

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

PROPOSAL

INCLUDES ADDENDUM NO. 1 DATED 08-05-2022

DATE AND TIME OF BID OPENING: **Aug 16, 2022 AT 02:00 PM**

CONTRACT ID C204730
WBS 48320.3.1

FEDERAL-AID NO. CMAQ-1213(039)
COUNTY GASTON
T.I.P NO. C-5606C, C-5703

MILES

ROUTE NO.

LOCATION GASTONIA CITYWIDE SIGNAL SYSTEM UPGRADE AND CCTV CAMERAS.

TYPE OF WORK ITS AND SIGNALS.

NOTICE:

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

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A SIGNAL PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

**PROPOSAL FOR THE CONSTRUCTION OF
CONTRACT No. C204730 IN GASTON COUNTY, NORTH CAROLINA**

Date _____ 20 _____

**DEPARTMENT OF TRANSPORTATION,
RALEIGH, NORTH CAROLINA**

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C204730** has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2018 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **C204730** in **Gaston County**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

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

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

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

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

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



State Contract Officer

DocuSigned by:

Ronald Elton Davenport, Jr.

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08/05/2022

TABLE OF CONTENTS

**COVER SHEET
PROPOSAL SHEET**

PROJECT SPECIAL PROVISIONS

INTERESTED PARTIES LIST: G-1
CONTRACT TIME AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES: G-2
INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES: G-3
INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES: G-4
INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES: G-5
MAJOR CONTRACT ITEMS: G-6
NO SPECIALTY ITEMS: G-6
SCHEDULE OF ESTIMATED COMPLETION PROGRESS:..... G-6
DISADVANTAGED BUSINESS ENTERPRISE: G-6
CERTIFICATION FOR FEDERAL-AID CONTRACTS: G-20
CONTRACTOR'S LICENSE REQUIREMENTS: G-21
RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:..... G-21
USE OF UNMANNED AIRCRAFT SYSTEM (UAS): G-21
EQUIPMENT IDLING GUIDELINES:..... G-22
U.S. DEPARTMENT OF TRANSPORTATION HOTLINE: G-22
CARGO PREFERENCE ACT: G-23
COOPERATION BETWEEN CONTRACTORS:..... G-23
ELECTRONIC BIDDING:..... G-24
AWARD LIMITS: G-24
NOTE TO CONTRACTOR: G-24

ROADWAY R-1

STANDARD SPECIAL PROVISIONS

AVAILABILITY FUNDS – TERMINATION OF CONTRACTS SSP-1
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY SSP-2
ERRATA..... SSP-5
PLANT AND PEST QUARANTINES SSP-7
TITLE VI AND NONDISCRIMINATION SSP-8
MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS SSP-16
REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONST. CONTRACTS SSP-19
ON-THE-JOB TRAINING SSP-28
MINIMUM WAGES SSP-31

UNIT PROJECT SPECIAL PROVISIONS

TRAFFIC CONTROL TC-1
EROSION CONTROL EC-1
ITS..... ITS-1

PROPOSAL ITEM SHEET

ITEM SHEET(S) (TAN SHEETS)

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

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

102

SP1 G02

Revise the *2018 Standard Specifications* as follows:

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

102-3 PROPOSALS AND INTERESTED PARTIES LIST

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

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

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

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

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

CONTRACT TIME AND LIQUIDATED DAMAGES:

(7-1-95) (Rev. 12-18-07)

108

SP1 G10 B

The date of availability for this contract is **November 1, 2022**.

The completion date for this contract is **June 6, 2025**.

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

INTERMEDIATE CONTRACT TIME NUMBER 1 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-85** during the following time restrictions:

DAY AND TIME RESTRICTIONS**Monday thru Sunday, 6:00 AM to 8:00 PM**

In addition, the Contractor shall not close or narrow a lane of traffic on **I-85**, 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 **8:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 PM** the following Tuesday.
3. For **Easter**, between the hours of **6:00 AM** Thursday and **8:00 PM** Monday.
4. For **Memorial Day**, between the hours of **6:00 AM** Friday and **8:00 PM** Tuesday.
5. For **Independence Day**, between the hours of **6:00 AM** the day before Independence Day and **8:00 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 **8:00 PM** the Tuesday after Independence Day.
6. For **Labor Day**, between the hours of **6:00 AM** Friday and **8:00 PM** Tuesday.
7. For **Thanksgiving**, between the hours of **6:00 AM** Tuesday and **8:00 PM** Monday.
8. For **Christmas**, between the hours of **6:00 AM** the Friday before the week of Christmas Day and **8:00 PM** the following Tuesday after the week of Christmas Day.
9. For **any event occurring at the Franklin Urban Sports and Entertainment (FUSE) Complex**, between **two (2) hours before** the start and **two (2) hours after** the end of the event.

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

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

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

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

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 **US 74, US 321, and/or NC 7** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 6:00 AM to 8:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **US 74, US 321, and/or NC 7**, 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 **8:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 PM** the following Tuesday.
3. For **Easter**, between the hours of **6:00 AM** Thursday and **8:00 PM** Monday.
4. For **Memorial Day**, between the hours of **6:00 AM** Friday and **8:00 PM** Tuesday.
5. For **Independence Day**, between the hours of **6:00 AM** the day before Independence Day and **8:00 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 **8:00 PM** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 AM** Friday and **8:00 PM** Tuesday.

7. For **Thanksgiving**, between the hours of **6:00 AM** Tuesday and **8:00 PM** Monday.
8. For **Christmas**, between the hours of **6:00 AM** the Friday before the week of Christmas Day and **8:00 PM** the following Tuesday after the week of Christmas Day.
9. For **any event occurring at the Franklin Urban Sports and Entertainment (FUSE) Complex**, between **two (2) hours before** the start and **two (2) hours after** the end of the event.

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

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

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

The liquidated damages are **One Thousand 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 **Any Road other than I-85, US 74, US 321 and/or NC 7**, during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday, 7:00 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 other than I-85, US 74, US 321 and/or NC 7**, 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 **7:00 AM** December 31st and **7:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **7:00 PM** the following Tuesday.

3. For **Easter**, between the hours of **7:00 AM** Thursday and **7:00 PM** Monday.
4. For **Memorial Day**, between the hours of **7:00 AM** Friday and **7:00 PM** Tuesday.
5. For **Independence Day**, between the hours of **7:00 AM** the day before Independence Day and **7:00 PM** the day after Independence Day.

If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **7:00 AM** the Thursday before Independence Day and **7:00 PM** the Tuesday after Independence Day.
6. For **Labor Day**, between the hours of **7:00 AM** Friday and **7:00 PM** Tuesday.
7. For **Thanksgiving**, between the hours of **7:00 AM** Tuesday and **7:00 PM** Monday.
8. For **Christmas**, between the hours of **7:00 AM** the Friday before the week of Christmas Day and **7:00 PM** the following Tuesday after the week of Christmas Day.
9. For **any event occurring at the Franklin Urban Sports and Entertainment (FUSE) Complex**, between **two (2) hours before** the start and **two (2) hours after** the end of the event.

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

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

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

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

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:

(2-20-07) (Rev. 6-14-22)

108

SP1 G14 H

The Contractor shall complete the work required to **install the new signal system fiber optic cable communications network with minimal disruption to the existing signal system fiber optic cable communications network.**

If the Contractor unintentionally breaks, cuts, and/or damages the existing fiber optic cables, all repairs shall be made, and communications restored within seventy-two (72) consecutive hours. If the Contractor is required to intentionally break and/or cut existing fiber optic cables to facilitate the installation of new fiber optic cables, approval is required by the Engineer, all repairs shall be made, and communications restored within seventy-two (72) consecutive hours.

The time of availability for this intermediate contract time shall be the **time** when the Contractor intentionally or unintentionally disrupts the existing fiber optic cable.

The completion time for this intermediate contract time shall be the **time which is seventy-two (72) consecutive hours after and including the time of availability.**

The liquidated damages are **Two Hundred Fifty Dollars (\$ 250.00)** per hour.

MAJOR CONTRACT ITEMS:

(2-19-02)

104

SP1 G28

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

Line #	Description
55	Controller With Cabinet And Aux File (2070LX, 332 Base Mounted)

NO SPECIALTY ITEMS:

(7-1-95)

108-6

SP1 G34

None of the items included in this contract will be specialty items (see Article 108-6 of the *2018 Standard Specifications*).

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-13-19)

108-2

SP1 G58

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

	<u>Fiscal Year</u>	<u>Progress (% of Dollar Value)</u>
2023	(7/01/22 - 6/30/23)	32% of Total Amount Bid
2024	(7/01/23 - 6/30/24)	43% of Total Amount Bid
2025	(7/01/24 - 6/30/25)	25% of Total Amount Bid

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

DISADVANTAGED BUSINESS ENTERPRISE:

(10-16-07)(Rev. 8-17-21)

102-15(J)

SP1 G61

Description

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

Definitions

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

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

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

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

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

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

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

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

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

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

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

Forms and Websites Referenced in this Provision

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

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

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

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

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

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

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

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

DBE Goal

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

Disadvantaged Business Enterprises **0.0** %

- (A) *If the DBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the contract as set forth above as the DBE goal.
- (B) *If the DBE goal is zero*, the Contractor shall make an effort to recruit and use DBEs during the performance of the contract. Any DBE participation obtained shall be reported to the Department.

Directory of Transportation Firms (Directory)

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

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

Listing of DBE Subcontractors

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

- (A) Electronic Bids

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

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

- (2) Submit the contract line numbers of work to be performed by each DBE firm. When no figures or firms are entered, the bidder will be considered to have no DBE participation.
- (3) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the DBE goal.

(B) Paper Bids

- (1) *If the DBE goal is more than zero,*
 - (a) Bidders, at the time the bid proposal is submitted, shall submit a listing of DBE participation, including the names and addresses on *Listing of DBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the DBE participation for the contract.
 - (b) If bidders have no DBE participation, they shall indicate this on the *Listing of DBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have DBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.
 - (c) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the corresponding goal.
- (2) *If the DBE goal is zero,* entries on the *Listing of DBE Subcontractors* are not required for the zero goal, however any DBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

DBE Prime Contractor

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

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

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

Written Documentation – Letter of Intent

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

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

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

Submission of Good Faith Effort

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

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

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

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

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

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

- (A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- (B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.
 - (1) Where appropriate, break out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.
 - (2) Negotiate with subcontractors to assume part of the responsibility to meet the contract DBE goal when the work to be sublet includes potential for DBE participation (2nd and 3rd tier subcontractors).
- (C) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (D)
 - (1) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.
 - (2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take

a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

- (E) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
- (F) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.
- (G) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs. Contact within 7 days from the bid opening the Business Opportunity and Work Force Development Unit at BOWD@ncdot.gov to give notification of the bidder's inability to get DBE quotes.
- (I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the DBE goal.

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

- (1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the DBE goal.
- (2) The bidders' past performance in meeting the DBE goals.
- (3) The performance of other bidders in meeting the DBE goal. For example, when the apparent successful bidder fails to meet the DBE goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the DBE goal, but meets or exceeds the average DBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

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

Non-Good Faith Appeal

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

Counting DBE Participation Toward Meeting DBE Goal

(A) Participation

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

(B) Joint Checks

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

(C) Subcontracts (Non-Trucking)

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

(D) Joint Venture

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

(E) Suppliers

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

(F) Manufacturers and Regular Dealers

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

- (1) The fees or commissions charged by a DBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.
- (2) With respect to materials or supplies purchased from a DBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) DBE Utilization

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

(B) DBE Utilization in Trucking

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

- (1) The DBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting DBE goals.
- (2) The DBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
- (3) The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
- (4) The DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.
- (5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the DBE and the Contractor will not count towards the DBE contract requirement.
- (6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.
- (7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the DBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

DBE Replacement

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

DBE subcontractor, a non-DBE subcontractor, or with the Contractor's own forces or those of an affiliate.

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

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

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

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

(A) Performance Related Replacement

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

DBEs submitted at the time of bid to cover the same amount of work as the DBE that was terminated.

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

- (1) Copies of written notification to DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.
- (2) Efforts to negotiate with DBEs for specific subbids including, at a minimum:
 - (a) The names, addresses, and telephone numbers of DBEs who were contacted.
 - (b) A description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed.
- (3) A list of reasons why DBE quotes were not accepted.
- (4) Efforts made to assist the DBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

- (1) When a committed DBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.
- (2) When a committed DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Contractor shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the DBE goal requirement. If a DBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).
- (3) Exception: If the DBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement and overall goal.

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

Changes in the Work

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

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

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

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

Reports and Documentation

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

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

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

Reporting Disadvantaged Business Enterprise Participation

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

- (A) Withholding of money due in the next partial pay estimate; or
- (B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

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

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

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

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

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

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

Failure to Meet Contract Requirements

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

CERTIFICATION FOR FEDERAL-AID CONTRACTS:

(3-21-90)

SP1 G85

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

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

agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

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

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

CONTRACTOR'S LICENSE REQUIREMENTS:

(7-1-95)

102-14

SP1 G88

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

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:

(11-17-20)

SP01 G090

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

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):

(8-20-19)

SP1 G092

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

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

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

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

EQUIPMENT IDLING GUIDELINES:

(1-19-21)

107

SP1 G096

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

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

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

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

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:

(11-22-94)

108-5

SP1 G100

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

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

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

CARGO PREFERENCE ACT:

(2-16-16)

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

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

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

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

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

COOPERATION BETWEEN CONTRACTORS:

(7-1-95)

105-7

SP1 G133

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

EB-5743 (Gaston) is located within the project limits; EB-5743 is anticipated for a June 27, 2024 non-DOT (LAP) Letting.

EB-5745 (Gaston) is located within the project limits; EB-5745 is anticipated for a June 25, 2024 Division (DPOC) Letting.

EB-5975 (Gaston) is located within the project limits; EB-5975 is anticipated for a September 27, 2024 non-DOT (LAP) Letting.

EB-5976 (Gaston) is located within the project limits; EB-5976 is anticipated for a June 28, 2024 non-DOT (LAP) Letting.

HO-0002A, etc. (C204556 - US 74 Broadband Infrastructure Project - Asheville to Wilmington) intersects this project at various locations. HO-0002A, etc. is currently under construction and not anticipated to be complete prior to the letting of this project.

U-5965 (Gaston) is located within the project limits; U-5965 is anticipated for a September 17, 2024 Division (DPOC) Letting.

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

ELECTRONIC BIDDING:

(2-19-19)

101, 102, 103

SP1 G140

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

AWARD LIMITS:

(4-19-22)

103

SP1 G141

Revise the *2018 Standard Specifications* as follows:

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

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

NOTE TO CONTRACTOR:

Any concrete waste water must be disposed of in accordance with the Department of Environmental Quality General Permit NCG01.

PROJECT SPECIAL PROVISIONS**ROADWAY****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.

SUPPLEMENTAL SURVEYING:

(4-20-21)

801

SP8 R03

Revise the *2018 Standard Specifications* as follows:

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

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

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY:

(9-15-20)

1000, 1014, 1024

SP10 R01

Revise the *2018 Standard Specifications* as follows:

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

TABLE 1000-1 REQUIREMENTS FOR CONCRETE											
Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum Slump		Cement Content			
		Air-Entrained Concrete		Non-Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
		Units	psi					inch	inch	lb/cy	lb/cy
AA	4500	0.381	0.426	---	---	3.5 ^A	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 - 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5 ^A	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 2.5 ^A hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0 ^A	---	715	---	---	---
Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	658	---	---	---
Flowable Fill excavatable	150 max. (at 56 days)	as needed	as needed	as needed	as needed	---	Flowable	---	---	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	---	Flowable	---	---	100	as needed
Pavement	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---
Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

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

MATERIALS FOR PORTLAND CEMENT CONCRETE:

(9-15-20)

1000, 1024

SP10 R24

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

MATERIAL AND EQUIPMENT STORAGE & PARKING OF PERSONAL VEHICLES:

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

1101

SP11 R03

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

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

WORK ZONE INSTALLER:

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

1101, 1150

SP11 R04

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

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

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

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

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

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

LAW ENFORCEMENT:

(6-21-22)

1190

SP11 R30

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

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

PORTABLE CONSTRUCTION LIGHTING:

4-19-22

1413

SP14 R13

Revise the *2018 Standard Specifications* as follows:

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

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

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

Provide tower lights of sufficient wattage or quantity to provide the minimum average maintained horizontal illuminance over the work area based on the Category of work as shown in Table 1413-

1. For any work not covered in Table 1413-1, provide a minimum average maintained horizontal illuminance of 20.0 footcandles over the work area.

