTION, TYPE D	15 EA		
0235	4102000000-N	904	SIGN ERECTION, TYPE E	150 EA		
0236	4108000000-N	904	SIGN ERECTION, TYPE F	46 EA		
0237	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	22 EA		
0238	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	9 EA		
0239	4114000000-N	904	SIGN ERECTION, MILEMARKERS	8 EA		
0240	4116000000-N	904	SIGN ERECTION, OVERLAY (GROUND MOUNTED)	9 EA		
0241	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	52 EA		
0242	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (B)	4 EA		
0243	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (D)	8 EA		
0244	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (E)	8 EA		
0245	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (F)	50 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0246	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (MILEMARKER)	6 EA		
0247	4116200000-N	904	SIGN ERECTION, REPOSITION OVERHEAD	7 EA		
0248	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (108+29 -L-)	Lump Sum	L.S.	
0249	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (109+50 -L-)	Lump Sum	L.S.	
0250	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (177' WEST OF EXISTING)	Lump Sum	L.S.	
0251	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (18+00 -L-)	Lump Sum	L.S.	
0252	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (31+00 -L-)	Lump Sum	L.S.	
0253	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (34+00 -Y2RPBC-)	Lump Sum	L.S.	
0254	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (34+50 -L-)	Lump Sum	L.S.	
0255	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (96+00 -L-)	Lump Sum	L.S.	
0256	4130000000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE ***** (99+00 -L-)	Lump Sum	L.S.	
0257	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	6 EA		
0258	4141000000-N	907	DISPOSAL OF SUPPORT, WOOD	62 EA		
0259	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	5 EA		
0260	4151000000-N	907	STOCKPILE SIGN SYSTEM, STEEL BEAM	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0261	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	20 EA		
0262	4154000000-N	907	STOCKPILE SIGN SYSTEM, U-CHANNEL	8 EA		
0263	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	141 EA		
0264	4157000000-N	907	STOCKPILE SIGN SYSTEM, WOOD	2 EA		
0265	4158000000-N	907	DISPOSAL OF SIGN SYSTEM, WOOD	4 EA		
0266	4192000000-N	907	DISPOSAL OF SUPPORT, U-CHANNEL	111 EA		
0267	4236000000-N	907	DISPOSAL OF SIGN, A & B (GROUND MOUNTED)	1 EA		
0268	4237000000-N	907	STOCKPILE SIGN, D, E OR F	1 EA		
0269	4238000000-N	907	DISPOSAL OF SIGN, D, E OR F	12 EA		
0270	4242000000-N	907	DISPOSAL OF SIGN, OVERLAY (GROUND MOUNTED)	2 EA		
0271	4360000000-N	SP	GENERIC SIGNING ITEM DISPOSAL OF SIGN SYSTEM, TEMPORARY WOOD SKID SYSTEM	1 EA		
0272	4360000000-N	SP	GENERIC SIGNING ITEM DISPOSAL OF SUPPORT, PORTABLE SIGN SUPPORT	4 EA		
0273	4360000000-N	SP	GENERIC SIGNING ITEM DISPOSAL OF SUPPORT, TEMPORARY WOODEN SKID SYSTEM	14 EA		
0274	4360000000-N	SP	GENERIC SIGNING ITEM RELOCATE EXISTING WAY FINDING ASSEMBLY	3 EA		
0275	4360000000-N	SP	GENERIC SIGNING ITEM SIGNS, COVERING	7 EA		
0276	4360000000-N	SP	GENERIC SIGNING ITEM STOCKPILE EXISTING WAY FINDING ASSEMBLY	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0277	4360000000-N	SP	GENERIC SIGNING ITEM STOCKPILE OF SIGN, LOGO BUSINESS PANEL	1 EA		
0278	4360000000-N	SP	GENERIC SIGNING ITEM STOCKPILE SIGN SYSTEM, PORTABLE SIGN SUPPORT	1 EA		
0279	4360000000-N	SP	GENERIC SIGNING ITEM SUPPORTS, PORTABLE SIGN SUPPORT	4 EA		
0280	4360000000-N	SP	GENERIC SIGNING ITEM SUPPORTS, TEMPORARY WOODEN SKID SYSTEM	23 EA		
0281	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	776 SF		
0282	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	244 SF		
0283	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	176 SF		
0284	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	342 SF		
0285	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	134 SF		
0286	4415000000-N	1115	FLASHING ARROW BOARD	8 EA		
0287	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	8 EA		
0288	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	150 DAY		
0289	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	19 EA		
0290	4424500000-N	SP	TEMPORARY PORTABLE TRAFFIC SIGNAL SYSTEM	1 EA		
0291	4430000000-N	1130	DRUMS	75 EA		
0292	4432000000-N	SP	HIGH VISIBILITY DRUMS	250 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0293	4434000000-N	1140	SEQUENTIAL FLASHING WARNING LIGHTS	24 EA		
0294	4435000000-N	1135	CONES	75 EA		
0295	4445000000-E	1145	BARRICADES (TYPE III)	240 LF		
0296	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	202 LF		
0297	4455000000-N	1150	FLAGGER	450 DAY		
0298	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	14 EA		
0299	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	26 EA		
0300	4480000000-N	1165	TMA	2 EA		
0301	4485000000-E	1170	PORTABLE CONCRETE BARRIER	21,000 LF		
0302	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	370 LF		
0303	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	62,800 LF		
0304	4510000000-N	1190	LAW ENFORCEMENT	192 HR		
0305	4516000000-N	1180	SKINNY DRUM	50 EA		
0306	4570000000-E	SP	TEMPORARY GLARE SCREEN	5,796 LF		