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

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

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

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

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

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08)

Z-2

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

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

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

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11)

Z-3

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

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

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

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

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

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

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

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

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

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

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

Sericea Lespedeza
Oats (seeds)

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

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

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

Common or Sweet Sundangrass

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

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

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

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

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

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

STANDARD SPECIAL PROVISION**ERRATA**

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

Z-4

Revise the *2018 Standard Specifications* as follows:

Division 4

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

Division 6

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

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

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

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

Division 7

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

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

Division 10

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

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

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

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

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

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

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

Division 17

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

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

Directional Drill (1)(1.25”) Linear Foot

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

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

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

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

Z-04a

Within Quarantined Area

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

Originating in a Quarantined County

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

Contact

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

Regulated Articles Include

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

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

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

Z-6

Revise the *2018 Standard Specifications* as follows:

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

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

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

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

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

(a) Compliance with Regulations

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

(b) Nondiscrimination

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

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

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

(d) Information and Reports

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

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

(e) Sanctions for Noncompliance:

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

- (i) Withholding payments to the contractor under the contract until the contractor complies; and/or
- (ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions

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

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

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

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

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

“The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 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. <i>(Executive Order 13166)</i>
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin (<i>Limited English Proficiency</i>)	Place of birth. Citizenship is not a factor. (<i>Discrimination based on language or a person's accent is also covered</i>)	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. <i>Note: Sex under this program does not include sexual orientation.</i>	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

<p>Religion (in the context of employment) <i>(Religion/ Creed in all aspects of any aviation or transit-related construction)</i></p>	<p>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.</p>	<p>Muslim, Christian, Sikh, Hindu, etc.</p>	<p>Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. <i>(49 U.S.C. 5332(b); 49 U.S.C. 47123)</i></p>
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(3) Pertinent Nondiscrimination Authorities

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

- (a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- (b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- (c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- (d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;
- (e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- (f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- (g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- (h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- (i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- (j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with

disproportionately high and adverse human health or environmental effects on minority and low-income populations;

- (k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
 - (l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).
 - (m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).
- (4) **Additional Title VI Assurances**

***The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*

- (a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)
The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

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

(HABENDUM CLAUSE)

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

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

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

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

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

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

- (*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)
- (c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

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

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

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

STANDARD SPECIAL PROVISION**MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS**

Z-7

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

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

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

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

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

**EMPLOYMENT GOALS FOR MINORITY
AND FEMALE PARTICIPATION**

Economic Areas

Area 023 29.7%

Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%

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

Area 025 23.5%

Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%

Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%

Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%

Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%

Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%

Buncombe County
Madison County

Area 030 6.3%

Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%

Currituck County

Area 9200 20.7%

Brunswick County

New Hanover County

Area 2560 24.2%

Cumberland County

Area 6640 22.8%

Durham County

Orange County

Wake County

Area 1300 16.2%

Alamance County

Area 3120 16.4%

Davidson County

Forsyth County

Guilford County

Randolph County

Stokes County

Yadkin County

Area 1520 18.3%

Gaston County

Mecklenburg County

Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION**REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS**

FHWA - 1273 Electronic Version - May 1, 2012

Z-8

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

- A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).
The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.
Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.
Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
 - a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
 - b. The contractor will accept as its operating policy the following statement:

- "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
 3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
 4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
 - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
 - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
 - c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
 5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
 - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
 - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
 6. **Training and Promotion:**
 - a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
 - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
 - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
 - d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.
 7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
 - a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
 - b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

- d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.
8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
- a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
- b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
- a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
- b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
- a. The records kept by the contractor shall document the following:
- (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
- (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
- (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
- b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

- a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
 - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
 - (ii) The classification is utilized in the area by the construction industry; and
 - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
 - (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - (4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
- c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
 - d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
 3. **Payrolls and basic records**
 - a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
 - b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.
 - (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - (i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
 - (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
 - (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

- (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.
 - (4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
 - c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
- 4. Apprentices and trainees**
- a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
 - b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
 - c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
 - d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.
5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
 6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
 7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
 8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
 9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
 10. **Certification of eligibility.**
 - a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

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

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
 - a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees

from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
 - (2) the prime contractor remains responsible for the quality of the work of the leased employees;
 - (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
 - (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.
- b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
 3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
 4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
 5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

- a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
 - (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
 - (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
 - (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of

Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

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

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

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

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

Z-10

Description

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

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

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

Minorities and Women

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

Assigning Training Goals

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

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

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

Z-088

Date: February 25, 2022

General Decision Number: NC20220088 02/25/2022 NC88

Superseded General Decision Numbers: NC20210088

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

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

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

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

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

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

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

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022

SUNC2014-003 11/14/2014

	Rates	Fringes
BLASTER	18.64	
CARPENTER	13.68 **	.05
CEMENT MASON/CONCRETE FINISHER	13.93 **	
ELECTRICIAN		
Electrician	18.79	2.72
Telecommunications Technician	15.19	1.25
IRONWORKER	13.30 **	
LABORER		
Asphalt Raker and Spreader	12.78 **	
Asphalt Screed/Jackman	14.50 **	
Carpenter Tender	12.51 **	.27
Cement Mason/Concrete Finisher Tender	11.04 **	
Common or General	10.40 **	.01
Guardrail/Fence Installer	13.22 **	
Pipelayer	12.43 **	
Traffic Signal/Lighting Installer	15.65	.24
PAINTER		
Bridge	23.77	
POWER EQUIPMENT OPERATORS		
Asphalt Broom Tractor	10.00 **	
Bulldozer Fine	16.13	
Bulldozer Rough	14.36 **	
Concrete Grinder/Groover	17.92	
Crane Boom Trucks	18.19	
Crane Other	19.83	
Crane Rough/All-Terrain	19.10	
Drill Operator Rock	14.28 **	
Drill Operator Structure	20.89	
Excavator Fine	16.95	
Excavator Rough	13.63 **	
Grader/Blade Fine	19.84	
Grader/Blade Rough	15.47	
Loader 2 Cubic Yards or Less	13.31 **	
Loader Greater Than 2 Cubic Yards	16.19	
Material Transfer Vehicle (Shuttle Buggy)	15.44	
Mechanic	17.51	
Milling Machine	15.22	
Off-Road Hauler/Water Tanker	11.83 **	
Oiler/Greaser	14.16 **	
Pavement Marking Equipment	12.05 **	
Paver Asphalt	15.97	
Paver Concrete	18.20	
Roller Asphalt Breakdown	12.79 **	

	Rates	Fringes
Roller Asphalt Finish	13.76 **	
Roller Other	12.08 **	
Scraper Finish	12.65 **	
Scraper Rough	11.50 **	
Slip Form Machine	19.60	
Tack Truck/Distributor Operator	14.82 **	
TRUCK DRIVER		
GVWR of 26,000 Lbs or Less	11.45 **	
GVWR of 26,001 Lbs or Greater	13.57 **	.03

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

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

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the David-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

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

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

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

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

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

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

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

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

END OF GENERAL DECISION

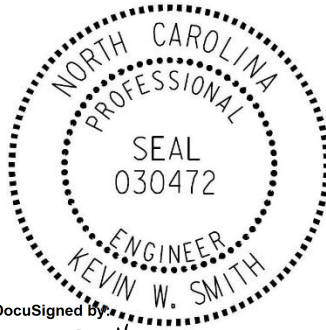
TC-1

C-5606C / C-5703

Gaston County

WORK ZONE TRAFFIC CONTROL Project Special Provisions Table of Contents

Special Provision	Page
ADA Compliant Pedestrian Traffic Control Devices	TC-2
Temporary Traffic Control	TC-3



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Kevin Smith 7/8/2022
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TC-2

C-5606C / C-5703

Gaston County

ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES:

(10/31/2017) (Rev. 6/3/2022)

Description

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

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.

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

TC-3

C-5606C / C-5703

Gaston County

TEMPORARY TRAFFIC CONTROL

(9-01-2021)

General Requirements

Maintain traffic on all roads in accordance with Divisions 10, 11 and 12 of the *2018 Standard Specifications* and the following provisions:

Install Work Zone Advance Warning Signs when work is within 40 ft. from the edge of the travel lane in accordance with Standard Drawing No. 1101.01 of the *2018 Roadway Standard Drawings* prior to beginning any other work. If signs are installed more than 3 calendar days prior to the beginning of work, cover the signs until the work begins. Install each work zone advance warning sign separately and not on the same post or stand with any other sign.

When personnel and/or equipment are working within 15 ft. of an open travel lane, close the nearest open shoulder using Roadway Standard Drawing No. 1101.04 unless the work area is protected by barrier or guardrail or a lane closure is installed.

When personnel and/or equipment are working on the shoulder adjacent to an undivided facility and within 5 ft. of an open travel lane, close the nearest open travel lane using Roadway Standard Drawing No. 1101.02 of the *2018 Roadway Standard Drawings* unless the work area is protected by barrier or guardrail.

When personnel and/or equipment are working on the shoulder adjacent to a divided facility and within 10 ft. of an open travel lane, close the nearest open travel lane using Roadway Standard Drawing No. 1101.02 of the *2018 Roadway Standard Drawings*, unless the work area is protected by barrier or guardrail.

When personnel and/or equipment are working within a lane of travel of an undivided or divided facility, close the lane using Roadway Standard Drawing No. 1101.02 of the *2018 Roadway Standard Drawings* or as directed by the Engineer. Conduct the work so that all personnel and/or equipment remain within the closed travel lane. Perform work only when weather and visibility conditions allow safe operations as directed by the Engineer.

Do not work simultaneously within 15 ft. on both sides of an open travel way, ramp, or loop within the same location, unless protected with guardrail or barrier.

Remove lane closure devices from the lane when work is not being performed behind the lane closure or when a lane closure is no longer needed or as directed by the Engineer.

TC-4

C-5606C / C-5703

Gaston County

Temporary Traffic Control (TTC)

Refer to Standard Drawing No. 1101.02, 1101.03, 1101.04, 1101.11, 1110.01, 1110.02, 1115.01, 1130.01, 1135.01, 1145.01, 1150.01, 1165.01, and 1180.01 of the *2018 Roadway Standard Drawings* when closing a lane of travel or shoulder in the work zone.

Notify the Engineer (30) calendar days prior to any traffic pattern alteration.

Ensure all necessary signing is in place prior to altering any traffic pattern.

When lane closures are not in effect, space channelizing devices in work areas no greater in feet than twice the posted speed limit (MPH), except 10 ft. on-center in radii, and 3 ft. off the edge of an open travelway. Refer to *2018 Standard Specifications* Sections 1130 (Drums), 1135 (Cones), and 1180 (Skinny Drums) for additional requirements.

Place additional sets of three channelizing devices (Drums, Cones, or Skinny Drums) perpendicular to the edge of travelway on 100 to 500 ft. centers, as directed by the Engineer, when unopened lanes are closed to traffic.

Place Type III Barricades with “ROAD CLOSED” sign R11-2 attached, of sufficient length to close the entire roadway.

Install black on orange “DIP” (W8-2) and/or “BUMP” (W8-1) signs in advance of the uneven area in accordance with Roadway Standard Drawing 1101.11, or as directed by the Engineer.

Law Enforcement

Use uniformed Law Enforcement officers to control traffic at signalized intersections when the temporary traffic pattern cannot be controlled by the signal’s normal operation.

Project Requirements

Failure to comply with the following requirements will result in a suspension of all other operations:

1. Prior to beginning work, the Contractor shall submit a written construction sequence for traffic control and construction lighting to the Engineer at the first pre-construction meeting and the sequence must be approved before closing a lane of traffic.

TC-5

C-5606C / C-5703

Gaston County

2. Obtain written approval of the Engineer before working in more than one location or setting up additional lane closures. The maximum length of any one lane closure is 1 mile unless otherwise directed by the Engineer.
3. If Lane Closure Restrictions apply, see Special Provision, “Intermediate Contract Times and Liquidated Damages”.
4. Contractor shall conduct operations in an order such that water does not accumulate.
5. The Contractor on this and any adjacent projects, or subcontractors working within this project shall coordinate lane closure location, type, and direction with the Engineer to best maintain lane continuity through the limits of this and adjacent projects.
6. Operate paving equipment and conduct paving operations in the same direction as the flow of traffic unless the operation is protected by barrier or guardrail or as directed by the Engineer. Maintain vehicular access in accordance with Section 1101-05 of the *2018 Standard Specifications*.
7. Provide appropriate construction lighting in accordance with Section 1413 of the *2018 Standard Specifications*.

Measurement and Payment

Law Enforcement will be measured and paid in accordance with Section 1190-3.

Temporary Traffic Control (Lump Sum) shall include but not be limited to providing Signs (portable, stationary, and/or barricade mounted), including detour signing, Truck Mounted Attenuators (TMA), Portable Changeable Message Signs (PCMS), Flashing Arrow Boards (FAB), Pilot Vehicle, Flaggers, Cones, Skinny Drums and Drums as shown in the applicable Roadway Standard Drawings and all labor, tools, equipment and incidentals necessary to furnish, install, maintain and remove traffic control devices when no longer required.

Temporary Traffic Control (Lump Sum) does not include Portable Concrete Barrier, Waterfilled Barrier, Temporary Crash Cushions, Digital Speed Limit Signs, Sequential Flashing Lights, or Presence Lights as these devices are beyond the scope of this provision.

TC-6

C-5606C / C-5703

Gaston County

Payment for *Temporary Traffic Control (Lump Sum)* will be made on the following schedule:

- (A) 70% of the unit bid price upon starting the project
- (B) 20% of the unit bid price when the project is 50% complete
- (C) 10% of the unit bid price when the project is 100% complete and all traffic control devices have been removed from the project.

Payment will be made under:

Pay Item

Temporary Traffic Control

Pay Unit

Lump Sum

STABILIZATION REQUIREMENTS:

(3-11-16) (Rev. 4-30-19)

S-3

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING:**(West)**

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

Shoulder and Median Areas

August 1 - June 1

20# Kentucky Bluegrass
 75# Hard Fescue
 25# Rye Grain
 500# Fertilizer
 4000# Limestone

May 1 - September 1

20# Kentucky Bluegrass
 75# Hard Fescue
 10# German or Browntop Millet
 500# Fertilizer
 4000# Limestone

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 - June 1

100# Tall Fescue
 15# Kentucky Bluegrass
 30# Hard Fescue
 25# Rye Grain
 500# Fertilizer
 4000# Limestone

May 1 - September 1

100# Tall Fescue
 15# Kentucky Bluegrass
 30# Hard Fescue
 10# German or Browntop Millet
 500# Fertilizer
 4000# Limestone

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Scorpion
2 nd Millennium	Essential	Kalahari	Serengeti
3 rd Millennium	Evergreen 2		Shelby
Apache III	Falcon IV	Kitty Hawk 2000	Sheridan
Avenger	Falcon NG	Legitimate	Signia
Barlexas	Falcon V	Lexington	Silver Hawk
Barlexas II	Faith	LSD	Sliverstar
Bar Fa	Fat Cat	Magellan	Shenandoah Elite
Barrera	Festnova	Matador	Sidewinder
Barrington	Fidelity	Millennium SRP	Skyline
Barrobusto	Finelawn Elite	Monet	Solara
Barvado	Finelawn Xpress	Mustang 4	Southern Choice II
Biltmore	Finesse II	Ninja 2	Speedway
Bingo	Firebird	Ol' Glory	Spyder LS
Bizem	Firecracker LS	Olympic Gold	Sunset Gold
Blackwatch	Fireza	Padre	Taccoa
Blade Runner II	Five Point	Patagonia	Tanzania
Bonsai	Focus	Pedigree	Trio
Braveheart	Forte	Picasso	Tahoe II
Bravo	Garrison	Piedmont	Talladega
Bullseye	Gazelle II	Plantation	Tarheel
Cannavaro	Gold Medallion	Proseeds 5301	Terrano
Catalyst	Grande 3	Prospect	Titan ltd
Cayenne	Greenbrooks	Pure Gold	Titanium LS
Cessane Rz	Greenkeeper	Quest	Tracer
Chipper	Gremlin	Raptor II	Traverse SRP
Cochise IV	Greystone	Rebel Exeda	Tulsa Time
Constitution	Guardian 21	Rebel Sentry	Turbo
Corgi	Guardian 41	Rebel IV	Turbo RZ
Corona	Hemi	Regiment II	Tuxedo RZ
Coyote	Honky Tonk	Regenerate	Ultimate
Darlington	Hot Rod	Rendition	Venture
Davinci	Hunter	Rhambler 2 SRP	Umbrella
Desire	Inferno	Rembrandt	Van Gogh
Dominion	Innovator	Reunion	Watchdog
Dynamic	Integrity	Riverside	Wolfpack II
Dynasty	Jaguar 3	RNP	Xtremegreen
Endeavor	Jamboree	Rocket	

Approved Kentucky Bluegrass Cultivars:

4-Season	Blue Velvet	Gladstone	Quantum Leap
Alexa II	Blueberry	Granite	Rambo
America	Boomerang	Hampton	Rhapsody
Apollo	Brilliant	Harmonie	Rhythm
Arcadia	Cabernet	Impact	Rita
Aries	Champagne	Jefferson	Royce
Armada	Champlain	Juliet	Rubicon
Arrow	Chicago II	Jump Start	Rugby II
Arrowhead	Corsair	Keeneland	Shiraz
Aura	Courtyard	Langara	Showcase
Avid	Delight	Liberator	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mercury	Sonoma
Bandera	Eagleton	Midnight	Sorbonne
Barduke	Emblem	Midnight II	Starburst
Barnique	Empire	Moon Shadow	Sudden Impact
Baroness	Envicta	Moonlight SLT	Total Eclipse
Barrister	Everest	Mystere	Touche
Barvette HGT	Everglade	Nu Destiny	Tsunami
Bedazzled	Excursion	NuChicago	Unique
Belissimo	Freedom II	NuGlade	Valor
Bewitched	Freedom III	Odyssey	Voyager II
Beyond	Front Page	Perfection	Washington
Blacksburg II	Futurity	Pinot	Zinfandel
Blackstone	Gaelic	Princeton 105	
Blue Note	Ginney II	Prosperity	

Approved Hard Fescue Cultivars:

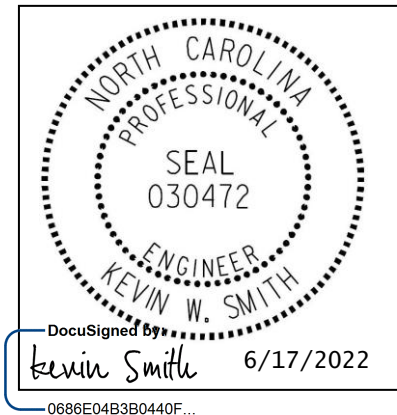
Aurora II	Eureka II	Oxford	Scaldis II
Aurora Gold	Firefly	Reliant II	Spartan II
Berkshire	Granite	Reliant IV	Stonehenge
Bighorn GT	Heron	Rescue 911	
Chariot	Nordic	Rhino	

On cut and fill slopes 2:1 or steeper add 20# Sericea Lespedeza January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

C-5606C / C-5703
INTELLIGENT TRANSPORTATION SYSTEMS
TRAFFIC SIGNAL SYSTEM
UPGRADE AND EXPANSION

PROJECT SPECIAL PROVISIONS
(Version 18.6)



Not Valid Unless Signed

Contents

1. GENERAL REQUIREMENTS..... 10

1.1. DESCRIPTION 10

 A. *General*..... 10

 B. *Scope* 10

1.2. MATERIAL 11

 A. *General*..... 11

 B. *Observation Period* 11

 C. *Performance of Warranty Repair and Maintenance* 11

1.3. CONSTRUCTION METHODS 11

 A. *General*..... 11

 B. *Removal of Existing Equipment and Material* 12

 C. *Requirements for Historic Areas*..... 12

 D. *Related Projects* 13

 E. *Sequence of Construction*..... 13

1.4. REQUIREMENTS FOR CABLES CROSSING RAILROADS 15

 A. *Railroad Crossings*..... 15

 B. *Insurance Requirements* 16

 C. *Flagging Protection or Watchman Service* 17

 D. *Delays Caused by Operations of Others* 17

 E. *Time Extensions*..... 17

 F. *Cooperation with Others*..... 17

 G. *Authority of Railroad Engineer*..... 17

 H. *Interference with Railroad Operations* 17

 I. *Storage of Materials*..... 18

 J. *Completion and Acceptance of Work* 18

1.5. MEASUREMENT AND PAYMENT 18

2. MOBILIZATION 19

2.1. DESCRIPTION 19

2.2. MEASUREMENT AND PAYMENT 19

3. CONCRETE SIDEWALKS.....	20
3.1. DESCRIPTION.....	20
3.2. MATERIAL.....	20
3.3. CONSTRUCTION METHOD.....	20
3.4. MEASUREMENT AND PAYMENT.....	20
4. SIGNAL HEADS	21
4.1. DESCRIPTION.....	21
4.2. MATERIAL.....	21
A. <i>General:</i>	21
B. <i>Vehicle Signal Heads:</i>	23
C. <i>Pedestrian Signal Heads:</i>	25
D. <i>Signal Cable:</i>	27
E. <i>Lowers:</i>	28
4.3. CONSTRUCTION METHODS.....	28
4.4. MEASUREMENT AND PAYMENT.....	28
5. BACKPLATES	29
5.1. DESCRIPTION.....	29
5.2. MATERIAL.....	29
5.3. CONSTRUCTION METHODS.....	29
5.4. MEASUREMENT AND PAYMENT.....	29
6. SIGNS INSTALLED FOR SIGNALS	30
6.1. DESCRIPTION.....	30
6.2. MATERIAL.....	30
6.3. CONSTRUCTION METHODS.....	30
6.4. MEASUREMENT AND PAYMENT.....	30
7. PEDESTALS	31
7.1. DESCRIPTION.....	31
7.2. MATERIAL.....	31
7.3. CONSTRUCTION METHODS.....	31
7.4. MEASUREMENT AND PAYMENT.....	31
8. MESSENGER CABLE.....	32
8.1. DESCRIPTION.....	32
8.2. MATERIAL.....	32
8.3. CONSTRUCTION METHODS.....	32
8.4. MEASUREMENT AND PAYMENT.....	32
9. UNDERGROUND CABLE INSTALLATION.....	33
9.1. DESCRIPTION.....	33
9.2. MATERIAL.....	33
9.3. CONSTRUCTION METHODS.....	33
9.4. MEASUREMENT AND PAYMENT.....	33
10. JUNCTION BOXES	35
10.1. DESCRIPTION.....	35