0307	4589000000-N	SP	GENERIC TRAFFIC CONTROL ITEM DYNAMIC ZIPPER MERGE SYSTEM DEPLOYMENT	Lump Sum	L.S.	
0308	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE SYSTEM	2 EA		
0309	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM DYNAMIC ZIPPER MERGE SYSTEM RELOCATION	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0310	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM HIGH VISIBILITY SKINNY DRUMS	50 EA		
0311	4609000000-N	SP	GENERIC TRAFFIC CONTROL ITEM DYNAMIC ZIPPER MERGE SYSTEM	84 DAY		
0312	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	1,200 EA		
0313	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (IV)	15,216 LF		
0314	4775000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (6") (IV)	19,713 LF		
0315	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (IV)	2,162 LF		
0316	4805000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (IV)	20 EA		
0317	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	151,248 LF		
0318	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	10,000 LF		
0319	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	10,000 LF		
0320	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	10,000 LF		
0321	4840000000-N	1205	PAINT PAVEMENT MARKING CHARACTER	200 EA		
0322	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	370 EA		
0323	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	568,752 LF		
0324	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	21,520 LF		
0325	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	22,460 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0326	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	1,000 LF		
0327	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	1,000 LF		
0328	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	1,130 LF		
0329	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	107 EA		
0330	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM YIELD LINE INTEGRATED MULTIPOLYMER PAVEMENT MARKING (24", 90 MILS)	118 LF		
0331	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM YIELD LINE PAINT PAVEMENT MARKING, 24"	70 LF		
0332	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING LINES (12", 90 MILS)	7,491 LF		
0333	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING LINES (24", 90 MILS)	2,562 LF		
0334	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING LINES (4", 90 MILS)	16,549 LF		
0335	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING LINES (6", 90 MILS)	74,199 LF		
0336	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING LINES (8", 90 MILS)	1,863 LF		
0337	4892000000-N	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING CHARACTERS (90 MILS)	36 EA		
0338	4892000000-N	1205	GENERIC PAVEMENT MARKING ITEM INTEGRATED MULTIPOLYMER PAVEMENT MARKING SYMBOLS (90 MILS)	124 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0339	4894900000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING CHARACTERS	20 EA		
0340	4894900000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING SYMBOLS	20 EA		
0341	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM INLAID CRADLE MARKERS	1,887 EA		
0342	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	93 EA		
0343	4915000000-E	1264	7' U-CHANNEL POSTS	9 EA		
0344	4955000000-N	1264	OBJECT MARKERS (END OF ROAD)	9 EA		
0345	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M1)	22 EA		
0346	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M2)	4 EA		
0347	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R1)	39 EA		
0348	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE R2)	4 EA		
0349	5080000000-N	SP	LIGHT STANDARD LUMINAIRES, TYPE ********** (RDW, 150W LED)	91 EA		
0350	5080000000-N	SP	LIGHT STANDARD LUMINAIRES, TYPE ********** (RDW, 195W LED)	24 EA		
0351	5120000000-N	1407	ELECTRIC SERVICE POLE ********** (30' CLASS 4)	2 EA		
0352	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 #1/0 USE)	50 LF		
0353	5150000000-E	1409	ELECTRICAL DUCT, TYPE **, SIZE ***** (TL, 3")	985 LF		
0354	5150000000-E	1409	ELECTRICAL DUCT, TYPE **, SIZE ***** (TL, 4")	870 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0355	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	1,165 LF		
0356	5170000000-E	1410	** #8 W/G FEEDER CIRCUIT (2)	1,785 LF		
0357	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2)	940 LF		
0358	5185000000-E	1410	** #2 W/G FEEDER CIRCUIT (2)	585 LF		
0359	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1-1/2")	10,850 LF		
0360	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1-1/2")	9,380 LF		
0361	5220000000-E	1410	** #2 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1-1/2")	4,350 LF		
0362	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (CS36)	2 EA		
0363	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG18)	15 EA		
0364	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG36)	6 EA		
0365	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS18)	32 EA		
0366	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (LS36)	6 EA		
0367	5252500000-N	1412	UNDERPASS LUMINARIES, TYPE ***** (WM)	6 EA		
0368	5253000000-N	1412	UNDERPASS CIRCUITRY AT ******* (UPL-F1)	Lump Sum	L.S.	
0369	5253000000-N	1412	UNDERPASS CIRCUITRY AT ******* (UPL-F2)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0370	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0371	5260000000-N	SP	GENERIC LIGHTING ITEM BREVARD RD BRIDGE ECS	Lump Sum	L.S.	
0372	5260000000-N	SP	GENERIC LIGHTING ITEM BRIDGES OVER HOMINY CREEK ECS	Lump Sum	L.S.	
0373	5260000000-N	SP	GENERIC LIGHTING ITEM STATE ST BRIDGE ECS	Lump Sum	L.S.	
0374	5260000000-N	SP	GENERIC LIGHTING ITEM STEEL FRAME, CCTV DISCON, PANEL P1	Lump Sum	L.S.	
0375	5265000000-E	SP	GENERIC LIGHTING ITEM 2" MUP LIGHTING CONDUIT, TYPE BD	8,620 LF		
0376	5270000000-N	SP	GENERIC LIGHTING ITEM FORMED OPENING - FO18	30 EA		
0377	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE RW, 240/480V	1 EA		
0378	5270000000-N	SP	GENERIC LIGHTING ITEM PAINTED LIGHT STANDARD, 35' SA, 15' ARM	16 EA		
0379	5270000000-N	SP	GENERIC LIGHTING ITEM PAINTED LIGHT STANDARD, 35' TA, 15' ARM	4 EA		
0380	5270000000-N	SP	GENERIC LIGHTING ITEM PAINTED LIGHT STANDARD, 45' SA, 15' ARM	35 EA		
0381	5270000000-N	SP	GENERIC LIGHTING ITEM PAINTED LIGHT STANDARD, 45' TA, 15' ARM	28 EA		
0382	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE CONTROL SYSTEM	1 EA		
0383	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE LIGHT STANDARD FOUNDATION	61 EA		
0384	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STANDARD	61 EA		
0385	5325200000-E	1510	2" WATER LINE	484 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0386	5325400000-E	1510	4" WATER LINE	7 LF		
0387	5325600000-E	1510	6" WATER LINE	464 LF		
0388	5325800000-E	1510	8" WATER LINE	236 LF		
0389	5326200000-E	1510	12" WATER LINE	592 LF		
0390	5327400000-E	1510	24" WATER LINE	4,133 LF		
0391	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	51,835 LB		
0392	5536000000-E	1515	2" VALVE	3 EA		
0393	5540000000-E	1515	6" VALVE	12 EA		
0394	5546000000-E	1515	8" VALVE	2 EA		
0395	5558000000-E	1515	12" VALVE	2 EA		
0396	5559400000-E	1515	24" VALVE	11 EA		
0397	5589200000-E	1515	2" AIR RELEASE VALVE	2 EA		
0398	5648000000-N	1515	RELOCATE WATER METER	12 EA		
0399	5649000000-N	1515	RECONNECT WATER METER	2 EA		
0400	5666000000-N	1515	FIRE HYDRANT	7 EA		
0401	5673000000-E	1515	FIRE HYDRANT LEG	125 LF		
0402	5686000000-E	1515	**" WATER SERVICE LINE (2")	285 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0403	5686500000-E	1515	WATER SERVICE LINE	645 LF		
0404	5691200000-E	1520	6" SANITARY GRAVITY SEWER	112 LF		
0405	5691300000-E	1520	8" SANITARY GRAVITY SEWER	3,639 LF		
0406	5691400000-E	1520	10" SANITARY GRAVITY SEWER	1,042 LF		
0407	5691500000-E	1520	12" SANITARY GRAVITY SEWER	535 LF		
0408	5692000000-E	1520	30" SANITARY GRAVITY SEWER	711 LF		
0409	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	26 EA		
0410	5768500000-E	1520	SEWER SERVICE LINE	700 LF		
0411	5773000000-N	SP	UTILITY VAULT	1 EA		
0412	5775000000-E	1525	4' DIA UTILITY MANHOLE	44 EA		
0413	5776000000-E	1525	5' DIA UTILITY MANHOLE	4 EA		
0414	5777000000-E	1525	6' DIA UTILITY MANHOLE	1 EA		
0415	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	332 LF		
0416	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	1 LF		
0417	5798000000-E	1530	ABANDON **" UTILITY PIPE (27")	624 LF		
0418	5800000000-E	1530	ABANDON 6" UTILITY PIPE	3,539 LF		
0419	5801000000-E	1530	ABANDON 8" UTILITY PIPE	4,599 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0420	5802000000-E	1530	ABANDON 10" UTILITY PIPE	849 LF		
0421	5804000000-E	1530	ABANDON 12" UTILITY PIPE	352 LF		
0422	5813000000-E	1530	ABANDON 24" UTILITY PIPE	3,900 LF		
0423	5815000000-N	1530	REMOVE WATER METER	34 EA		