10.2. MATERIAL	35
10.3. CONSTRUCTION METHODS	35
10.4. MEASUREMENT AND PAYMENT	35
11. WOOD POLES	36
11.1. DESCRIPTION	36
11.2. MATERIAL	36
A. <i>General</i>	36
B. <i>CCTV Wood Pole</i>	36
C. <i>Remove and Replace Existing Traffic Signal Span Pole</i>	36
11.3. CONSTRUCTION METHOD	36
11.4. MEASUREMENT AND PAYMENT	37
12. GUY ASSEMBLIES	38
12.1. DESCRIPTION	38
12.2. MATERIAL	38
12.3. CONSTRUCTION METHODS	38
12.4. MEASUREMENT AND PAYMENT	38
13. RISER ASSEMBLIES	39
13.1. DESCRIPTION	39
13.2. MATERIAL	39
13.3. CONSTRUCTION METHOD	39
13.4. MEASUREMENT AND PAYMENT	39
14. INDUCTIVE DETECTION LOOPS	40
14.1. DESCRIPTION	40
14.2. MATERIAL	40
14.3. CONSTRUCTION METHOD	40
14.4. MEASUREMENT AND PAYMENT	40
15. LEAD-IN CABLE	41
15.1. DESCRIPTION	41
15.2. MATERIAL	41
15.3. CONSTRUCTION METHOD	41
15.4. MEASUREMENT AND PAYMENT	41
16. FIBER OPTIC CABLE	42
16.1. DESCRIPTION	42
16.2. MATERIAL	42
16.3. CONSTRUCTION METHODS	42
A. <i>General</i>	42
B. <i>Underground Installation</i>	42
C. <i>Cable Protector</i>	43
16.4. MEASUREMENT AND PAYMENT	43
17. FIBER OPTIC SPLICE CENTERS	44
17.1. DESCRIPTION	44
17.2. MATERIALS	44

17.3. CONSTRUCTION METHODS	44
17.4. MEASUREMENT AND PAYMENT	44
18. DELINEATOR MARKERS	46
18.1. DESCRIPTION	46
18.2. MATERIALS	46
18.3. CONSTRUCTION METHODS	46
18.4. MEASUREMENT AND PAYMENT	46
19. JUNCTION BOX MARKERS	47
19.1. DESCRIPTION	47
19.2. MATERIALS	47
A. <i>Junction Box Markers</i>	47
19.3. CONSTRUCTION METHODS	48
A. <i>Junction Box Markers</i>	48
19.4. MEASUREMENT AND PAYMENT	48
20. POWER OVER ETHERNET (POE) CABLE.....	49
20.1. DESCRIPTION	49
20.2. MATERIAL	49
20.3. CONSTRUCTION METHODS	50
20.4. MEASUREMENT AND PAYMENT	50
21. REMOVE EXISTING COMMUNICATIONS CABLE.....	51
21.1. DESCRIPTION	51
21.2. CONSTRUCTION METHODS	51
21.3. MEASUREMENT AND PAYMENT	51
22. CABLE TRANSFERS.....	52
22.1. DESCRIPTION	52
22.2. CONSTRUCTION METHODS	52
22.3. MEASUREMENT AND PAYMENT	52
23. WIRELESS ETHERNET RADIO SYSTEM.....	53
23.1. DESCRIPTION	53
23.2. MATERIALS	53
A. <i>Field Set-up Software</i>	53
B. <i>Central Management Software</i>	53
C. <i>2.4 GHz Broadband (Ethernet) Dual Radio (Integrated Panel)</i>	54
D. <i>5.8 GHz Broadband (Ethernet) Dual Radio (Integrated Panel)</i>	54
E. <i>Antenna Mounting Hardware Kit</i>	54
23.3. CONSTRUCTION METHODS	54
23.4. MEASUREMENT AND PAYMENT	55
24. SIGNAL CABINET FOUNDATIONS	56
24.1. DESCRIPTION	56
24.2. MATERIAL	56
24.3. CONSTRUCTION METHODS	56
24.4. MEASUREMENT AND PAYMENT	56

25. CONTROLLERS WITH CABINETS	57
25.1. DESCRIPTION	57
25.2. MATERIAL	57
A. <i>General</i>	57
B. <i>Type 2070LX Controllers</i>	57
C. <i>General Cabinets</i>	57
D. <i>Type 170E Cabinets</i>	58
E. <i>Type 170 Detector Sensor Units</i>	82
25.3. CONSTRUCTION METHODS	82
A. <i>General</i>	82
B. <i>Workshop</i>	82
C. <i>Railroad Preemption</i>	83
D. <i>Vehicle Detection</i>	83
E. <i>Audible Pedestrian Signals</i>	83
25.4. MEASUREMENT AND PAYMENT	83
26. VEHICLE PREEMPTION SYSTEM.....	84
26.1. DESCRIPTION	84
26.2. MATERIAL	84
A. <i>General</i>	84
B. <i>System Functionality</i>	84
C. <i>Intersection Equipment</i>	84
D. <i>Test Vehicle Equipment</i>	84
E. <i>Software</i>	84
26.3. CONSTRUCTION METHODS	85
A. <i>General</i>	85
B. <i>Intersection Equipment</i>	85
C. <i>Test Vehicle Equipment</i>	85
D. <i>Software</i>	85
26.4. MEASUREMENT AND PAYMENT	85
27. MODIFY CABINET FOUNDATIONS	86
27.1. DESCRIPTION	86
27.2. MATERIAL	86
27.3. CONSTRUCTION METHODS	86
27.4. MEASUREMENT AND PAYMENT	86
28. CABINET BASE ADAPTER/EXTENDER	87
28.1. DESCRIPTION	87
28.2. MATERIAL	87
A. <i>General</i>	87
B. <i>Integrated Base Adapter</i>	87
28.3. CONSTRUCTION METHODS	87
28.4. MEASUREMENT AND PAYMENT	87
29. ELECTRICAL SERVICE	89
29.1. DESCRIPTION	89
29.2. MATERIAL	89

A.	<i>Meter Base/Disconnect Combination Panel</i>	89
B.	<i>Equipment Cabinet Disconnect</i>	90
C.	<i>3-Wire Copper Service Entrance Conductors</i>	90
D.	<i>3-Wire Copper Feeder Conductors</i>	90
E.	<i>Grounding System</i>	91
29.3.	CONSTRUCTION METHODS	91
A.	<i>General</i>	91
B.	<i>Meter Base/Disconnect Combination Panel</i>	91
C.	<i>Electrical Service Disconnect</i>	91
D.	<i>3-Wire Copper Service Entrance Conductors</i>	91
E.	<i>3-Wire Copper Feeder Conductors</i>	91
F.	<i>Grounding System</i>	91
29.4.	MEASUREMENT AND PAYMENT	91
30.	DIGITAL CCTV CAMERA ASSEMBLY	93
30.1.	DESCRIPTION	93
30.2.	MATERIALS	93
A.	<i>General</i>	93
B.	<i>Camera and Lens</i>	93
C.	<i>Camera Housing</i>	94
D.	<i>Pan and Tilt Unit</i>	95
E.	<i>Video Ethernet Encoder</i>	95
F.	<i>Control Receiver/Driver</i>	95
G.	<i>Electrical</i>	96
H.	<i>CCTV Camera Attachment to Pole</i>	96
I.	<i>Riser</i>	96
J.	<i>Data Line Surge Suppression</i>	96
K.	<i>POE Injector</i>	97
30.3.	CONSTRUCTION METHODS	97
A.	<i>General</i>	97
B.	<i>Electrical and Mechanical Requirements</i>	98
30.4.	GENERAL TEST PROCEDURE	98
30.5.	COMPATIBILITY TESTS	99
A.	<i>CCTV System</i>	99
30.6.	OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)	99
A.	<i>CCTV System</i>	99
30.7.	MEASUREMENT AND PAYMENT	100
31.	CCTV FIELD EQUIPMENT CABINET	102
31.1.	DESCRIPTION	102
31.2.	MATERIALS	102
A.	<i>Shelf Drawer</i>	102
B.	<i>Cabinet Light</i>	102
C.	<i>Surge Protection for System Equipment</i>	102
31.3.	CONSTRUCTION METHODS	105
A.	<i>General</i>	105
31.4.	MEASUREMENT AND PAYMENT	105

32. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM.....	106
32.1. DESCRIPTION.....	106
32.2. MATERIALS	106
A. <i>General</i>	106
B. <i>Wood Pole</i>	106
C. <i>Metal Pole</i>	106
D. <i>Copper Lightning Conductor and Ground Rods</i>	106
32.3. CONSTRUCTION METHODS	107
A. <i>Wood Pole</i>	107
B. <i>Metal Pole</i>	107
C. <i>Copper Lightning Conductor and Ground Rods</i>	107
32.4. MEASUREMENT AND PAYMENT	108
33. UPGRADE CCTV LIGHTNING PROTECTION.....	109
33.1. DESCRIPTION.....	109
33.2. MATERIAL	109
A. <i>General</i>	109
33.3. CONSTRUCTION METHODS.....	109
A. <i>General</i>	109
33.4. MEASUREMENT AND PAYMENT	109
34. REMOVE EXISTING EQUIPMENT.....	110
34.1. DESCRIPTION	110
34.2. CONSTRUCTION METHODS	110
A. <i>Remove Existing CCTV Assembly</i>	110
B. <i>Remove Existing CCTV Cabinet</i>	110
C. <i>Remove Existing Terminal Splice Cabinet</i>	110
34.3. MEASUREMENT AND PAYMENT	110
35. LOCAL AREA NETWORK EQUIPMENT.....	112
35.1. DESCRIPTION.....	112
35.2. MATERIAL.....	112
B. <i>General</i>	112
C. <i>Network Performance Management Software</i>	112
D. <i>SFP Modules</i>	113
E. <i>Field Ethernet Switch</i>	113
F. <i>Core Ethernet Switch</i>	115
G. <i>VPN Firewall</i>	118
H. <i>Cable</i>	118
35.3. CONSTRUCTION METHODS	119
A. <i>General</i>	119
B. <i>Requirements Definition Document</i>	119
C. <i>LAN Integration</i>	119
D. <i>Network Performance Management Software</i>	119
E. <i>Field Ethernet Switch</i>	120
F. <i>Core Ethernet Switch</i>	120
G. <i>Cellular Modem and Antenna</i>	120
H. <i>VPN Firewall</i>	120

35.4. MEASUREMENT AND PAYMENT	120
36. SYSTEM SOFTWARE	122
36.1. DESCRIPTION	122
36.2. MATERIAL	122
A. <i>General</i>	122
B. <i>Distributed Processing System Software</i>	122
C. <i>Enterprise Video Management System Software</i>	124
36.3. CONSTRUCTION METHODS	126
A. <i>General</i>	126
B. <i>Local Controller Software</i>	126
C. <i>Distributed Processing System Software</i>	126
D. <i>Enterprise Video Management System Software</i>	127
36.4. MEASUREMENT AND PAYMENT	127
37. COMPUTER HARDWARE	129
37.1. DESCRIPTION	129
37.2. MATERIAL	129
A. <i>General</i>	129
B. <i>Distributed Processing Signal System Server</i>	129
C. <i>Distributed Processing Signal System Communications Server</i>	130
D. <i>Enterprise Video Management System Server</i>	130
E. <i>Vehicle Preemption System Server</i>	131
F. <i>Remote Access Server</i>	131
G. <i>Backup Storage Server</i>	131
H. <i>Computer Workstations</i>	132
I. <i>Laptop Computers</i>	132
J. <i>Surge Suppression Strips</i>	133
K. <i>Equipment Rack Cabinet</i>	134
L. <i>Uninterruptible Power Supply</i>	134
37.3. CONSTRUCTION METHODS	135
A. <i>General</i>	135
B. <i>Distributed Processing Signal Server</i>	135
C. <i>Signal System Communications Server</i>	135
D. <i>Enterprise Video Management System Server</i>	135
E. <i>Vehicle Preemption System Server</i>	135
F. <i>Remote Access Server</i>	135
G. <i>Backup Storage Server</i>	136
H. <i>Computer Workstations</i>	136
I. <i>Laptop Computers</i>	136
J. <i>Surge Suppression Strips</i>	136
K. <i>Rack Cabinets</i>	136
L. <i>Uninterruptible Power Supply</i>	136
M. <i>Computer Hardware Integration</i>	136
37.4. MEASUREMENT AND PAYMENT	137
38. CCTV VIDEO MONITORS	138
38.1. DESCRIPTION	138

38.2. MATERIAL	138
A. <i>General</i>	138
B. <i>Video Wall System</i>	138
38.3. CONSTRUCTION METHODS	140
A. <i>General</i>	140
B. <i>Video Wall System</i>	140
38.4. MEASUREMENT AND PAYMENT	140
39. BUILDING MODIFICATIONS AND FIBER OPTIC CABLE TERMINATION	142
39.1. DESCRIPTION	142
39.2. MATERIALS	142
A. <i>General</i>	142
B. <i>Central Interconnect Center</i>	142
39.3. CONSTRUCTION METHODS	143
A. <i>General</i>	143
B. <i>MOC Modifications</i>	143
39.4. MEASUREMENT AND PAYMENT	144
40. SYSTEM SUPPORT EQUIPMENT	145
40.1. DESCRIPTION	145
40.2. MATERIAL	145
A. <i>Signal System Support Equipment</i>	145
B. <i>Test Cabinet/Controller</i>	145
C. <i>Conflict Monitor Tester with Notebook Computer</i>	146
D. <i>Communication System Support Equipment</i>	146
E. <i>CCTV System Support Equipment</i>	147
40.3. MEASUREMENT AND PAYMENT	147
41. TRAINING	149
41.1. DESCRIPTION	149
41.2. MATERIAL	149
A. <i>General</i>	149
B. <i>Subject Areas</i>	150
C. <i>Required Content and Format</i>	150
41.3. MEASUREMENT AND PAYMENT	155
42. TESTING AND ACCEPTANCE	156
42.1. DESCRIPTION	156
42.2. CABLE TESTS	156
42.3. EQUIPMENT TESTS	156
42.4. TRAFFIC SIGNAL SUBSYSTEM	156
42.5. INTERSECTION OPERATIONAL TESTS	156
42.6. SYSTEM OPERATIONAL TEST	157
42.7. OBSERVATION PERIOD	158
42.8. FINAL ACCEPTANCE	159
42.9. MEASUREMENT AND PAYMENT	159

1. GENERAL REQUIREMENTS

1.1.DESCRPTION

A. General

Conform to these Project Special Provisions, Project Plans, the Signals and ITS Project Special Provisions (current version 18.1), and the *2018 Standard Specifications for Roads and Structures* (also referred to hereinafter as the “Standard Specifications”). The current edition of these specifications and publications in effect on the date of advertisement will apply.

In the event of a conflict between these Project Special Provisions and the Standard Specifications or the Signals and ITS Project Special Provisions, these Project Special Provisions govern.

In the event of a conflict between the Signals and ITS Project Special Provisions and the Standard Specifications, the Signals and ITS Project Special Provisions govern.

B. Scope

Furnish, install, and fully integrate new and existing traffic signal controllers and cabinets, new and existing fiber optic communications cable, new and existing wireless radio communications links, new and existing closed-circuit television camera units, and new and existing central hardware and software for the upgrade and expansion of the existing central distributed processing traffic signal system for the City of Gastonia in North Carolina.

Furnish, install, and fully integrate approximately 144 new 2070LX traffic signal controllers in new model 332 and 336 style cabinets to replace existing controllers and cabinets at locations shown in the Plans.

Furnish, install, and fully integrate a new GPS-based emergency vehicle preemptions (EVP) system at approximately 50 locations shown in the Plans.

Furnish, install, and fully integrate a new closed-circuit television (CCTV) system. Install 29 new digital IP cameras by establishing new installations or replacing existing analog CCTV cameras at locations shown in the Plans. Integrate 11 existing digital IP cameras at locations shown in the Plans.

Furnish and install new fiber optic cables in new underground conduit, existing underground conduit, or attached to existing joint-use utility poles as shown in the Plans.

Furnish, install, and fully integrate a new local area network (LAN) utilizing Ethernet communications over fiber optic cables to connect field ethernet switches at signal cabinets and a core ethernet switch at the TOC.

Furnish, install, and fully integrate new wireless Ethernet radio systems to replace existing serial radio systems at five (5) locations shown in the Plans.

Furnish, install, and fully integrate new dial-up cellular modems at one (1) location shown in the Plans.

Furnish, install, and fully integrate new head-end terminations of the communications network at the modified Traffic Operations Center (TOC) in the City of Gastonia Municipal Operations Center (MOC) located at 1300 North Broad Street in Gastonia.

1.2.MATERIAL

A. General

Comply with Section 1098-1 of the Standard Specifications in addition to the following special provisions.

B. Observation Period

Prior to final acceptance, all Contractor-furnished equipment and software shall successfully complete a 60-day Observation Period.

The 60-day Observation Period is considered to be part of the work included in the total contract time and must be completed prior to final acceptance of the project.

Final acceptance will occur following the successful completion of the 60-day Observation Period and after all documentation requirements have been fully satisfied.

Refer to the Testing and Acceptance section of these Project Special Provisions for additional requirements.

C. Performance of Warranty Repair and Maintenance

Provide authorization to the City of Gastonia and the North Carolina Department of Transportation to perform all warranty repairs after project acceptance. The decision to perform warranty work at a City or Department facility by City or Department technicians or to have warranty work performed by the vendor shall be at the discretion of the City of Gastonia or the North Carolina Department of Transportation. Provide any training required by the manufacturer to authorize the City of Gastonia and the North Carolina Department of Transportation to perform warranty work and ensure manufacturer will furnish parts to the City of Gastonia and the North Carolina Department of Transportation for all warranty repairs at no cost to the City or Department. In addition, ensure the manufacturer agrees to provide prompt technical support to the City of Gastonia and the North Carolina Department of Transportation technicians for a period of one year after the end of the warranty period at no cost to the City or Department. Defective parts replaced under warranty by the City of Gastonia and the North Carolina Department of Transportation will be returned to the vendor at the vendor's request. Provide schematics, part lists, and other documentation to perform bench repair to the City of Gastonia or the North Carolina Department of Transportation within 2 weeks upon request. The City and Department agree not to divulge any proprietary information in the schematics, part lists and other documentation upon request from the vendor. After project acceptance and at the request of the City or Department, manufacturer shall perform warranty repairs to equipment which fails during the warranty period at no cost to the City or Department including freight costs to ship repaired equipment back to Gastonia. Ensure all equipment is repaired and returned to the City of Gastonia or the North Carolina Department of Transportation within 21 calendar days of receipt by the manufacturer.