0424	5815500000-N	1530	REMOVE FIRE HYDRANT	4 EA		
0425	5816000000-N	1530	ABANDON UTILITY MANHOLE	40 EA		
0426	5828000000-N	1530	REMOVE UTILITY MANHOLE	3 EA		
0427	5835000000-E	1540	**" ENCASEMENT PIPE (48")	634 LF		
0428	5835000000-E	1540	**" ENCASEMENT PIPE (60")	344 LF		
0429	5836000000-E	1540	24" ENCASEMENT PIPE	1,707 LF		
0430	5872500000-E	1550	BORE AND JACK OF **" (24")	1,707 LF		
0431	5872500000-E	1550	BORE AND JACK OF **" (48")	634 LF		
0432	5872500000-E	1550	BORE AND JACK OF **" (60")	344 LF		
0433	5882000000-N	SP	GENERIC UTILITY ITEM 6" FLEXIBLE COUPLING	2 EA		
0434	5882000000-N	SP	GENERIC UTILITY ITEM ABANDON UTILITY VAULT	1 EA		
0435	6000000000-E	1605	TEMPORARY SILT FENCE	53,700 LF		
0436	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	2,450 TON		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0437	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	9,560 TON		
0438	6012000000-E	1610	SEDIMENT CONTROL STONE	9,050 TON		
0439	6015000000-E	1615	TEMPORARY MULCHING	200 ACR		
0440	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	9,700 LB		
0441	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	50 TON		
0442	6024000000-E	1622	TEMPORARY SLOPE DRAINS	1,315 LF		
0443	6029000000-E	SP	SAFETY FENCE	450 LF		
0444	6030000000-E	1630	SILT EXCAVATION	24,310 CY		
0445	6036000000-E	1631	MATTING FOR EROSION CONTROL	137,650 SY		
0446	6037000000-E	1629	COIR FIBER MAT	100 SY		
0447	6042000000-E	1632	1/4" HARDWARE CLOTH	25,100 LF		
0448	6043000000-E	1644	LOW PERMEABILITY GEOTEXTILE	400 SY		
0449	6045000000-E	SP	**" TEMPORARY PIPE (24")	720 LF		
0450	6070000000-N	1639	SPECIAL STILLING BASINS	4 EA		
0451	6071002000-E	1642	FLOCCULANT	2,500 LB		
0452	6071010000-E	1642	WATTLE	900 LF		
0453	6071012000-E	1642	COIR FIBER WATTLE	2,000 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0454	6071014000-E	1642	COIR FIBER WATTLE BARRIER	9,000 LF		
0455	6071030000-E	1640	COIR FIBER BAFFLE	1,950 LF		
0456	6071050000-E	1644	**" SKIMMER (1-1/2")	12 EA		
0457	6071050000-E	1644	**" SKIMMER (2")	4 EA		
0458	6084000000-E	1660	SEEDING & MULCHING	135 ACR		
0459	6087000000-E	1660	MOWING	100 ACR		
0460	6090000000-E	1661	SEED FOR REPAIR SEEDING	2,000 LB		
0461	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	5.5 TON		
0462	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	3,300 LB		
0463	6108000000-E	1665	FERTILIZER TOPDRESSING	98.75 TON		
0464	6111000000-E	SP	IMPERVIOUS DIKE	210 LF		
0465	6114500000-N	1667	SPECIALIZED HAND MOWING	35 MHR		
0466	6114800000-N	SP	MANUAL LITTER REMOVAL	55 MHR		
0467	6114900000-E	SP	LITTER DISPOSAL	2.5 TON		
0468	6117000000-N	1675	RESPONSE FOR EROSION CONTROL	100 EA		
0469	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	4 EA		
0470	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION CLEANOUT	2,500 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0471	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION, TYPE 1	850 EA		
0472	6132000000-N	SP	GENERIC EROSION CONTROL ITEM PREFABRICATED CONCRETE WASHOUT	23 EA		
0473	6141000000-E	SP	GENERIC EROSION CONTROL ITEM PERMANENT SOIL REINFORCEMENT MAT, TYPE 1	715 SY		
0474	6141000000-E	SP	GENERIC EROSION CONTROL ITEM PERMANENT SOIL REINFORCEMENT MAT, TYPE 2	425 SY		
0475	6141000000-E	SP	GENERIC EROSION CONTROL ITEM PERMANENT SOIL REINFORCEMENT MAT, TYPE 3	650 SY		
0476	6141000000-E	SP	GENERIC EROSION CONTROL ITEM PERMANENT SOIL REINFORCEMENT MAT, TYPE 4	20 SY		
0477	6675000000-E	SP	GENERIC PLANTING ITEM FESCUE/BLUEGRASS BLEND SOD	260 SY		
0478	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	15 EA		
0479	7060000000-E	1705	SIGNAL CABLE	11,000 LF		
0480	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	57 EA		
0481	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	5 EA		
0482	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	2 EA		
0483	7204000000-N	1705	LOUVER	3 EA		
0484	7252000000-E	1710	MESSENGER CABLE (1/4")	5,500 LF		
0485	7264000000-E	1710	MESSENGER CABLE (3/8")	1,500 LF		
0486	7279000000-E	1715	TRACER WIRE	12,770 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0487	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	1,100 LF		
0488	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	260 LF		
0489	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 1-1/2")	9,150 LF		
0490	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 2")	210 LF		
0491	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	620 LF		
0492	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	1,320 LF		
0493	7301000000-E	1715	DIRECTIONAL DRILL (**********) (3, 1-1/2")	1,600 LF		
0494	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	12 EA		
0495	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	20 EA		
0496	7360000000-N	1720	WOOD POLE	11 EA		
0497	7372000000-N	1721	GUY ASSEMBLY	45 EA		
0498	7420000000-E	1722	2" RISER WITH WEATHERHEAD	9 EA		
0499	7430000000-N	1722	HEAT SHRINK TUBING RETROFIT KIT	2 EA		
0500	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	2,100 LF		
0501	7456100000-E	1726	LEAD-IN CABLE (14-2)	2,650 LF		
0502	7481000000-N	SP	SITE SURVEY	8 EA		
0503	7481200000-N	SP	LUMINAIRE ARM FOR VIDEO SYSTEM	15 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0504	7481240000-N	SP	CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT	13 EA		
0505	7481260000-N	SP	EXTERNAL LOOP EMULATOR PROCESSING UNIT	4 EA		
0506	7481280000-N	SP	RELOCATE CAMERA SENSOR UNIT	3 EA		
0507	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (144)	13,400 LF		
0508	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (60)	4,200 LF		
0509	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (96)	13,250 LF		
0510	7528000000-E	1730	DROP CABLE	3,880 LF		
0511	7540000000-N	1731	SPLICE ENCLOSURE	11 EA		
0512	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	4 EA		
0513	7552000000-N	1731	INTERCONNECT CENTER	7 EA		
0514	7566000000-N	1733	DELINEATOR MARKER	48 EA		
0515	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	3,582 LF		
0516	7575170000-E	1738	BACK PULL FIBER OPTIC CABLE	1,150 LF		
0517	7575180000-N	1735	CABLE TRANSFER	5 EA		
0518	7588000000-N	SP	METAL POLE WITH SINGLE MAST ARM	6 EA		
0519	7590000000-N	SP	METAL POLE WITH DUAL MAST ARM	2 EA		
0520	7613000000-N	SP	SOIL TEST	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0521	7614100000-E	SP	DRILLED PIER FOUNDATION	72 CY		
0522	7631000000-N	SP	MAST ARM WITH METAL POLE DESIGN	8 EA		
0523	7636000000-N	1745	SIGN FOR SIGNALS	34 EA		
0524	7642100000-N	1743	TYPE I POST WITH FOUNDATION	5 EA		
0525	7642200000-N	1743	TYPE II PEDESTAL WITH FOUNDATION	9 EA		
0526	7684000000-N	1750	SIGNAL CABINET FOUNDATION	2 EA		
0527	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (2070LX, BASE MOUNTED)	1 EA		
0528	7744000000-N	1751	DETECTOR CARD (TYPE 170)	11 EA		
0529	7901000000-N	1753	CABINET BASE EXTENDER	1 EA		
0530	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA LOWERING SYSTEM	2 EA		
0531	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET	1 EA		
0532	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE	2 EA		
0533	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	2 EA		
0534	7980000000-N	SP	GENERIC SIGNAL ITEM ELECTRONIC MARKER BALL	33 EA		
0535	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	2 EA		