1.3.CONSTRUCTION METHODS

A. General

Comply with Section 1700-3 of the Standard Specifications in addition to the following special provisions.

Article 1700-3(K) of the Standard Specifications is revised as follows:

Page 17-4, revise sentence starting on line 14 to read “Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these Standard Specifications, Standard Drawings, and the project plans.”

Page 17-4, revise sentence beginning on line 21 to read “Furnish and install additional ground rods to grounding electrode system as necessary to meet the Standard Specifications, Standard Drawings, and test requirements.”

Article 1700-3(M) of the Standard Specifications is revised as follows:

Page 17-4, Replace the sentence beginning on line 41 with “Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer.”

Article 1720-3 of the Standard Specifications are revised as follows:

Page 17-18, revise sentence starting on line 13 to read “On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole.”

B. Removal of Existing Equipment and Material

Remove all Department-owned signals and communications related equipment and material that will not be used. Assume ownership of removed poles, messenger cable, interconnect cable, communications cable and supporting hardware. Return all other equipment and material between 8:00 a.m. and 12:00 p.m., Monday through Thursday, to the Division 12 Traffic Services Office located at 230 Kemper Road in Shelby.

Remove all City of Gastonia owned signals and communications related equipment and material that will not be used. Return all signal controllers and signal cabinets between 8:00 a.m. and 12:00 p.m., Monday through Thursday, to the City Municipal Operations Center located at 1300 North Broad Street in Gastonia. Assume ownership of all other equipment and material.

All existing communications cable and supporting splicing and communications equipment that is not being reused or removed shall be abandoned in place.

C. Requirements for Historic Areas

As shown in the Plans, some work will be conducted within areas determined to contain properties with documented historic significance. If it is necessary to deviate from the Plans in these areas, alert the Engineer to contact the Environmental Analysis Unit, Cultural Resources Section for an effects determination before proceeding.

Avoid damaging or removing sidewalks and curbs within designated historic districts whenever possible. Do not damage, disturb, or remove any existing granite curbs. Where granite curbs conflict with the installation of underground conduit and cable, bore (drill) conduit underneath granite curb. Do not bore through granite curbs. Replace any granite curb damaged due to construction of this project at no cost to the Department.

Where removal and replacement of concrete sidewalk and concrete curb is unavoidable, replace them with concrete materials that match the finish, appearance, and color of the adjacent existing sidewalk as close as technically feasible as determined by the Engineer. Finishes may include, but are not limited to, water-washed, broom, and trowel. The dimensions and the profile (i.e., shape) of the new curbing shall match that of the adjacent existing curbing.

Where removal and replacement of sidewalk constructed of materials other than concrete is unavoidable, replace the sidewalk with in-kind materials that match the finish, appearance, and color of the adjacent existing sidewalk as close as technically feasible as determined by the Engineer. If the sidewalk is constructed of materials such as brick, stone, or pavers, carefully remove and subsequently reinstall the bricks, stones, or pavers using methods approved by the Engineer. Take photographs and make sketches to record the pattern of the existing materials prior to removal. Replace any bricks, stones, or pavers damages due to construction on this project with approved in-kind, matching materials.

Repair and replacement of existing sidewalk will be measured and paid for in accordance with the Signal Cabinet Foundations section of these Project Special Provisions.

Complete all repairs with in-kind materials to all sidewalks removed for construction and reopen the repaired and restored sidewalk to pedestrian traffic within five consecutive calendar days following initial removal. If the Contractor fails to repair and reopen a sidewalk in accordance with these Project Special provisions within the time frame specified, the Department reserves the right to make the necessary repairs, and all expenses incurred by the Department in making the repairs and restoring the sidewalk will be deducted from payment due the Contractor, plus \$500 liquidated damage per occasion, per day, or any portion thereof, until corrected.

Do not trim, remove, or damage tree limbs within historic districts. Hand-lashing of aerial cables to messenger cable may be required in some areas due to overhanging and protruding tree limbs along the cable route. When required, hand-lashing will be performed at no additional cost to the Department.

D. Related Projects

Current roadway and transportation projects within the project area may impact traffic signal operations and communications. Coordinate with the Engineer on how to proceed if those projects have not been completed and construction in these areas is on the critical path of the project schedule. These projects may include, but not limited to, the following:

- U-5965 – Intersection Improvements at US 29 and NC 274 (estimated let date of March 2024)

The City and Department have general maintenance backlog work for public safety that will need to be continued throughout the duration of this project. Coordinate with Engineer for actions to be taken if any maintenance construction prohibits the availability of the traffic signal for construction.

E. Sequence of Construction

Perform construction of the project in the sequence called for in these Project Special Provisions. All work not performed in accord with the sequence of construction must be approved by the Engineer. Adherence to the sequence of construction must be reflected in the Contractor's project schedule and all updates to the project schedule. Construction shall have minimal disruption to the existing signal operations.

As new intersections are installed but are not under monitoring and supervision of the central system, maintain existing signal coordination and common controller clock time. All clocks that are updated shall be updated from a single clock source. Review each intersection that has been installed but is not online on a regular basis (no less than three times a week) in the form of a field visit and review the controller clock for drift against the common time source. Reset clock to common time source if it has drifted. Document the field visit and any actions taken in the cabinet's maintenance diary. Record time and date of each visit, activity performed, and person performing visit. Maintain records of clock maintenance activities in a single document and furnish to the Engineer for review upon request. Failure to visit each intersection that is not online to check and update clocks will result in a liquidated damage of \$1,500 per visit not performed.

For the Sequence of Construction, the Contractor shall perform the work per the following phasing.

Phase 1 – This phase shall consist of installing new infrastructure for the fiber optic communications and includes:

- Installing new messenger cable and guy assemblies throughout the project area. Also, installing communications cable ID markers on messenger cable to identify and reserve fiber optic cable attachment locations on existing utility poles.
- Installing new junction boxes, underground conduit, and pole risers throughout the project area.
- Not disturbing the existing signal cabinets/controller or the existing signal system communications network.

Phase 2 – This phase shall consist of installing new fiber optic communications cables and equipment and includes:

- Installing new fiber optic cables throughout the project area by lashing to aerial messenger cable and/or existing communications cables or pulling through underground conduit.
- Installing new fiber optic splice enclosures and performing splicing where new fiber optic cables connect. No splicing involving existing fiber optic cables shall be performed during this phase.
- Not disturbing the existing signal cabinets/controller or the existing signal system communications network.

Phase 3 – This phase shall consist of preparing the signal system at the MOC and includes:

- Routing the fiber optic cable that enters the building to the Server Room using existing building entrances and raceways.
- Installing the new fiber optic interconnect center in the Server Room rack cabinet and terminating the fiber optic cable.
- Installing the core Ethernet switch and application servers in the rack cabinets.
- Configuring and integrating the application servers to establish the new central signal system.

- Configuring and integrating the application server to establish the upgraded CCTV video management software.
- Installing the new computer workstation at the TOC and installing the signal system and CCTV video management client software.

Phase 4 – This phase shall consist of integrating the Ethernet groups and includes:

- Performing one session of the cabinet and controller training for City and Department technicians (as detailed in these Project Special Provisions) prior to installing any new cabinets and controllers in the field.
- Integrating groups (one group at a time) starting closest to the TOC and working out towards the farthest extents of the system.
- The Contractor shall complete all work for a given group and verify it is fully functional before starting work in a different group. After taking down an existing communication channel, the contractor must complete all construction for traffic signals in that channel in a time period no greater than two (2) days per traffic signal in that channel. Establish time-based coordination within the limits of the prior closed loop system and maintain controller clocks.
- Verifying that all existing traffic signal communication channels are still fully functional at the TOC.
- Performing signal work (cabinet and controller replacement) for traffic signals within the group.
- Performing CCTV work (camera installation and replacement) for proposed and existing CCTV cameras within the group.
- Performing communications work (field Ethernet switch installation and wireless radio upgrade) within the group.
- Integrating the field Ethernet switches within the group with the fiber optic communications network and the core Ethernet switch at the TOC.
- Integrating the Ethernet group with the signal system software at the TOC to establish communications with the traffic signals.
- Integrating the Ethernet group with the CCTV control software at the TOC to establish communications with the CCTV cameras along with viewing video and controlling PTZ functions.

Phase 5 – This phase shall consist of all testing and training required in these Project Special Provisions prior to System Acceptance.

1.4.REQUIREMENTS FOR CABLES CROSSING RAILROADS

A. Railroad Crossings

Application has been made with Norfolk Southern Corporation (NS), CSX Transportation (CSX), and North Carolina Railroad Company (NCR) herein called the Railroad Company(ies), for the encroachment agreements necessary under this Contract. Do not commence cable routings over or under railroad-owned facilities until notification and coordination with Engineer and the

appropriate Railroad Company has occurred. Install fiber-optic communications cable as shown on the Plans. All work associated with the crossing is to conform to the Railroad Company's specifications.

B. Insurance Requirements

The Department has provided Railroad Protective Liability Insurance to the railroad companies as part of the Department's encroachment agreements with the railroad companies for each of location listed in the table above.

If required by the railroad, pay for railroad personnel to be present when work is performed.

In addition to any other forms of insurance or bonds required under the terms of the Contract and the Standard Specifications, take out and keep in force from the commencement of all construction on railroad right-of-way until the final inspection and acceptance of the project by the Engineer, insurance of the following kinds and amount. It is understood that the amounts specified are minimum amounts and that larger amounts may be carried if so desired. Any insurance taken out due to these requirements shall be subject to the approval of the Engineer, and the Railroad Companies as to form and amount. Furnish satisfactory policies prior to beginning of the work on railroad right-of-way.

Refer to the following web links for more specific insurance requirements and requirements for working on the rights-of-way of each railroad company. In the event of a conflict between the requirements of one or more railroad companies and the requirements contained in the Plans or these Project Special Provisions, the requirements of the railroad company shall govern.

1. Commercial General Liability Insurance

Furnish evidence to the Engineer of Contractor's commercial General Liability Insurance coverage with a combined single limit of not less than \$5,000,000 for each occurrence for operations performed on the railroad right-of-way. The Contractor's policy shall name the railroad company(ies) as an additional insured. If any part of the work is sublet, similar insurance in the same amounts and evidence thereof as required of the Prime Contractor shall be provided by or on behalf of the Subcontractor to cover Subcontractor's operations on the railroad right-of-way.

Keep such insurance in force until final inspection of the project, or that portion or portions within the railroad right-of-way, by the Engineer or, in the case of Subcontractors, until the Contractor furnishes a letter to the Engineer stating that the Subcontractor has completed his/her subcontracted work within the railroad right-of-way to Contractor's satisfaction, and that the Contractor will accomplish any additional work necessary on the railroad right-of-way with the Contractor's own forces.

2. Termination of Insurance and Policies to be Submitted

Any insurance policies given hereunder shall cover all Contractor-performed work the Contractor in connection with the work in the introductory paragraph within railroad right-of-way but shall not be liable for accidents occurring after acceptance of the completed project by the Department. Such policies shall contain a clause requiring 30 days written notice be given to the Engineer and to the appropriate Railroad Company, prior to cancellation or change.

Submit to the Engineer the original and one copy of the Commercial General Liability Policy, one certified duplicate copy of all other policies, and certificates of insurance in an original and two copies as required by these Project Special Provisions.

No extra allowance will be made for the insurance required hereunder. The entire cost shall be included in the contract unit price bids for other pay items.

The named insured under the commercial General Liability Insurance Policy is the respective Railroad Company, and the designation of the job site description of work is as follows: All construction on the <<RAILROAD COMPANY>> right-of-way on NCDOT Project No. C-5703 in the City of Gastonia, North Carolina.

C. Flagging Protection or Watchman Service

Provide 72 hours advance notice to NS in order that flagging service can be arranged and provided. Do not undertake any work within the NS right-of-way until the flagman is at the job site.

Provide a minimum of 10 working days advanced written notice to NCRP in order that flagging service can be arranged and provided. Do not undertake any work within the NCRP right-of-way until the flagman is at the job site.

D. Delays Caused by Operations of Others

Neither the Department nor the Railroad Company assumes any responsibility for any work performed by others in connection with the construction of the project, and the Contractor shall have no claim whatsoever against the Department or the Railroad Company for any inconvenience, delay, or additional cost incurred by the Contractor on account of such operations by others.

E. Time Extensions

No time extensions related to railroad encroachments will be allowed until the related work becomes the controlling factor relative to overall project completion.

F. Cooperation with Others

Cooperate with others participating in the construction of the project to the end that all work may be carried on to the best advantage.

G. Authority of Railroad Engineer

The authorized representative of the Railroad Company, hereinafter referred to as the Railroad Engineer, will have the final authority in all matters affecting the safe maintenance of railroad traffic of his company.

H. Interference with Railroad Operations

Arrange and conduct work so that there will be no interference with railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to the poles, wire, and other facilities of tenants on the rights-of-way of the Railroad Company. Wherever work is liable to affect the operations or safety of trains, first submit the method of doing such work to the Railroad Engineer for approval. However, such approval will not relieve the Contractor from liability.

Should conditions arising from or in connection with the work, require that immediate and unusual provisions be made to protect train operations and property of the Railroad Company, it shall be a part of the required services by the Contractor to make such provisions and if, in the

judgment of the Railroad Engineer such provisions are insufficient, the Railroad Engineer or the Department may, at the expense of the Contractor, require or provide such provisions as may be deemed necessary.

I. Storage of Materials

Do not store materials and equipment where they will interfere with railroad operations, nor on the rights-of-way of the Railroad Company without first having obtained permission from the Railroad Engineer. Such permission will be with the understanding that the Railroad Company will not be liable or damage to such material and equipment from any cause, and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

J. Completion and Acceptance of Work

Upon completion of the work, remove from within the limits of the railroad right-of-way all machinery, equipment, surplus materials, or rubbish and leave said rights-of-way in a neat and orderly condition. Acceptance of the work will be contingent upon final inspection by the Department and by the Railroad Company (if required by the Railroad Company) to determine if the work was completed satisfactorily in a manner acceptable to the Department and the Railroad Company.

1.5.MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this section. Payment at the contract unit prices for the various items in the contract will be full compensation for all work covered by this section.

Repair, removal and replacement of damaged or unacceptable equipment or work under this section will be at no additional cost to the Department. The Department will deduct the cost of Department-owned equipment damaged by the Contractor from money due to the Contractor.

If the Department or City of Gastonia performs maintenance and emergency service necessary to ensure continuous traffic signal operation, all expenses incurred by the Department or City in implementing this option will be deducted from payment due the Contractor, plus \$2,500 liquidated damage per occasion, per day or any portion thereof, until corrected.

2. MOBILIZATION

2.1.Description

This work consists of preparatory work and operations, including but not limited to the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of offices, buildings, and other facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals, or other facilities that were established for the prosecution of work on the project; and for all other work and operations which must be performed for costs incurred prior to beginning work on the various items on the project site.

2.2.Measurement and Payment

Mobilization will be measured and paid for at the contract lump sum price.

Partial payments for Mobilization will be made with the first and second partial pay estimates paid on the contract and will be made at the rate of 50% lump sum price on each of these partial pay estimates, provided the amount bid for Mobilization does not exceed 5% of the total amount bid for the contract. Where the amount bid for Mobilization exceeds 5% of the total amount bid for the contract, 2.5% of the total amount bid will be paid on each of the first 2 partial pay estimates. That portion exceeding 5% will be paid on the last partial pay estimate.

Such price and payment includes, but is not limited to, the movement of personnel, equipment, supplies and incidentals to the project site, for the establishment of offices, buildings and other facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals or other facilities that were established for the prosecution of work on the project; and for all other work and operations that shall be performed for costs incurred before beginning work on the various items on the project site.

Payment will be made under:

Pay Item	Pay Unit
Mobilization	Lump Sum

3. CONCRETE SIDEWALKS

3.1.DESCRPTION

Construct Portland cement concrete sidewalks in accordance with the contract.

3.2.MATERIAL

Provide materials in compliance with all requirements of Section 848-2 of the Standard Specifications.

3.3.CONSTRUCTION METHOD

Construct sidewalks in compliance with all requirements of Section 848-3 of the Standard Specifications.

3.4.MEASUREMENT AND PAYMENT

___" *Concrete Sidewalk* will be measured and paid in square yards, measured along the surface of the completed and accepted work. Such price includes, but is not limited to, excavating and backfilling, sawing the existing sidewalk, furnishing and placing concrete, and constructing and sealing joints.

Payment will be made under:

Pay Item	Pay Unit
4" Concrete Sidewalk	Square Yard

4. SIGNAL HEADS

4.1.DESCRPTION

Furnish and install vehicle LED signal heads, visors, interconnecting brackets, wire entrance fittings, mounting assemblies, signal cable, lashing wire, grounding systems and all necessary hardware.

4.2.MATERIAL

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 12-inch and 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Fabricate 9-inch pedestrian signal head housings, end caps, and visors from virgin polycarbonate material. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, wire outlet bodies, wire entrance fitting brackets and end caps when supplied as components of messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538), or black (Federal Standard 595C, Color Chip Number 27038) as called for in the Plans, 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) or black (Federal Standard 595C, Color Chip Number 27038) as called for in the Plans. 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 1 ¼-inch vertical conduit entrance hubs with the hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions and can accommodate a minimum of ten Number 14 AWG conductors.

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
 - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
 - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
 - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

(Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,

3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's

warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 8 inches in length for 8-inch vehicle signal head sections. Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

For mast-arm mounting, provide rigid vehicle signal head mounting brackets and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the mast arms and to provide a means for vertically adjusting the vehicle signal heads to proper alignment. Fabricate the mounting assemblies from aluminum, and provide serrated rings made of aluminum. Provide stainless steel cable attachment assemblies to secure the brackets to the mast arms. Ensure all fastening hardware and fasteners are fabricated from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra-bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections, and 8-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

<i>Module Type</i>	<i>Max. Wattage at 165° F</i>	<i>Nominal Wattage at 77° F</i>
12-inch red circular	17	11
8-inch red circular	13	8
12-inch green circular	15	15
8-inch green circular	12	12

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to ensure power required at 77° F is 22 Watts or less for the 12-inch circular module and 13 Watts or less for the 8-inch circular module.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic

Signal Supplement” dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

<i>Module Type</i>	<i>Max. Wattage at 165° F</i>	<i>Nominal Wattage at 77° F</i>
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 ensure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

3. LED U-Turn Arrow Signal Modules:

Provide modules in the following configurations: 12-inch left U-turn arrow signal modules and 12-inch right U-turn arrow signal modules.

Modules are not required to be listed on the ITS and Signals Qualified Products List. 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 have minimum maintained luminous intensity values that are not less than 16% of the values calculated using the method described in section 4.1 of the VTCSH Circular Supplement.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

<i>Module Type</i>	<i>Max. Wattage at 165° F</i>	<i>Nominal Wattage at 77° F</i>
12-inch red U-turn arrow	17	11
12-inch green U-turn arrow	15	15

For yellow U-turn arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to ensure power required at 77° F is 22 Watts or less.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

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. Where required by the plans, provide 12-inch pedestrian signal heads with traditional three-sided, rectangular visors, 8 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

When called out on the Plans, furnish push-button housings with a powder coating finish that is black (Federal Standard 595C, Color Chip Number 27038).

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 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9
Countdown Indication	16	13

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

D. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

E. 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.

4.3.CONSTRUCTION METHODS

Comply with Section 1705-3 of the Standard Specifications.