0536	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	2 EA		
0537	7980000000-N	SP	GENERIC SIGNAL ITEM LIMITED ACCESS FACILITIES - JUNCTION BOX (OVERSIZED)	23 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0538	7980000000-N	SP	GENERIC SIGNAL ITEM LIMITED ACCESS FACILITIES - JUNCTION BOX (SPECIAL OVERSIZED)	10 EA		
0539	7980000000-N	SP	GENERIC SIGNAL ITEM LIMITED ACCESS FACILITIES - JUNCTION BOX (STANDARD SIZE)	1 EA		
0540	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE FOUNDATION REMOVAL	1 EA		
0541	7980000000-N	SP	GENERIC SIGNAL ITEM METAL POLE REMOVAL	1 EA		
0542	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINATION PANEL	1 EA		
0543	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTOR - MULTIPLE ZONES (PRESENCE)	3 EA		
0544	7980000000-N	SP	GENERIC SIGNAL ITEM NON-INTRUSIVE DETECTION SYSTEM PROCESSOR	3 EA		
0545	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR DUAL MAST ARM POLE (27038)	2 EA		
0546	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR SINGLE MAST ARM POLE (27038)	6 EA		
0547	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR TYPE I PUSHBUTTON POST (27038)	7 EA		
0548	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR TYPE II SIGNAL PEDESTAL (27038)	9 EA		
0549	7980000000-N	SP	GENERIC SIGNAL ITEM RECTANGULAR RAPID FLASHING BEACON ASSEMBLY	6 EA		
0550	7980000000-N	SP	GENERIC SIGNAL ITEM VARIABLE SPEED DRILL	2 EA		
0551	7985000000-N	SP	GENERIC SIGNAL ITEM TRAINING FOR NON-INTRUSIVE DETECTION	Lump Sum	L.S.	
0552	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS	1,350 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0553	8522000000-E	460	GENERIC STRUCTURE ITEM CONCRETE BARRIER RAIL WITH MOMENT SLAB AT BEAR CREEK RD BRIDGE	60 LF		
			WALL ITEMS			
0554	8504000000-E	460	CONCRETE BARRIER RAIL WITH MOMENT SLAB	7,253.18 LF		
0555	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	4,845 SF		
0556	8801000000-E	SP	MSE RETAINING WALL NO **** (12)	11,180 SF		
0557	8801000000-E	SP	MSE RETAINING WALL NO **** (18)	15,415 SF		
0558	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	12,140 SF		
0559	8801000000-E	SP	MSE RETAINING WALL NO **** (28)	370 SF		
0560	8801000000-E	SP	MSE RETAINING WALL NO **** (3)	17,495 SF		
0561	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	2,175 SF		
0562	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	44,945 SF		
0563	8801000000-E	SP	MSE RETAINING WALL NO **** (7)	1,500 SF		
0564	8801000000-E	SP	MSE RETAINING WALL NO **** (8)	1,410 SF		
0565	8801000000-E	SP	MSE RETAINING WALL NO **** (9)	5,755 SF		
0566	8802010000-E	SP	SOIL NAIL RETAINING WALLS	73,975 SF		
0567	8802014000-E	SP	SOLDIER PILE RETAINING WALLS	3,905 SF		
0568	8802015100-N	SP	SOIL NAIL VERIFICATION TESTS	17 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0569	8802015110-N	SP	SOIL NAIL PROOF TESTS	150 EA		
0570	8802040000-E	453	CIP GRAVITY RETAINING WALLS	17,385 SF		
0571	8839000000-E	SP	GENERIC RETAINING WALL ITEM CONCRETE BARRIER RAIL WITH MOMENT SLAB AND LIGHT SUPPORT	217 LF		
0572	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT	217,525 SF		
0573	8847000000-E	SP	GENERIC RETAINING WALL ITEM CIP MSE RETAINING WALL NO 22	5,600 SF		
0574	8847000000-E	SP	GENERIC RETAINING WALL ITEM CIP MSE RETAINING WALL NO 23	7,265 SF		
0575	8847000000-E	SP	GENERIC RETAINING WALL ITEM CIP MSE RETAINING WALL NO 24	6,250 SF		
0576	8847000000-E	SP	GENERIC RETAINING WALL ITEM CIP MSE RETAINING WALL NO 25	7,770 SF		
0577	8892000000-E	SP	GENERIC STRUCTURE ITEM ARCHITECTURAL SURFACE TREATMENT (SOUND BARRIER WALL)	266,158 SF		