4.4.MEASUREMENT AND PAYMENT

Vehicle Signal Head (____) and *Pedestrian Signal Head* (____) will be measured and paid as the actual number of signal heads of each type, size and number of sections furnished, installed, and accepted.

Louver will be measured and paid as the actual number of signal sections for which louvers have been furnished, installed and accepted.

Modify Existing Vehicle Signal Head will be measured and paid as the actual number of existing vehicle heads modified and accepted.

Signal Cable will be measured and paid as actual linear feet of signal cable furnished, installed and accepted. Measurement will be point to point with no allowance for sag. Twenty-five feet will be allowed for vertical segments up or down poles.

No measurement will be made of visors, wire entrance fittings, interconnecting brackets, mounting assemblies, pedestrian pushbuttons, pedestrian signal signs and signal head shifts as these are incidental to furnishing and installing signal heads. No measurement will be made for drip loops, coiled sections or lashing wire as these are incidental to furnishing and installing signal cable.

Payment will be made under:

Pay Item	Pay Unit
Vehicle Signal Head (12”, 3 Section).....	Each
Vehicle Signal Head (12”, 4 Section).....	Each
Vehicle Signal Head (12”, 5 Section).....	Each
Pedestrian Signal Head (16” 1 Section with Countdown).....	Each
Louver	Each
Modify Existing Vehicle Signal Head	Each
Signal Cable	Linear Foot

5. BACKPLATES

5.1.DESCRPTION

Furnish and install backplates for vehicle signal heads with all necessary hardware.

5.2.MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1098-2 (Backplates) of the Standard Specifications.

5.3.CONSTRUCTION METHODS

Comply with Section 1706-3 of the Standard Specifications.

5.4.MEASUREMENT AND PAYMENT

Backplate will be measured and paid in units of each, furnished, installed and accepted. No measurement will be made for different sizes, type or reflective taping of backplates.

Payment will be made under:

Pay Item	Pay Unit
Backplate.....	Each

6. SIGNS INSTALLED FOR SIGNALS

6.1.DESCRPTION

Furnish and install signs for signals with cable hangers, rigid sign mounting brackets, U-channel posts and all necessary hardware.

6.2.MATERIAL

Provide signs according to Section 1745-2 of the Standard Specifications.

Refer to Articles 1092-1 (Signs and Hardware) and 1092-2 (Retroreflective Sheeting) of the Standard Specifications.

6.3.CONSTRUCTION METHODS

Install signs in compliance with all requirements of Section 1745-3 of the Standard Specifications.

6.4.MEASUREMENT AND PAYMENT

Sign for Signals will be measured and paid as the actual number of signs for signals, regardless of mounting method, furnished, installed and accepted.

Payment will be made under:

Pay Item	Pay Unit
Sign for Signals.....	Each

7. PEDESTALS

7.1.DESCRPTION

Furnish and install the size and type of support assembly for vehicular or pedestrian signal heads, pedestrian pushbuttons, Intelligent Transportation System technologies or other traffic control devices as shown in the plans. Furnish assembly with foundation, grounding system and all necessary hardware as shown in the *Roadway Standard Drawings*. Provide a pedestal assembly that meets *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* in effect on the date of project advertisement. Unless otherwise required by the plans, install signal pedestals and pedestrian pushbutton posts on FHWA-approved breakaway support or anchor systems.

Furnish and install screw-in helical foundation as an alternative to the standard reinforced concrete foundation for supporting Type I and Type II Pedestals. Do not use for Type III Pedestals.

7.2.MATERIAL

Provide pedestals according to Section 1743-2 of the Standard Specifications.

When called out on the Plans, furnish pedestals with a powder coating finish that is black (Federal Standard 595C, Color Chip Number 27038).

7.3.CONSTRUCTION METHODS

Comply with Section 1743-3 of the Standard Specifications.

7.4.MEASUREMENT AND PAYMENT

Type I Post with Foundation will be measured and paid as the actual number of pedestrian pushbutton posts furnished, installed and accepted.

Type II Pedestal with Foundation will be measured and paid as the actual number of normal-duty pedestals with foundations furnished, installed and accepted.

No measurement will be made for pedestal foundations, pedestal screw-in helical foundations, grounding systems, powder coating, and any peripheral pedestal mounting hardware as these are incidental to furnishing and installing pedestals.

Payment will be made under:

Pay Item	Pay Unit
Type I Post with Foundation.....	Each
Type II Pedestal with Foundation.....	Each

8. MESSENGER CABLE

8.1.DESCRPTION

Furnish and install messenger cable (spanwire) with cable clamps, machine bolts, eye bolts, 3-bolt clamps, eye nuts, split-bolt connectors and all necessary hardware.

8.2.MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1091-2 (Wire), 1091-6 (Grounding Electrode), 1098-3 (Messenger Cable), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

8.3.CONSTRUCTION METHODS

Comply with Section 1710-3 of the Standard Specifications.

8.4.MEASUREMENT AND PAYMENT

Messenger Cable (____) will be measured and paid as actual horizontal linear feet of messenger cable furnished, installed, and accepted. Measurement will be point to point with no allowance for sag.

No measurement will be made of cable clamps, machine bolts, eye bolts, 3-bolt assemblies, eye nuts, split bolt connectors and pole grounding systems as these will be incidental to furnishing and installing messenger cable.

Payment will be made under:

Pay Item	Pay Unit
Messenger Cable (1/4")	Linear Foot

9. UNDERGROUND CABLE INSTALLATION

9.1.DESCRPTION

Furnish and install conduit for underground installation with miscellaneous fittings, all necessary hardware, marker tape, backfill, graded stone, paving materials, and seeding and mulching in accordance with Section 1715 of the Standard Specifications

9.2.MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Articles 1091-3 (Conduit), 1091-4 (Duct and Conduit Sealer), 1018-2 (Backfill), and 545-2 and 545-3 (Graded Stone) of the Standard Specifications.

Furnish underground HDPE or PVC conduits as shown in the Plans. All vertical conduits (entrance to electrical service and equipment disconnect and pole mounted cabinet) must be rigid galvanized steel.

9.3.CONSTRUCTION METHODS

Install underground conduit in compliance with all requirements of Section 1715-3 of the Standard Specifications and the Plans.

Contractor shall avoid installing underground conduit in locations that will disturb existing brick pavers. If potential impacts are possible, notify the Engineer prior to perform the installation.

9.4.MEASUREMENT AND PAYMENT

Tracer Wire will be measured along the horizontal linear feet of tracer wire furnished, installed and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be made in linear feet. No payment will be made for excess tracer wire in junction boxes and/or cabinets

Unpaved Trenching (qty) (size) will be measured horizontal linear feet of trenching for underground conduit installation of each type furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

Paved Trenching (qty)(size) & (qty)(size) will be measured horizontal linear feet of trenching for underground conduit installation of each type furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

Directional Drill (qty) (size) will be measured horizontal linear feet of directional drill for underground conduit installation furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

No measurement will be made of vertical segments, non-metallic conduit, metallic conduit, conduit sealing material, backfill, graded stone, paved materials, brick pavers, miscellaneous fittings, non-detectable marker tape, pull lines, seeding and mulching as these will be considered incidental to conduit installation.

Payment will be made under:

Pay Item	Pay Unit
Tracer Wire	Linear Foot
Unpaved Trenching (1) (2").....	Linear Foot
Unpaved Trenching (2) (2").....	Linear Foot
Paved Trenching (2) (2")	Linear Foot
Directional Drill (2) (2")	Linear Foot

10. JUNCTION BOXES

10.1. DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems, and all necessary hardware. Comply with Section 1716 of the Standard Specifications.

10.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department’s QPL.

Refer to Section 1005 (#57 or #67 Washed Stone) and Article 1098-5 (Junction Boxes) of the Standard Specifications.

Provide covers engraved with “NCDOT FIBER OPTIC CABLE” on the top face.

Install special oversized heavy-duty junction boxes with minimum inside dimensions of 36” x 36” (length x width) for storage of fiber optic splice enclosures and communications cables.

10.3. CONSTRUCTION METHODS

Install junction boxes in compliance with all requirements of Section 1716-3 of the Standard Specifications.

Contractor shall provide real-world coordinates according to Section 1716-3 for all new junction boxes installed as well as all existing junction boxes that are reused.

10.4. MEASUREMENT AND PAYMENT

Junction Box (____) will be measured and paid in actual number of junction boxes of each size and type furnished, installed, and accepted.

No measurement will be made of covers, graded stone, and grounding systems as these will be considered incidental to furnishing and installing junction boxes. Payment will be made under:

Pay Item	Pay Unit
Junction Box (Standard Size).....	Each
Junction Box (Oversized, Heavy Duty)	Each
Junction Box (Special Oversized, Heavy Duty)	Each

11. WOOD POLES

11.1. DESCRIPTION

Furnish and install wood poles with grounding systems and all necessary hardware in accordance with Section 1720 of the Standard Specifications.

Furnish an air terminal and lightning protection system in accordance with the “Air Terminal & Lightning Protection System” Project Special Provisions.

11.2. MATERIAL

A. General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department’s QPL.

Refer to Section 1082 (Wood Poles and Inspection Requirements) and Articles 1091-2 (Wire) and 1091-6 (Grounding Electrodes) of the Standard Specifications.

B. CCTV Wood Pole

Unless otherwise specified in the Plans, furnish Class 3 or better wood poles that are a minimum of 55’ long to permit the CCTV camera to be mounted approximately 40 feet above the ground and a minimum 5 feet from the top of the pole.

C. Remove and Replace Existing Traffic Signal Span Pole

At locations shown in the Plans, the existing traffic signal span pole is to be removed and replaced with a new Class II, 60 ft. traffic signal span pole in the same location and meeting the specifications above.

The Contractor shall stabilize all existing cables that attach to the signal pole prior to removal. This may include, but not be limited to, messenger cable, signal cable, lead-in cable, communications cable, and guy wires. Any cables that need to be disconnected to perform the work shall be documented for correct operation and labeled prior to disconnecting.

After installing the Class II, 60 ft. traffic signal span pole, the Contractor shall attach all existing cables and guy wires in compliance with these Project Special Provisions and the Standard Specifications. Existing pole attachment hardware shall be replaced with new hardware that meets the Project Special Provisions and Standard Specifications. This includes but is not limited to angle eye bolts, oval eye bolts, nuts, washers, and strandvises.

All work at a location shall be completed in one working day. Existing spans, cables and risers shall all be attached to the new Class II, 60 ft. wood pole prior to leaving the work site. All cables disconnected to perform the work shall be verified to be re-connected and operational.

11.3. CONSTRUCTION METHOD

Install wood poles in compliance with all requirements of Section 1720-3 of the Standard Specifications.

Section 1720-3 of the 2018 Standard Specifications is revised as follows:

Page 17-18, revise sentence starting on line 13 to read “On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole.”

Install the required Air Terminal & Lightning Protection System as described in the Air Terminal & Lighting Protection Specifications and as referenced in the following Typical Details:

- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

11.4. MEASUREMENT AND PAYMENT

CCTV Wood Pole will be measured and paid as the actual number of wood poles for CCTV camera attachments furnished, installed, and accepted.

Remove and Replace Traffic Signal Span Pole will be measured and paid as the actual number of existing traffic signal span poles removed, replaced with a new 60 ft. Class II wood pole, and accepted. No separate pay item will be made for permits, labor, equipment, or materials required while disconnecting and reattaching electrical services, cables and wires or for any temporary relocations made before acceptance. Removal and disposal of any items not re-used will be considered incidental to this pay item. Any cables damaged during the work required for this item shall be replaced at no cost to the City or Department.

No measurement will be made for installing grounding systems as these will be incidental to furnishing and installing poles.

Payment will be made under:

Pay Item	Pay Unit
CCTV Wood Pole.....	Each
Remove and Replace Traffic Signal Span Pole	Each

12. GUY ASSEMBLIES

12.1. DESCRIPTION

Furnish and install guy assemblies with all necessary hardware.

12.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1098-6 (Pole Line Hardware) and 1098-7 (Guy Assembly) of the Standard Specifications.

12.3. CONSTRUCTION METHODS

When installing messenger cable for supporting only communications cable, use approved one-bolt attachment method for attaching messenger cable and guy assembly.

Bond guy assembly to existing pole ground using parallel groove clamp or equivalent. If existing poles do not have a grounding system, install new grounding system for bonding guy assembly that complies with Article 1720-3.

Do not attach to existing guy assemblies unless specifically approved by owner.

12.4. MEASUREMENT AND PAYMENT

Guy Assembly will be measured and paid as the actual number of guy assemblies furnished, installed and accepted.

No measurement will be made of guy cable, guy guards, anchors, clamps, grounding systems or fittings as these will be incidental to furnishing and installing guy assemblies.

Payment will be made under:

Pay Item	Pay Unit
Guy Assembly.....	Each

13. RISER ASSEMBLIES

13.1. DESCRIPTION

Furnish and install riser assemblies with clamp-on, aluminum weatherheads or heat shrink tubing, galvanized pole attachment fittings and all necessary hardware.

13.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1091-2 (Wire), 1091-3 (Rigid Metallic Conduit), 1091-6 (Grounding Electrodes), 1098-4 (Riser Sealing Devices), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

13.3. CONSTRUCTION METHOD

Install riser assemblies in compliance with all requirements of Section 1722-3 of the Standard Specifications.

13.4. MEASUREMENT AND PAYMENT

___" Riser with ___ will be measured and paid as the actual number of risers of each type and size furnished, installed and accepted. No measurement will be made of weatherheads, heat shrink tubing or pole attachment fittings as these will be incidental to furnishing and installing risers.

Heat Shrink Tubing Retrofit Kit will be measured and paid as the actual number of heat shrink tubing retrofit kits furnished, installed and accepted.

Payment will be made under:

Pay Item	Pay Unit
½" Riser with Weatherhead	Each
1" Riser with Weatherhead	Each
2" Riser with Weatherhead	Each
2" Riser with Heat Shrink Tubing	Each
Heat Shrink Tubing Retrofit Kit	Each

14. INDUCTIVE DETECTION LOOPS

14.1. DESCRIPTION

Furnish and install inductive detection loops with loop slot sealant, loop wire, conduit with fittings and all necessary hardware.

14.2. MATERIAL

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

Provide the Engineer a Type 3 material certification and MSDS for the sealant in accordance with Article 106-3.

Refer to 1098-8 (Inductive Detection Loops) of the Standard Specifications.

14.3. CONSTRUCTION METHOD

Install inductive detection loops in compliance with all requirements of Section 1725-3 of the Standard Specifications.

14.4. MEASUREMENT AND PAYMENT

Inductive Loop Sawcut will be measured and paid as the actual linear feet of inductive loop sawcut furnished, installed, and accepted.

No measurement will be made of core drilling, loop slot sealant, loop wire, conduit and conduit fittings as these will be incidental to furnishing and installing inductive detection loops.

Payment will be made under:

Pay Item	Pay Unit
Inductive Loop Sawcut	Linear Foot

15. LEAD-IN CABLE

15.1. DESCRIPTION

Furnish and install lead-in cable with all necessary hardware to be used in conjunction with inductive detection loops.

15.2. MATERIAL

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

Refer to 1098-6 (Lashing Wire and Hardware), 1098-6 (Wrapping Tape), and 1098-9 (Lead-In Cable) of the Standard Specifications.

15.3. CONSTRUCTION METHOD

Install lead-in cable in compliance with all requirements of Section 1726-3 of the Standard Specifications.

15.4. MEASUREMENT AND PAYMENT

Lead-in Cable (____) will be measured and paid as the actual linear feet of lead-in cable furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Terminate all cables before determining length of cable run.

If markings are not visible, measurement will be point to point with no allowance for sag. Twenty-five feet will be allowed for vertical segments up or down poles.

Payment will be made under:

Pay Item	Pay Unit
Lead-In Cable (14-2).....	Linear Foot

16. FIBER OPTIC CABLE

16.1. DESCRIPTION

Furnish and install single mode fiber-optic (SMFO) communications cable and drop cable assemblies with grounding systems, fiber-optic cable storage racks (snowshoes), communications cable identification markers, lashing wire, and all necessary hardware.

16.2. MATERIAL

Furnish material, equipment, and hardware under this section that is pre-approved on the Department's QPL.

Refer to Articles 1098-10(A) (SMFO Communications Cable), 1098-10(C) (Communications Cable Identification Markers), 1098-10(D) (Fiber-Optic Cable Storage Guides), and 1098-6 (Lashing Wire and Hardware) of the Standard Specifications.

Provide communications cable identification markers with (704) 866-6843 as the contact telephone number.

When required, furnish aerial cable protectors that protect fiber-optic cables from abrasions due to squirrels and other rodents. The cable protector shall be a minimum 2" outer diameter round split-sheath pipe constructed from LDPE or PVC.

16.3. CONSTRUCTION METHODS

A. General

Install fiber-optic cable in compliance with all requirements of Section 1730-3 of the Standard Specifications.

Do not install any communications cables in the same conduit or junction box as power cables.

Store 30 feet of each fiber optic cable entering a junction box or field equipment. Store 100 feet of each fiber optic cable being spliced in an underground splice enclosure located in a junction box. Coil all stored cable in the bottom of the junction box and in a manner that does not violate the maximum bending radius of the cable.

B. Underground Installation

Install fiber-optic cable in underground conduit in compliance with Article 1730-3(C) of the Standard Specifications.

When installing new fiber optic cables in existing conduit that was not installed under this Project, use pull lines when available and other methods approved by the Engineer. Use care not to damage existing fiber optic cables in the conduit system when installing new fiber optic cables. In the event of damage to existing cables, the Contractor shall make all required repairs and/or remediations within three calendar days of the damage being done.

In some situations, the Contractor may need to remove an existing signal system fiber optic trunk cable to assist in the installation of a new fiber optic trunk cable. Upon approval by the Engineer and City of Gastonia, the Contractor may remove the existing cable between existing splice points and pull in the new cable(s) and re-splice the existing cable within three calendar days of the removal.

C. Cable Protector

When overlashing to existing aerial communications cable, remove any existing cable protectors and install new cable protectors of the same length and coverage.

16.4. MEASUREMENT AND PAYMENT

Communications cable (____-fiber) will be measured and paid as the actual linear feet of fiber-optic cable of each fiber count furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Terminate all fibers before determining length of cable run.

Drop Cable will be measured and paid as linear feet of fiber-optic drop cable (12-fiber) assemblies furnished, installed and accepted. Sag and vertical segments will not be paid as these distances are incidental to the installation of drop cable assemblies.

Cable Protector will be measured and paid as linear feet of cable protector furnished and installed.

No measurement will be made for terminating, splicing and testing fiber-optic cable, communications cable identification markers, fiber-optic storage racks or lashing wire and all necessary hardware as these will be incidental to the installation of fiber-optic cable.

Payment will be made under:

Pay Item	Pay Unit
Communications Cable (24-Fiber)	Linear Foot
Communications Cable (48-Fiber)	Linear Foot
Communications Cable (72-Fiber)	Linear Foot
Drop Cable	Linear Foot
Cable Protector.....	Linear Foot

17. FIBER OPTIC SPLICE CENTERS

17.1. DESCRIPTION

Furnish and install fiber-optic interconnect centers, fiber-optic splice enclosures, and all necessary hardware.