0578	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND ABSORPTIVE BARRIER WALL NO NW7B	10,310 SF		
0579	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND ABSORPTIVE BARRIER WALL NO NW7C	26,523 SF		
0580	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL NO NW3	45,906 SF		
0581	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL NO NW5A	24,964 SF		
0582	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL NO NW68	26,683 SF		
0583	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL NO NW7A	11,099 SF		
0584	8892000000-E	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL NO NW7B	13,552 SF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			STRUCTURE ITEMS			
0585	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (105+49.43 -L- RT)	Lump Sum	L.S.	
0586	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (22+70.15 -Y2-)	Lump Sum	L.S.	
0587	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (45+58.00 -L-)	Lump Sum	L.S.	
0588	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (83+50.80 -L- RT)	Lump Sum	L.S.	
0589	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0590	8096000000-E	450	PILE EXCAVATION IN SOIL	90 LF		
0591	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	47.4 LF		
0592	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (4'-6")	215.4 LF		
0593	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (8'-0")	49.3 LF		
0594	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (4'-6")	247.6 LF		
0595	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (8'-0")	74.2 LF		
0596	8108000000-E	411	**'-**" DIA DRILLED PIERS (3'-6")	243.5 LF		
0597	8111000000-E	411	PERMANENT STEEL CASING FOR **'-**" DIA DRILLED PIER (4'-6")	215.4 LF		
0598	8111000000-E	411	PERMANENT STEEL CASING FOR **'-**" DIA DRILLED PIER (8'-0")	48.8 LF		
0599	8113000000-N	411	SID INSPECTIONS	5 EA		
0600	8115000000-N	411	CSL TESTING	7 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0601	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (105+49.43 -L- LT)	Lump Sum	L.S.	
0602	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (105+49.43 -L- RT)	Lump Sum	L.S.	
0603	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (22+70.15 -Y2-)	Lump Sum	L.S.	
0604	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (28+46.00 -Y2RPC-)	Lump Sum	L.S.	
0605	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (45+58.00 -L-)	Lump Sum	L.S.	
0606	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (83+50.80 -L- LT)	Lump Sum	L.S.	
0607	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (83+50.80 -L- RT)	Lump Sum	L.S.	
0608	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	130,849 SF		
0609	8161000000-E	420	GROOVING BRIDGE FLOORS	143,939 SF		
0610	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	2,569.4 CY		
0611	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (105+49.43 -L- LT)	Lump Sum	L.S.	
0612	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (105+49.43 -L- RT)	Lump Sum	L.S.	
0613	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (19+17.50 -Y2RPB-)	Lump Sum	L.S.	
0614	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (22+70.15 -Y2-)	Lump Sum	L.S.	
0615	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (28+46.00 -Y2RPC-)	Lump Sum	L.S.	

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0616	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (45+44.00 -L-)	Lump Sum	L.S.	
0617	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (45+58.00 -L-)	Lump Sum	L.S.	
0618	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (83+50.80 -L- LT)	Lump Sum	L.S.	
0619	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (83+50.80 -L- RT)	Lump Sum	L.S.	