Modify existing fiber optic interconnect centers and/or splice enclosures as shown in the plans. Refer to manufacturer's recommendations for opening, modifying and re-sealing the existing fiber optic interconnect center and/or fiber optic splice enclosures.

17.2. MATERIALS

Comply with Article 1098-11 (Fiber-Optic Splice Centers) of the Standard Specifications with the following exceptions:

Furnish splice enclosures that utilize compressed gel to seal the cable entry ports. The sealing shall be re-useable and not require the use of heat shrink materials.

For terminating cables inside signal cabinets and CCTV cabinets, furnish standard sized interconnect centers to accommodate a minimum of 12 fibers entering the cabinet.

17.3. CONSTRUCTION METHODS

Install fiber-optic splice centers, perform termination and splicing, and test in compliance with all requirements of Section 1731-3 of the Standard Specifications.

Contractor is responsible for field verifying existing splicing. The Contractor shall coordinate with the Engineer where existing splicing is not as expected with regards to the number and size of existing cables shown on the Splice Details or the existing connections between cables shown on the Splice Details.

17.4. MEASUREMENT AND PAYMENT

Interconnect center will be measured and paid as the actual number of fiber-optic interconnect centers of each type furnished, installed, and accepted.

Splice enclosure will be measured and paid as the actual number of fiber-optic splice enclosures furnished, installed, and accepted. No measurement will be made between aerial, underground, manhole, or junction box installation of the fiber-optic splice enclosure.

Modifying splice enclosure will be measured and paid as the actual number of fiber-optic splice enclosures modified and accepted. No measurement will be made between aerial, underground, splice cabinet, manhole, or junction box installation of the fiber-optic splice enclosure.

No measurement will be made of splice trays, pigtailed, jumpers, connector panels, testing and any corrective actions, repairs and replacements needed for exceeding maximum allowable attenuation or other defects, as these will be considered incidental to furnishing and installing fiber-optic interconnect centers and splice enclosures and modifying splice enclosures.

No measurement will be made for the removal of existing interconnect centers as part of signal cabinet or CCTV cabinet replacements.

Payment will be made under:

Pay Item	Pay Unit
Interconnect Center.....	Each
Splice Enclosure.....	Each
Modify Splice Enclosure.....	Each

18. DELINEATOR MARKERS

18.1. DESCRIPTION

Furnish and install delineator markers with all necessary hardware.

18.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department’s QPL. Refer to Article 1098-13 (Delineator Markers) of the Standard Specifications.

Provide delineator markers with (704) 866-6843 as the contact telephone number.

18.3. CONSTRUCTION METHODS

Install delineator markers in compliance with all requirements of Section 1733-3 of the Standard Specifications.

18.4. MEASUREMENT AND PAYMENT

Delineator marker will be paid for by the actual number furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Delineator Marker	Each

19. JUNCTION BOX MARKERS

19.1. DESCRIPTION

Furnish and install junction box markers with all necessary hardware and adhesives to warn of buried fiber-optic communications cable.

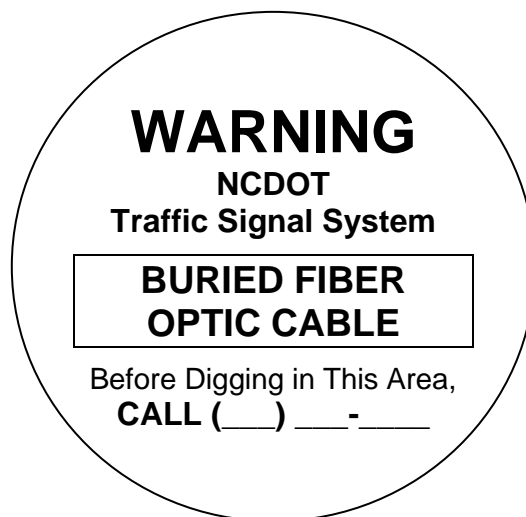
19.2. MATERIALS

A. Junction Box Markers

Furnish durable, non-reflective junction box markers, also known as curb markers, fabricated from UV-resistant, non-metallic materials other than ceramic material, such as polyurethane or high impact polypropylene or other high impact plastic. Provide junction box markers that are designed for outdoor use, that are waterproof, that resist fading, that are temperature stable and that resist chemical and mechanical abrasion. Furnish junction box markers with a quick-setting adhesive designed for use with the junction box markers supplied and designed to permanently adhere junction box markers to Portland cement/concrete, steel, and cast iron as well as other non-porous hard surfaces. Do not provide markers that require intrusive fasteners to secure the marker to the surface. Do not provide adhesives that are not designed for use with the junction markers supplied. Provide junction box markers that do not require special tools such as torches, tamping machines or drills or hardware or special surface preparation for installation. Furnish junction box markers from a manufacturer that has been producing such junction box markers (i.e., curb markers) for a minimum of 10 consecutive years.

Provide junction box markers with (704) 866-6843 as the contact telephone number.

Order the junction box marker with the Phone Number printed on the marker, hand written sharpie labeling is not acceptable. Consult with the Engineer to ensure the junction box labels are ordered with the correct phone number. Provide junction box markers that contain the text and symbols, text emphasis and text proportions depicted in the example format shown below.:



Overall Junction Box Marker Dimensions: 2.5" diameter

Text: Black

Background: Light Gray (to blend with concrete and granite surfaces)

Submit samples of proposed junction marker to the Engineer for approval before installation. In lieu of designing a custom junction box marker, the Contractor may submit for the Engineer’s approval a stock/standard junction box marker format (i.e., off-the-shelf format) from the junction box marker manufacturer that differs from the example format proposed above but that still embodies the content and intent conveyed by the example format.

Have the junction box marker manufacturer provide a list of references along with contract information for at least five different municipal government agencies and/or state departments of transportation that have installed the proposed manufacturer’s markers and can attest to the performance of the manufacturer’s markers over a continuous period of no less than seven years. Submit these references to the Engineer for review in conjunction with submission of the sample.

19.3. CONSTRUCTION METHODS

A. Junction Box Markers

Apply junction box markers to the surface of the junction box cover/lid on all new and/or existing junction boxes that are to be reused to house the fiber-optic communications cable. Additionally, at locations where a junction box is perpendicular to a raised curb place an additional junction box marker on the curb.

Clean surface to which the junction box marker will be applied. Make sure application surface is dry and free of any loose debris or cracks. Apply adhesive to back side of the junction box marker in accordance with manufacturer’s instructions. Apply additional adhesive when surface is uneven or textured to fill voids and assure secure adhesion. Apply the junction box marker to the application surface and press firmly. Ensure that entire edge around perimeter of marker is sealed to the application surface.

Position the marker in the approximate center of the junction box cover and orient the marker so that its text is parallel to long side of the cover. On curb sections install the marker on the flattest surface of the curb at a point that is perpendicular to the junction box.

Junction box markers are not required to be place on flat surfaces of the roadway where there is no curbing, unless required by the Engineer.

19.4. MEASUREMENT AND PAYMENT

Junction Box Marker will be measured and paid for as the actual number of junction box markers furnished, installed, and accepted.

No measurement will be made of junction box marker adhesive as this will be considered incidental to furnishing and installing the junction box marker.

Payment will be made under:

Pay Item	Pay Unit
Junction Box Marker.....	Each

20. POWER OVER ETHERNET (POE) CABLE

20.1. DESCRIPTION

Furnish and install Power Over Ethernet (PoE) cable to serve as interconnect between Ethernet switches and Digital CCTV cameras.

20.2. MATERIAL

Furnish CAT6A PoE cable that is suitable for outdoor installation that and meets or exceeds the following standards:

- 4-pair shielded twisted pair cable
- 23 AWG (minimum) solid bare copper conductor
- Meets or exceeds CAT6A specifications
- High-density polyethylene insulation, PVC jacket
- Ascending / Descending Sequential Foot Markings
- Compliant with EIA/TIA standards
- UL/CSA listed
- UV Stabilized PE Jacket
- Gel Filled
- Meets TIA/EIA 568B.2 Networking Standard
- Supports 10/100/1000/10,000Mbps
- Mean Power Sum for Equal Level Far End Crosstalk (ELFEXT): 45dB/kft (minimum) at 772kHz
- Worst Pair Power Sum for ELFEXT: 40dB/kft (minimum) at 772kHz
- Mean Power Sum for Near-end Crosstalk (NEXT): 42dB/kft (minimum) at 772 kHz
- Operating Temperature: Rated from -10 to +60 Celsius
- Average mutual capacitance: 90nf/mile (maximum)

The PoE cable must be factory tested on reels for each pair's mutual capacitance, crosstalk loss, insulation resistance, and conductor resistance. Furnish the Engineer with a certified factory report for each reel showing compliance with these Project Special Provisions, the factory test results, and the manufactured date of the cable. The contractor shall not use Ethernet cable manufactured more than one year before the date of installation.

Provide RJ-45 connectors with gold conductors and terminate according EIA/TIA 568 A/568-B standards. Provide connectors with eight contacts. Furnish connectors appropriately rated for the cable being installed.

20.3. CONSTRUCTION METHODS

Install PoE cable in conduits, risers, and on aerial messenger cable at locations shown in the Plans. Allow a minimum of 5 feet of cable slack in each cabinet.

PoE cables shall not be spliced. All PoE cables shall be labeled with waterproof, smear resistant labels that denote the equipment cabinets or housing they are run from and the device and identifier for that device they are connected.

The contractor shall not exceed 80 percent of the manufacturer's maximum pulling tension when installing underground PoE cable. Use a clutch device (dynamometer) so as not to exceed the allowable pulling tension if the cable is pulled by mechanical means. Do not use a motorized vehicle to generate cable-pulling forces.

Keep tension on the cable reel and the pulling line at the start of each pull. Do not release the tension in the cable if the pulling operation is halted. Restart the pulling operation by gradually increasing the tension until the cable is in motion.

20.4. MEASUREMENT AND PAYMENT

PoE cable will be measured and paid as linear feet of outdoor rated PoE cable furnished, installed, and accepted. Lengths of PoE cable installed will be determine using the sequential foot markings for each segment of cable installed and terminated.

No measurement will be made for terminating and testing of the cable, connectors, cable and identification markers, as these will be considered incidental to the installation of the PoE cable.

Payment will be made under:

Pay Item	Pay Unit
PoE Cable.....	Linear Feet

21. REMOVE EXISTING COMMUNICATIONS CABLE

21.1. DESCRIPTION

Remove existing communications cable as shown in the Plans.

21.2. CONSTRUCTION METHODS

Remove existing communications cable in compliance with all requirements of Section 1734-2 of the Standard Specifications.

Contractor shall only remove existing drop cables to facilitate the installation of new drop cables to a signal cabinet or CCTV cabinet. Under no circumstances should an existing trunk cable be removed or disturbed.

If the existing drop cable is being removed up to the existing splice enclosure, do not open or disturb the splice enclosure. Contractor shall cut the existing drop cable outside of the splice enclosure.

21.3. MEASUREMENT AND PAYMENT

Remove Existing Communications Cable will be measured in horizontal linear feet of existing communications cable removed and accepted. Payment will be in linear feet. Sag, vertical segments or spare segments of communications cable will not be paid as these distances will be incidental to the removal of existing communications cable.

No additional measurement will be made for multiple cables being removed from the same conduit or same pole. Where multiple adjacent conduits exist (each containing multiple cables), each conduit will be measured and paid separately. No payment will be made for cable that cannot be removed and is abandoned in place.

No measurement will be made of the removal of messenger cable and pole attachment hardware, as these will be incidental to removing existing communications hardware.

Payment will be made under:

Pay Item	Pay Unit
Remove Existing Communications Cable	Linear Foot

22. CABLE TRANSFERS

22.1. DESCRIPTION

Remove and reinstall existing communications cable for pole relocations.

22.2. CONSTRUCTION METHODS

Transfers of existing communications cable to new poles may be required during this project. Perform transfers as directed by the Engineer. Remove existing communications cables from pole to be removed and reinstall these communications cables and any existing attachment hardware on new pole. Remove all communications hardware from existing pole. Furnish and install any new attachment hardware as required.

22.3. MEASUREMENT AND PAYMENT

Cable Transfer will be measured and paid as the actual number of cable transfers with attachment hardware to new poles furnished, installed, and accepted.

The transfer of signal cables from an existing signal pole to a new CCTV pole will be measured and paid for according to the “Remove and Replace Existing Wood Signal Pole” pay item in these Project Special Provisions.

Payment will be made under:

Pay Item	Pay Unit
Cable Transfer.....	Each

23. WIRELESS ETHERNET RADIO SYSTEM

23.1. DESCRIPTION

Furnish and install a spread spectrum wireless Ethernet radio system with all necessary hardware and signage in accordance with the Plans and Project Special Provisions to provide a data link between field devices. Provide a radio system with a bi-directional, full duplex communications channel between multiple “line-of-sight” antennas to the fiber optic network using license free, spread spectrum technology. Radio systems for transmission of compressed digital video shall operate at the 2.4 or 5.8 GHz frequency.

Furnish material and workmanship conforming to the *National Electrical Code* (NEC), the *National Electrical Safety Code* (NESC), Underwriter’s Laboratories (UL) or a third-party listing agency accredited by the North Carolina Department of Insurance, and all local safety codes in effect on the date of advertisement.

23.2. MATERIALS

A. Field Set-up Software

The Field Set-up Software shall be a Window-based software program that uses a GUI (Graphical User Interface) to provide the following features at a minimum:

- Remote programming
- Remote radio configuration
- Remote maintenance
- Remote diagnostics
- Spectrum analyzer

Furnish software supplied with drivers to allow easy set-up with all industry standard traffic signal controllers, including 2070L/2070LX controllers containing custom software written specifically for the North Carolina Department of Transportation. Manufacturer is required to develop additional drivers (at no charge) for other equipment not supported by their existing pre-written Driver Package when needed.

B. Central Management Software

The Central Management Software shall provide the following minimum features:

- Window-based software program that uses a GUI (Graphical User Interface)
- Network mapping: online/offline status, Auto Discovery
- Wireless diagnostics: Wireless link status, Signal level, Spectrum Analyzer, Antenna Alignment
- Network Diagnostics: Bandwidth testing, Network traffic monitoring, Ping test capabilities
- Event logs
- System configuration utility: Security, RF channels, VLAN, configuration system backup

- Email alert capabilities
- GPS identification

C. 2.4 GHz Broadband (Ethernet) Dual Radio (Integrated Panel)

Furnish a 2.4 GHz Broadband Ethernet Dual Radio Transceiver with a RJ-45 Ethernet 10/100 Base T connector (auto crossover) with an integrated 20 dBi gain panel antenna and Field Set-up Software. Ensure the dual radio design is designed to support a second antenna configuration (yagi/single panel) through one additional (1) N-Type-Female coaxial port.

D. 5.8 GHz Broadband (Ethernet) Dual Radio (Integrated Panel)

Furnish a 5.8 GHz Broadband Ethernet Dual Radio Transceiver with a RJ-45 Ethernet 10/100 Base T connector (auto crossover) with an integrated 23 dBi gain panel antenna and Field Set-up Software. Ensure the dual radio design is designed to support a second antenna configuration (yagi/single panel) through one additional (1) N-Type-Female coaxial port. Provide Field Set-up Software with each radio.

E. Antenna Mounting Hardware Kit

Furnish an antenna mounting kit to support the antenna when attached to a metal pole, mast arm, or wood pole.

Ensure the Antenna Mounting Hardware Kit includes the following:

- 96" galvanized cable with stainless steel bolt with a nut and lock washer assembly on each end.
- Pole base plate accepts a 1 ½" NPT aluminum pipe and provides a surface that is a minimum of 6 ¾ inch long by 4 ¼" to provide contact with the surface of the pole. Ensure the pole base plate is designed to allow both ends of the 96" galvanized cable to be secured and tightened to the base plate. Furnish a stainless-steel set screw to secure the 1 ½" NPT aluminum pipe to the base plate.
- A 90 degree, die cast elbow with internal treads on both ends to accommodate 1 ½" NPT aluminum pipes. Furnish the elbow with a minimum of 1 stainless steel set screw on each end of the elbow for securing the threaded nipple and support pipes.
- Nipple Pipe: 1 ½" * 18" NPT long aluminum pipe, threaded on both ends.
- Support Pipe: 1 ½" * 24" NPT long aluminum pipe, threaded on 1 end with an end cap.

23.3. CONSTRUCTION METHODS

Perform a radio path Site Survey test before installing any equipment. All radio path site surveys shall be completed during full foliage conditions. Ensure the test evaluates the Signal Strength (dBm), Fade Margin (dB), Signal-to-Noise Ratio, Data Integrity (poll test), and a complete frequency spectrum scan. Ensure the radio path site survey test is performed using the supplied brand of radio equipment to be deployed. During the initial radio path signal strength test it may be determined that a repeater station may be necessary to complete the intended link. Provide the test results to the Engineer for review and approval. Submit copies of the test results and colored copies of the frequency spectrum scan along with an electronic copy of this information. The Engineer will

approve final locations of antennas and any necessary repeater stations. Install a coaxial cable – jumper with N-type connectors and additional antenna at locations where it is determined that a dual antenna configuration is necessary to accommodate communications in multiple directions.

Install the antenna in such a manner that avoids conflicts with other utilities (separation distances in accordance with the guidelines of the NESC) and as specified in the antenna manufacturer’s recommendations. Secure the antenna mounting hardware to the pole and route the coaxial cable such that no strain is placed on the N-Type Male coaxial connectors. On wood pole installations, bond the antenna mounting hardware to the pole ground using # 6 AWG bare copper wire using split bolt or compression type fitting.

Do not exceed the 1-inch bend radius of the coaxial cable as it traverses from the dual radio to the standalone antenna assembly. Properly ground and secure the arrestor in the cabinet. Permanently label all cables entering the cabinet. Ensure the POE injector for the radio system is **NOT** connected to the GFCI receptacle circuit located in the cabinet. Place a copy of all manufacturer equipment specifications and instruction and maintenance manuals in the equipment cabinet.

At certain locations it may be necessary to integrate the radio system with a fiber optic system. Follow the details shown in the fiber optic splice plans.

23.4. MEASUREMENT AND PAYMENT

Wireless Ethernet Radio System will be measured and paid for as the actual number of wireless radio systems furnished, installed, and accepted.

This item includes the appropriately sized antennas, radios, power supplies and injectors, disconnect/snap switches, signs, decals, interface cabling, coaxial cabling, coaxial cable connectors, and labeling. Any integration between the wireless radio system and a fiber optic network, installation materials and configuration software necessary to complete this work, including the radio path Site Survey test and warranties, will be incidental.

Payment will be made under:

Pay Item	Pay Unit
Wireless Ethernet Radio System.....	Each

24. SIGNAL CABINET FOUNDATIONS

24.1. DESCRIPTION

Furnish and install signal cabinet foundations and all necessary hardware.

Furnish either poured concrete foundations or preformed cabinet pad foundations and all necessary hardware. Obtain approval of foundation type.

24.2. MATERIAL

Furnish preformed cabinet pad foundation material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

Refer to Articles 100-4 (Portland Cement Concrete) and 1098-15 (Signal Cabinet Foundation) of the Standard Specifications.

24.3. CONSTRUCTION METHODS

Install signal cabinet foundations in compliance with all requirements of Section 1750-3 of the Standard Specifications.

24.4. MEASUREMENT AND PAYMENT

Signal Cabinet Foundation will be measured and paid as the actual number furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Signal Cabinet Foundation.....	Each

25. CONTROLLERS WITH CABINETS

25.1. DESCRIPTION

Furnish and install controllers with cabinets and all necessary hardware. Furnish all pole or foundation mounting hardware, detector sensor cards, external electrical service disconnects, one Corbin Number 2 cabinet key, one police panel key, conflict monitors, surge protection, grounding systems, AC/DC isolator cards and all necessary hardware.

25.2. MATERIAL

A. General

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

B. 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

Provide a Board Support Package (BSP) to the state and to any specified applications software manufacturer when requested by the state to facilitate the porting of application software.

C. 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

D. Type 170E Cabinets

1. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

2. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40° F to +185° F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....20,000A
- Occurrences (8x20µs waveform).....10 minimum @ 20,000A
- Maximum Clamp Voltage.....395VAC
- Operating Current.....15 amps
- Response Time.....< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (6 times, 8x20µs)
 - (Differential Mode).....400A
 - (Common Mode).....1,000A
- Occurrences (8x20µs waveform).....500 min @ 200A

Maximum Clamp Voltage

(Differential Mode @400A).....35V

(Common Mode @1,000A).....35V

Response Time.....< 5 nanoseconds

Maximum Capacitance.....35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20 μ s).....10,000AOccurrences (8x20 μ s waveform).....100 min @ 2,000A

Maximum Clamp Voltage.....Rated for equipment protected

Response Time.....< 1 nanosecond

Maximum Capacitance.....1,500 pF

Maximum Series Resistance.....15 Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20 μ s).....10,000AOccurrences (8x20 μ s waveform).....100 @ 2,000A

Maximum Clamp Voltage.....30V

Response Time.....< 1 nanosecond

Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20 μ s).....20,000A

Maximum Clamp Voltage.....350VAC

Response Time.....< 200 nanoseconds

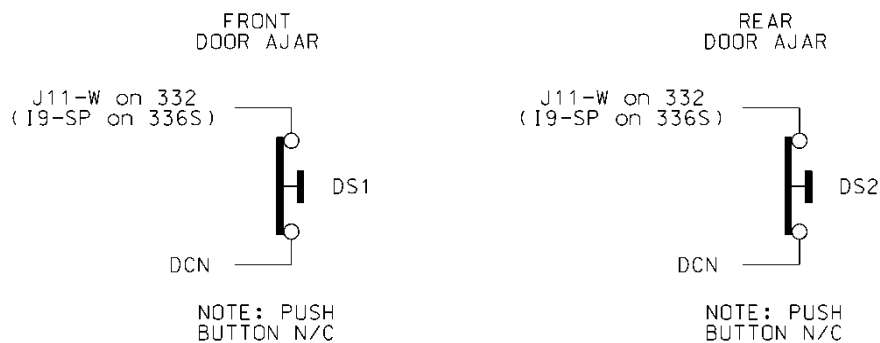
Discharge Voltage.....<200 Volts @ 1,000A

Insulation Resistance..... \geq 100 M Ω

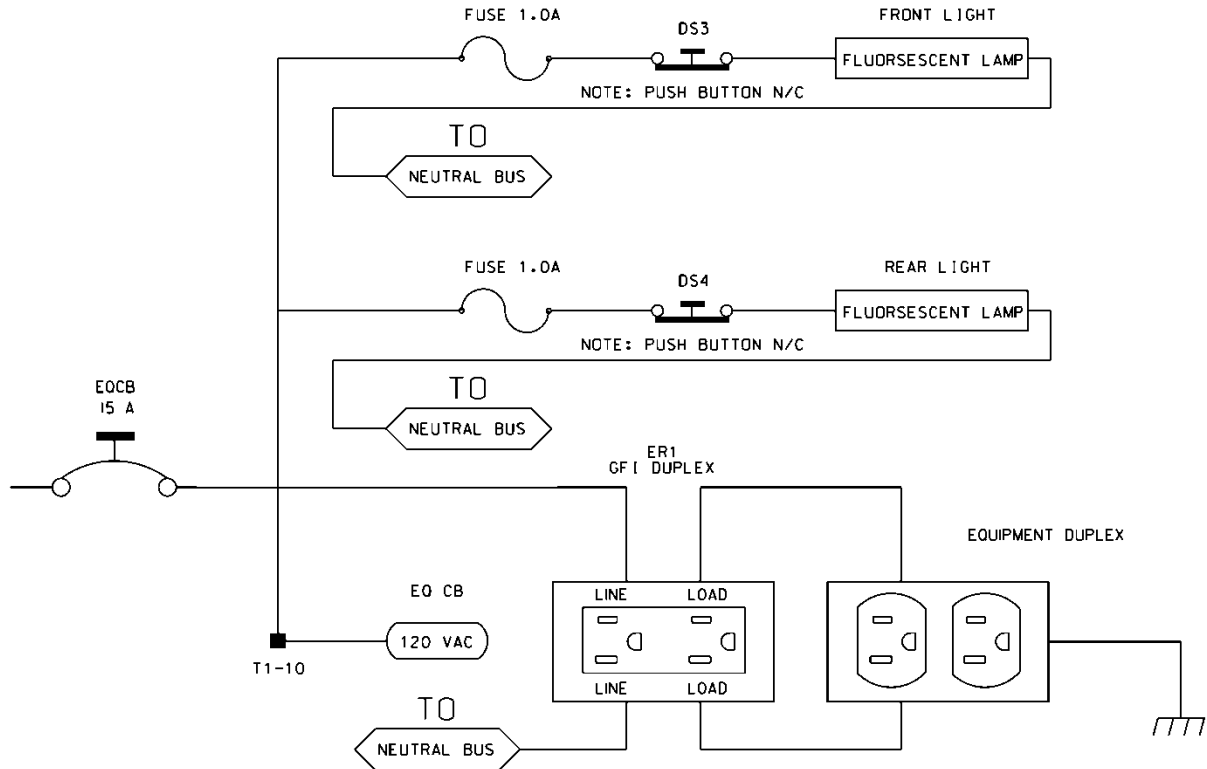
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16-watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15-amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. 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:

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 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.

PIN	P1		P2		P3	
	FUNCTION	CONN TO	FUNCTION	CONN TO	FUNCTION	CONN TO
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

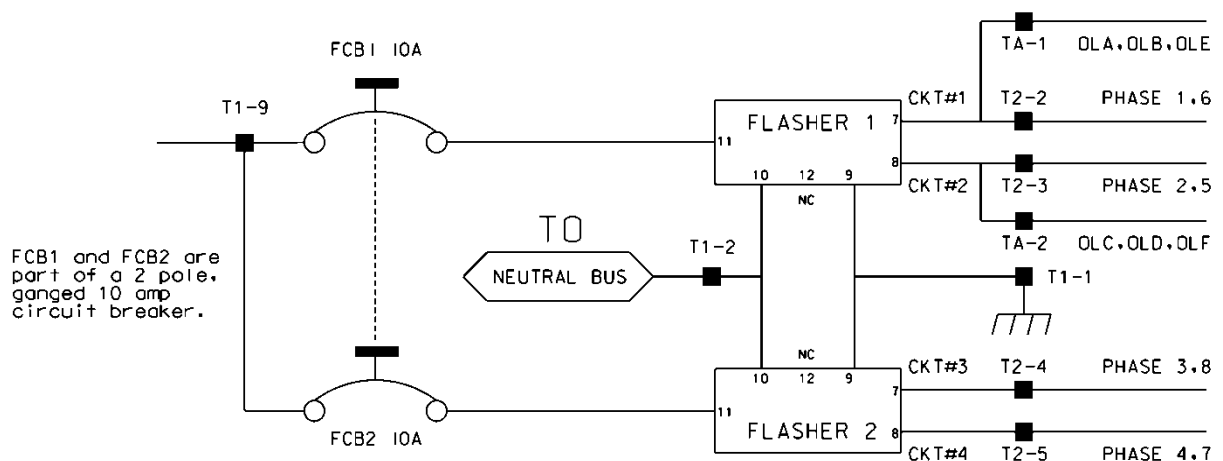
P20 Connector					
PIN	FUNCTION	CONN TO	PIN	FUNCTION	CONN TO
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four-pole relay and K2 on the PDA is a two-pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	FUNCTION
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	WATTAGE
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' *“Transportation Electrical Equipment Specifications”* dated March 12, 2009 with Erratum 1.

3. 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 cabinet shells with a painted finish that is black (Federal Standard 595C, Color Chip Number 27038). All steel components (including nuts, bolts, screws, etc.) shall have a shop painted finish coat. The finish coating shall be a six-stage chemical treatment for an electrostatically applied fusion bonded polyester epoxy coating. The polyester protective coating shall be one coat, minimum 4 mls thick, heat curable, thermosetting powdered coating.

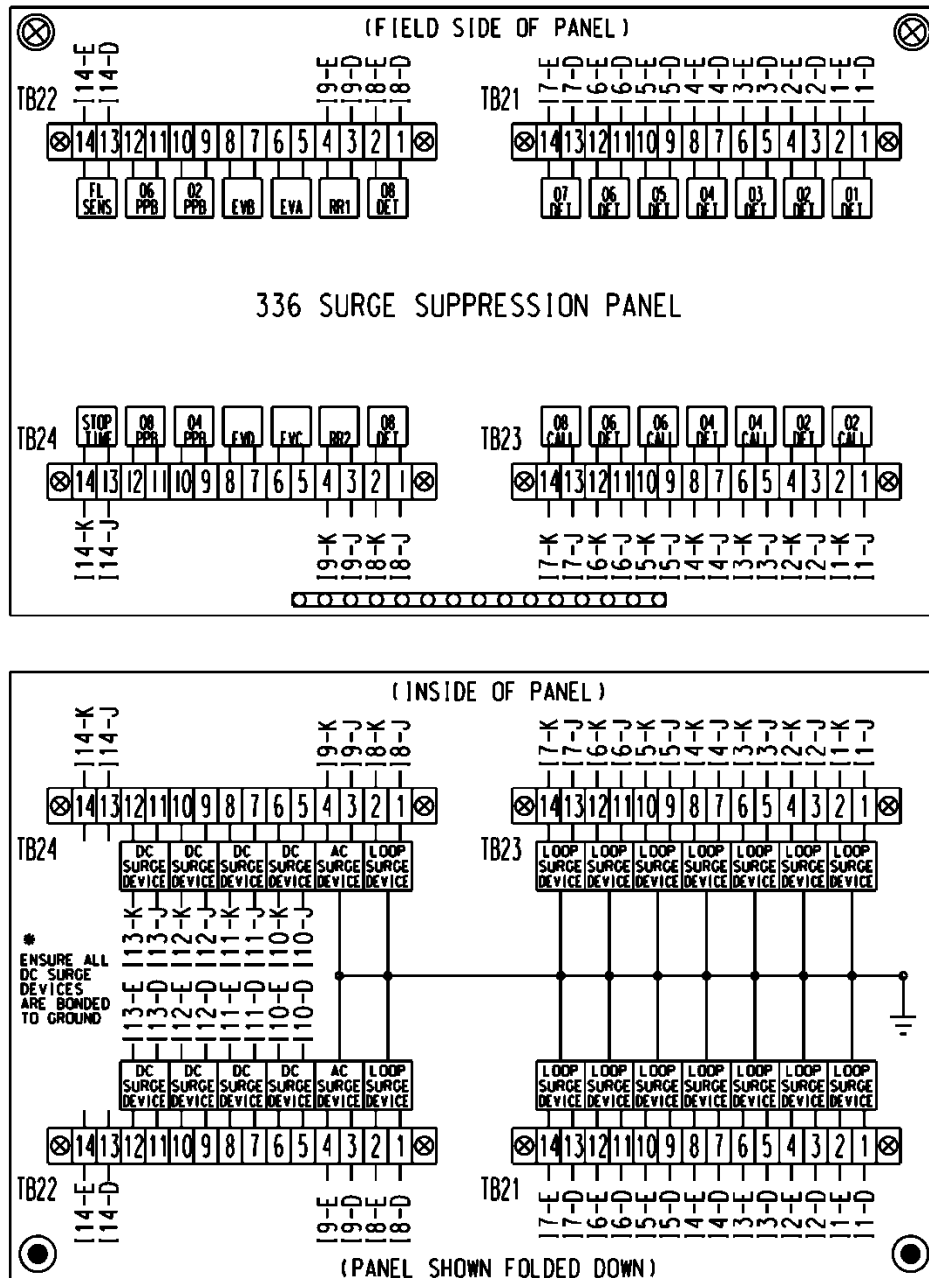
Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125-inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75-inch minimum diameter stainless steel handles with a minimum 0.5-inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For 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.



For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070L controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070L controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

4. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18-channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode) and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)

- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150 ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150 ms (210 mode).

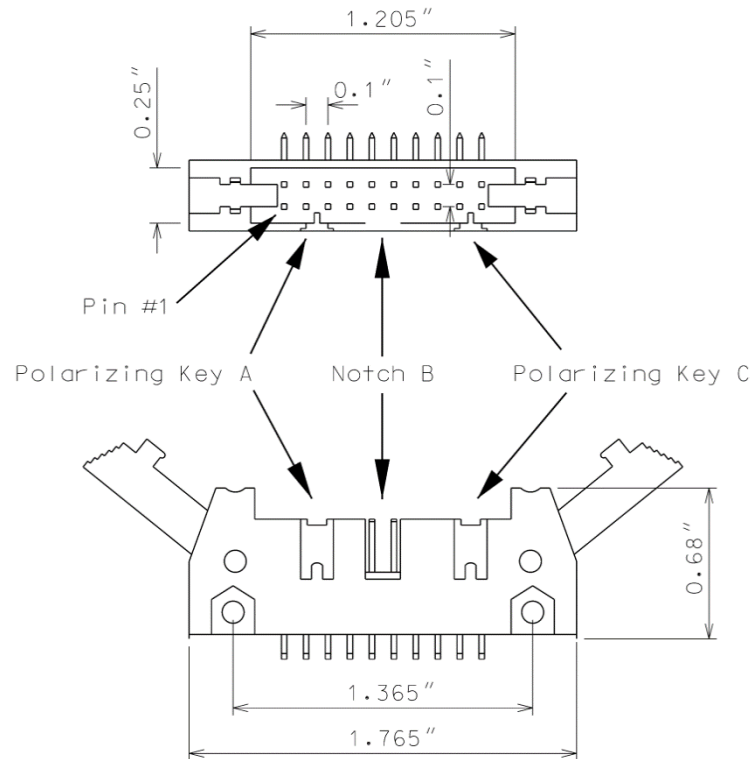
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17 ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered 'Active' at a voltage greater than 70 Vrms and 'Not Active' at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered 'Active' at a voltage less than 50 Vrms and 'Not Active' at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS' 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right-angle solder tails are designed for a 0.062" thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10" and pitch is 0.10". Ensure the mating length of the connector pins is 0.24". Ensure the pins are finished with gold plating 30μ" thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less than 250 ms. A Special Function input is undefined by these specifications and may or may not be sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an “on” condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an “off” condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an “on” condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an “off” condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS’ 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no “on” voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070 controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less than 700 ms when used with a 170 controller and 1200 ms when used with a 2070 controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:
 - a) Red Enable input to monitor is active (Red Enable voltages are “on” at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and
 - b) Neither Special Function 1 nor Special Function 2 inputs are active.

- c) Pin #EE (output relay common) is not active
2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1 -second accuracy). If a channel fails to detect an “on” signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an “on” signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.
 3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as “on” at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
 4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 Hz \pm 20% with a 50% duty cycle when the AC Line voltage falls below the “drop-out” level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the “restore” level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the “restore” level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 10 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 Hz \pm 20% with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the “restore” level. If the watchdog input has not made

5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel pair for the following fault conditions: Conflict, Flash Rate Detection, Red Fail, Dual Indication, and Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 9 Red	Channel 10 Red	Channel 11 Red	Channel 12 Red
Yellow Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Flashing Yellow Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

FYAc mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
Flashing Yellow Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green
Green Arrow	Channel 9 Green	Channel 9 Yellow	Channel 10 Green	Channel 10 Yellow

If a FYA channel pair is enabled for FYA operation, the conflict monitor will monitor the FYA logical channel pair for the additional following conditions:

1. **Conflict:** Channel conflicts are detected based on the permissive programming jumpers on the program card. This operation remains unchanged from normal operation except for the solid Yellow arrow (FYA clearance) signal.
2. **Yellow Change Interval Conflict:** During the Yellow change interval of the Permissive Turn channel (flashing Yellow arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active. These conflicting channels shall be determined by the program card compatibility programming of the Permissive Turn channel (flashing Yellow arrow). During the Yellow change interval of the Protected Turn channel (solid Green arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active as determined by the program card compatibility programming of the Protected Turn channel (solid Green arrow).
3. **Flash Rate Detection:** The conflict monitor unit shall monitor for the absence of a valid flash rate for the Permissive turn channel (flashing Yellow arrow). If the Permissive turn channel (flashing Yellow arrow) is active for a period greater than 1600 milliseconds, ensure the conflict monitor triggers and puts the intersection into flash. If the Permissive turn channel (flashing Yellow arrow) is active for a period less than 1400 milliseconds, ensure the conflict monitor does not trigger. Ensure the conflict monitor will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input. Provide a jumper or switch that will enable and disable the Flash Rate Detection function. Ensure that when the jumper is not present or the switch is in the OFF position the Flash Rate Detection function is enabled. Ensure that when the jumper is present or the switch is in the ON position the Flash Rate Detection function is disabled.
4. **Red Monitoring or Absence of Any Indication (Red Failure):** The conflict monitor unit shall detect a red failure if there is an absence of voltage on all four of the inputs of a FYA channel pair (RA, YA, FYA, GA).
5. **Dual Indications on the Same Channel:** The conflict monitor unit shall detect a dual indication if two or more inputs of a FYA channel pair (RA, YA, FYA, GA) are “on” at the same time.
6. **Short/Missing Yellow Indication Fault (Clearance Error):** The conflict monitor unit shall monitor the solid Yellow arrow for a clearance fault when terminating both the Protected Turn channel (solid Green arrow) interval and the Permissive Turn channel (flashing Yellow arrow) interval.

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

For conflict monitors used within an Ethernet communications system, provide a conflict monitor with an Ethernet 10/100 Mbps, RJ-45 port for data communication access to the monitor by a local notebook computer and remotely via a workstation or notebook computer device connected to the signal system local area network. The Ethernet port shall be electrically isolated from the conflict monitor's electronics and shall provide a minimum of 1500 Vrms isolation. Integrate monitor with Ethernet network in cabinet. Provide software to retrieve the time and date from a network server in order to synchronize the on-board times between the conflict monitor and the controller. Furnish and install the following Windows based, graphic user interface software on workstations and notebook computers where the signal system client software is installed: 1) software to view and retrieve all event log information, 2) software that will search and display a list of conflict monitor IP addresses and IDs on the network, and 3) software to change the conflict monitor's network parameters such as IP address and subnet mask.