0620	8217000000-E	425	REINFORCING STEEL (BRIDGE)	417,362 LB		
0621	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	44,214 LB		
0622	8265000000-E	430	54" PRESTRESSED CONCRETE GIRDERS	3,585.92 LF		
0623	8277000000-E	430	MODIFIED 72" PRESTRESSED CONC GIRDERS	1,471.8 LF		
0624	8280000000-E	440	APPROX ..... LBS STRUCTURAL STEEL	3,866,936 LS		
0625	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	267 EA		
0626	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 14 X 73)	26 EA		
0627	8364000000-E	450	HP 12 X 53 STEEL PILES	14,130 LF		
0628	8384000000-E	450	HP 14 X 73 STEEL PILES	690 LF		
0629	8391000000-N	450	STEEL PILE POINTS	122 EA		
0630	8392500000-E	450	PREDRILLING FOR PILES	166.4 LF		
0631	8394000000-N	450	DYNAMIC PILE TESTING	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0632	8503000000-E	460	CONCRETE BARRIER RAIL	4,993.4 LF		
0633	8504000000-E	460	CONCRETE BARRIER RAIL WITH MOMENT SLAB	114 LF		
0634	8517000000-E	460	1'-**" X *****" CONCRETE PARAPET (1'-2" X 3'-3")	407.22 LF		
0635	8524000000-E	SP	**" CHAIN LINK FENCE (72")	1,178.5 LF		
0636	8531000000-E	462	4" SLOPE PROTECTION	3,345.8 SY		
0637	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	882 TON		
0638	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	980 SY		
0639	8654000000-N	SP	DISC BEARINGS	Lump Sum	L.S.	
0640	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0641	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum	L.S.	
0642	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA ********** (105+49.43 -L- RT)	Lump Sum	L.S.	
0643	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA ********** (19+17.50 -Y2RPB-)	Lump Sum	L.S.	
0644	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA ********** (22+70.15 -Y2-)	Lump Sum	L.S.	
0645	8860000000-N	SP	GENERIC STRUCTURE ITEM ELECTRICAL CONDUIT SYSTEM FOR LIGHTING AT STATION 22+70.15 -Y2-	Lump Sum	L.S.	
0646	8860000000-N	SP	GENERIC STRUCTURE ITEM PRECAST CONCRETE FASCIA AT STATION 105+49.43 -L- LT	Lump Sum	L.S.	
0647	8860000000-N	SP	GENERIC STRUCTURE ITEM PRECAST CONCRETE FASCIA AT STATION 105+49.43 -L- RT	Lump Sum	L.S.	

County: BUNCOMBE

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0648	8860000000-N	SP	GENERIC STRUCTURE ITEM PRECAST CONCRETE FASCIA AT STATION 83+50.80 -L- LT	Lump Sum	L.S.	
0649	8860000000-N	SP	GENERIC STRUCTURE ITEM PRECAST CONCRETE FASCIA AT STATION 83+50.80 -L- RT	Lump Sum	L.S.	
0650	8860000000-N	SP	GENERIC STRUCTURE ITEM SOUND BARRIER WALL (BRIDGE MOUNTED)	Lump Sum	L.S.	
0651	8860000000-N	SP	GENERIC STRUCTURE ITEM STRIP SEAL EXPANSION JOINTS	Lump Sum	L.S.	
0652	8867000000-E	SP	GENERIC STRUCTURE ITEM ANODIZED TWO BAR METAL RAIL	374.44 LF		
0653	8867000000-E	SP	GENERIC STRUCTURE ITEM CONCRETE BARRIER RAIL WITH MOMENT SLAB AT SOUND BARRIER WALL (BRIDGE MOUNTED)	259.8 LF		
0654	8892000000-E	SP	GENERIC STRUCTURE ITEM APPLICATION OF BRIDGE COATING	17,428.9 SF		
0655	8892000000-E	SP	GENERIC STRUCTURE ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT (BRIDGE)	701 SF		
0656	8897000000-N	SP	GENERIC STRUCTURE ITEM CAP END AESTHETIC	2 EA		
0657	8897000000-N	SP	GENERIC STRUCTURE ITEM DRILLED PIER PILOT BORING	3 EA		
0658	8897000000-N	SP	GENERIC STRUCTURE ITEM TPL TESTING	3 EA		

1056/Sep18/Q9524881.393/D3132824152210/E658 **Total Amount Of Bid For Entire Project :**