For non-Ethernet connected monitors, provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070 controller or to a Department-furnished laptop computer. Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070). Furnish and connect a serial cable from the conflict monitor's DB-9 connector to Comm Port 1 of the 2070 controller. Ensure conflict monitor communicates with the controller. Provide a Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	Function	I/O
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

MONITOR BOARD EDGE CONNECTOR

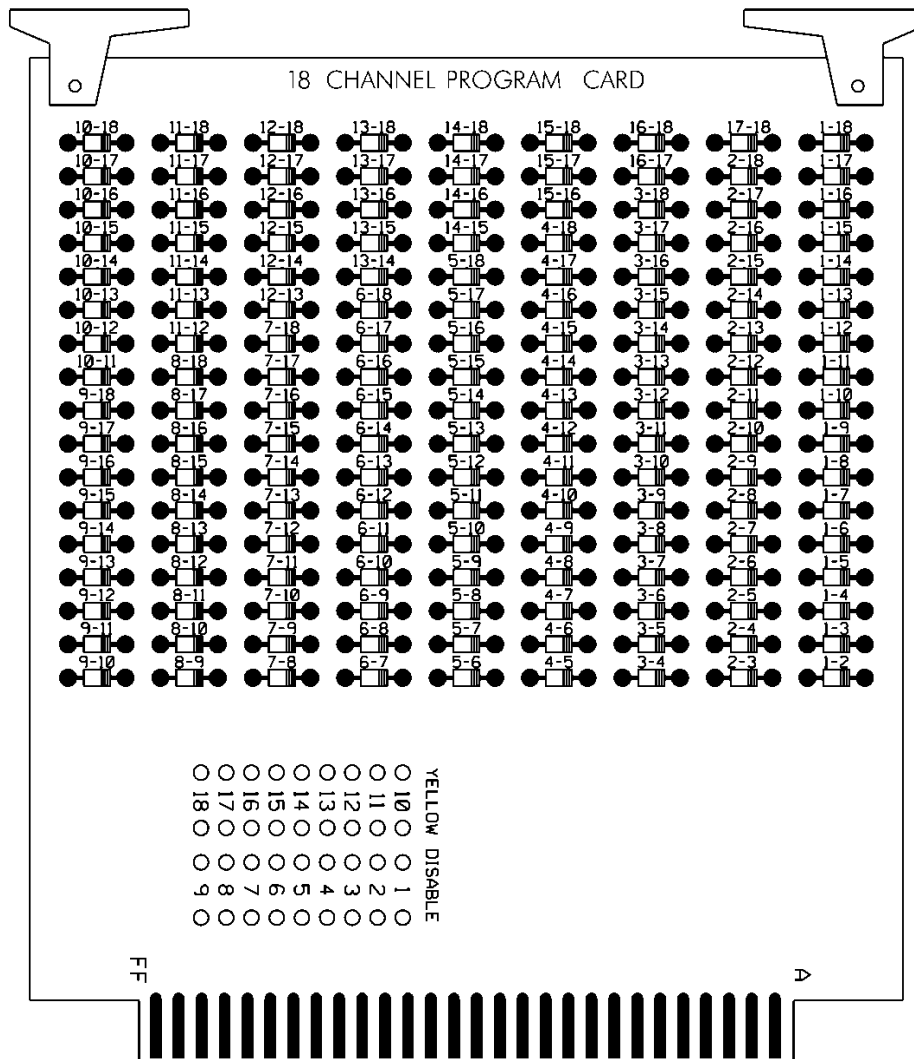
Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output, Side #2, Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



5. Preemption and Sign Control Box

Provide preemption and sign control box to operate in a Model 332 and Model 336S cabinet. Provide hardware to mount the box to the cage of the cabinet to ensure the front side is facing the opposite side of the cabinet. Furnish the material of the box from a durable finished metallic or thermoplastic case. Ensure the size of the box is not greater than 7(l) x 5(w) x 5(d) inches. Ensure that no modification is necessary to mount the box on the cabinet cage.

Provide the following components in the preemption and sign control box: relays, fuses, terminal blocks, MOVs, resistor, RC network, lamp, and push button switch.

Provide UL Listed or Recognized relay K1 as a DPDT enclosed relay (120 VAC, 60 Hz coil) with an 8-pin octal-style plug and associated octal base. Provide contact material made of AgCdO with a 10 amp, 240 VAC rating. Ensure the relay has a specified pickup voltage of 102 VAC.

Provide relay SSR1 as a Triac SPST normally open solid-state relay that is rated for 120 VAC input and zero-crossing (resistive load) 25 amp @ 120 VAC output. Ensure the relay turns on at 90 Vrms within 10 ms and turns off at 10 Vrms within 40 ms. Ensure the relay has physical

characteristics as shown in the wiring detail in Figure 1. Provide 4 terminal screws with saddle clamps.

Provide fuses F1 and F2 as a UL Listed ¼" x 1-1/4" glass tube rated at 250 volts with a 10kA interrupting rating. Ensure F1 non-delay (fast-acting) and F2 slow-blow (time-delay) fuses have a maximum opening times of 60 minutes and 120 seconds for currents of 135 and 200 percent of the ampere rating, respectively. Ensure F2 slow-blow (time-delay) fuses have a minimum opening times of 12 seconds at 200 percent of the ampere rating. Provide fuse holders that are UL Recognized panel-mounted holders rated 250V, 15 ampere minimum with bayonet-type knobs which accept ¼" x 1-1/4" glass tube fuses.

Provide terminal blocks that are rated for 300V and are made of electrical grade thermoplastic or thermosetting plastic. Ensure each terminal block is of closed back design and has recessed-screw terminals with molded barriers between terminals. Ensure each terminal block is labeled with a block designation. Ensure each terminal is labeled with the function and a number.

Provide 3/4-inch diameter radial lead UL-recognized metal oxide varistors (MOVs) that have electrical performance as 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

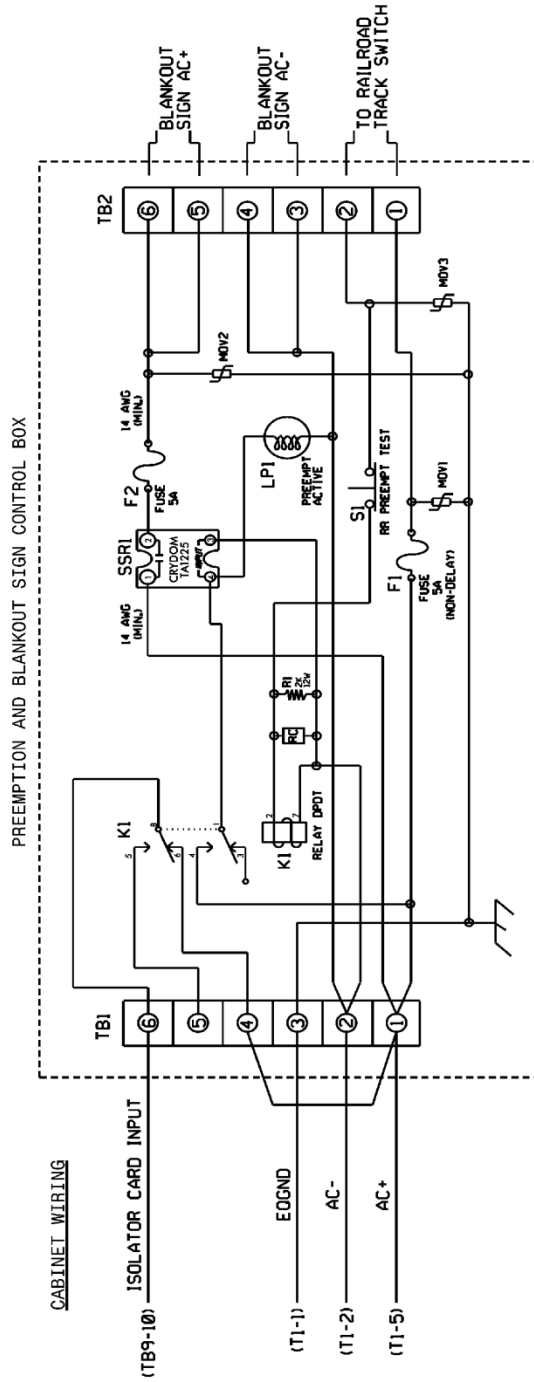
Provide resistor R1 as a 2K ohm, 12 watt, wirewound resistor with tinned terminals and attaching leads. Ensure the resistor is spaced apart from surrounding wires.

Provide a LED or incandescent lamp that has a voltage rating of 120 VAC with a minimum life rating at 50,000 hours.

Wire the preemption and sign control box as shown in Figure 1.

RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)



NOTES

1. RELAY K1 IS SHOWN IN THE ENERGIZED (PREEMPT NOT ACTIVE) NORMAL OPERATION STATE.
2. AC ISOLATOR CARD SHALL ACTIVATE PREEMPTION UPON REMOVAL OF AC+ FROM INPUT (AS SHOWN ABOVE). THIS IS ACCOMPLISHED BY SETTING TYPE 252 AC ISOLATOR CARD TO INVERTED OPERATION.

FRONT VIEW

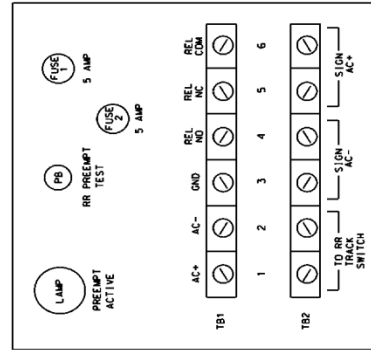


Figure 1

E. 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.

25.3. CONSTRUCTION METHODS**A. General**

Remove existing controllers and cabinets where required. Remove maintenance diary from cabinet and place in new cabinet. Take existing equipment out of service only at the time directed.

Locate new cabinets so as not to obstruct sight distance of vehicles turning on red.

Install controllers, cabinets, detector sensor units and hardware that provide required phasing, color sequence, flash sequence, interconnection, railroad clearance and preemption and emergency vehicle clearance and preemption.

Stencil signal inventory number on cabinet side facing roadway. Use 3" white characters.

Provide external electrical service disconnect at all new and existing cabinet locations unless otherwise specified.

Do not program controller for late night flashing operation at railroad preemption installations. For all other installations, do not program controller for late night flashing operation unless otherwise directed. Ensure all signal heads for same approach flash concurrently during flashing operation.

Provide serial number and cabinet model number for each new controller and controller cabinet installed.

Install pole mounted cabinets so height to cabinet middle is 4 ft.

Activate controllers with proposed phasing and timing.

B. Workshop

Provide enclosed workshop to set up and test new controllers and cabinets before installation. Locate workshop within Division responsible for project administration. Ensure workshop provides protection from weather and sufficient space to house 2 test observers, all necessary test equipment and material, controllers, and cabinets.

Configure and test each controller and cabinet to match the proposed signal design. Ensure all equipment furnished and installed or modified by the Contractor at each location operates in full compliance with the plans and project special provisions. Test each controller and cabinet for proper color sequence, flashing operation, phase timings, preemption, coordination, and conflict monitor programming or malfunction management unit programming. Ensure that simultaneous conflicting phase outputs will cause the cabinet to revert to flashing operation. For intersections with any type of preemption, submit a completed Preemption Test Procedure Checklist. The checklist is located on the Department's website at <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx>.

Test the cabinet and controller for eight hours minimum. Following this test and before installation, the Engineer will inspect the equipment in operation. The Engineer may require other tests to ensure proper operation. These tests shall be at no additional cost to the Department.

C. Railroad Preemption

Where railroad preemption is required, coordinate all work with the railroad company. Do not place signals into operation until signal equipment has been interconnected with required railroad-highway crossing devices and railroad preemption is working properly. Ensure preemption sequences begin immediately after activation of train detection.

Contact and coordinate with the railroad company to schedule interconnection of the signal to the railroad controller cabinet. Install lead-in cable from the signal controller cabinet to a railroad company furnished and installed lockable junction box. Interconnection will be made by the railroad company.

Provide fail-safe operation such that removal of voltage from the railroad side of the isolation relay will initiate the railroad preemption sequence.

D. Vehicle Detection

Where required, preserve the existing video and/or microwave radar vehicle detection systems functionality during signal cabinet change-outs or other cabinet modifications by reusing and/or providing all necessary equipment and hardware. This work shall be considered incidental to the installation of new signal cabinets.

E. Audible Pedestrian Signals

Where required, preserve the existing audible pedestrian signal functionality during signal cabinet change-outs or other cabinet modifications by reusing and/or providing all necessary equipment and hardware. This work shall be considered incidental to the installation of new signal cabinets.

25.4. MEASUREMENT AND PAYMENT

Controllers with Cabinet (____) will be measured and paid as the actual number of each type of controllers with cabinets furnished, installed, and accepted.

Detector Card (____) will be measured and paid as the actual number furnished, installed, and accepted.

No measurement will be made of conflict monitors, external electrical service disconnects, grounding systems, meter bases, painted finishes, and workshop as these will be incidental to furnishing and installing controllers with cabinets.

No measurement will be made for the removal of existing signal cabinets or removal of existing signal controllers as this will be incidental to the installation of the new signal cabinet.

Payment will be made under:

Pay Item	Pay Unit
Controller with Cabinet and Aux File (2070LX, 332 Base Mounted)	Each
Detector Card (2070L)	Each

26. VEHICLE PREEMPTION SYSTEM

26.1. DESCRIPTION

At locations shown in the Signal Plans the Contractor shall furnish, install, and implement GPS-based vehicle preemption systems.

Coordinate vehicle preemption work with the Engineer and proper operating authority.

26.2. MATERIAL

A. General

Material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

B. System Functionality

The vehicle preemption system shall provide the following features and functionality:

- The system shall be GPS-based and provide vehicle-to-intersection communications using 2.4 GHz spread spectrum radio transceivers with a minimum range of 2,000 feet. No infrared or cellular communications shall be used.
- The system shall provide for high and low levels of priority.
- The system shall allow each vehicle to have a unique identification code.

C. Intersection Equipment

Furnish a GPS radio for the vehicle preemption system that is an integrated stand-alone unit consisting of a GPS receiver with antenna and 2.4 GHz spread spectrum transceiver with antenna. The transceiver shall receive and process data being transmitted by equipped vehicle within radio range. This data shall include vehicle location, heading, and speed.

Furnish a phase selector for the vehicle preemption system that is card-based and can be installed directly in the input file of the traffic signal cabinet. The phase selector shall be Ethernet-enabled for integration with the signal system communications network

Furnish cabling to connect the GPS radio and phase selector per the manufacturer's recommendation. All cabling shall be outdoor rated and suitable for lashing to existing signal cable or installed in existing underground conduit, vertical risers, or metal pole raceways.

D. Test Vehicle Equipment

Furnish test vehicle equipment that consists of a GPS receiver with antenna and 2.4 GHz spread spectrum transceiver with antenna. The test equipment shall be fully compatible with the intersection equipment and central management software being installed.

E. Software

Furnish central management software that monitors the status of the vehicle preemption system in real-time. The software shall archive preempt data and generate activity logs and user-defined reports. The software shall also allow for the remote configuration and diagnostics of the intersection equipment.

26.3. CONSTRUCTION METHODS

A. General

Install and integrate all vehicle preemption system equipment according to manufacturer’s recommendations.

Vehicle equipment for the system will be furnished and installed by others following acceptance of the intersection equipment.

B. Intersection Equipment

Install the GPS radio on the exterior of the traffic signal cabinet and routing cabling to the phase selector using a method approved by the Engineer.

Integrate and program the phase selector according to the Signal Plans.

The Contractor shall be responsible for approach mapping at the intersection level.

C. Test Vehicle Equipment

Provide test vehicle equipment to the Engineer.

D. Software

Install the central management software on workstations in the TOC as shown on the block diagram in the Plans. Integrate the software clients with the signal system communications network to monitor all intersection preemption equipment installed under this Project.

26.4. MEASUREMENT AND PAYMENT

Vehicle Preemption System Intersection Equipment will be measured and paid as the actual number of intersections where GPS radios and phase selectors are furnished, installed, and accepted.

Vehicle Preemption System Software will be paid at the contract lump sum price. This shall include furnishing, installing, configuring, and testing the software.

No measurement will be made for cabling, integration, programming, radio surveys, testing, test vehicle equipment, or any other activities required to establish a fully functioning vehicle preemption system as this will be considered incidental to the intersection equipment and software.

Payment will be made under:

Pay Item	Pay Unit
Vehicle Preemption System Intersection Equipment	Each
Vehicle Preemption System Software	Lump Sum

27. MODIFY CABINET FOUNDATIONS

27.1. DESCRIPTION

Where approved by the Engineer, install conduit entrances into existing foundations in accordance with the plans and specifications. Modify existing foundations in accordance with the plans and specifications.

27.2. MATERIAL

Material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Refer to Articles 100-4 (Portland Cement Concrete) and 1098-15 (Signal Cabinet Foundation) of the Standard Specifications.

27.3. CONSTRUCTION METHODS

Modify signal cabinet foundations in compliance with all requirements of Section 1752-3 of the Standard Specifications.

27.4. MEASUREMENT AND PAYMENT

Conduit Entrance into Existing Foundation will be measured and paid as the actual number of conduit entrances drilled into existing cabinet foundations furnished, installed, and accepted.

Modify Foundation for Controller Cabinet will be measured and paid as the actual number of existing cabinet foundations modified and accepted.

No measurement or payment will be made for rotating the signal cabinet foundation on an existing cabinet foundation that is not being modified.

Payment will be made under:

Pay Item	Pay Unit
Conduit Entrance into Existing Foundation.....	Each
Modify Foundation for Controller Cabinet.....	Each

28. CABINET BASE ADAPTER/EXTENDER

28.1. DESCRIPTION

Furnish and install cabinet base adapters and extenders with all necessary hardware for Type 170 cabinets.

28.2. MATERIAL

A. General

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

Refer to Article 1098-16 (Cabinet Base Adapter or Extender) of the Standard Specifications.

Furnish cabinet base adapters and extenders with a painted finish that is black (Federal Standard 595C, Color Chip Number 27038). All steel components (including nuts, bolts, screws, etc.) shall have a shop painted finish coat. The finish coating shall be a six-stage chemical treatment for an electrostatically applied fusion bonded polyester epoxy coating. The polyester protective coating shall be one coat, minimum 4 mls thick, heat curable, thermosetting powdered coating.

B. Integrated Base Adapter

Furnish cabinet base adapters with an integrated electrical service meter and disconnect. The integrated unit shall provide physical separation and protection between electrical service equipment and cabling and signal cabinet equipment and cabling.

The integrated unit shall meet all requirements for Cabinet Base Adapter and Electrical Service in these Project Special Provisions.

28.3. CONSTRUCTION METHODS

Install cabinet base adapters and extenders in compliance with all requirements of Section 1753-3 of the Standard Specifications.

Coordinate with the City of Gastonia and Gastonia Electric prior to and during the installation of integrated cabinet base adapters.

28.4. MEASUREMENT AND PAYMENT

Cabinet Base Adapters will be measured and paid as the actual number furnished, installed, and accepted.

Integrated Cabinet Base Adapters will be measured and paid as the actual number furnished, installed, and accepted.

Cabinet Base Extenders will be measured and paid as the actual number furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Cabinet Base Adapter	Each
Integrated Cabinet Base Adapter	Each
Cabinet Base Extender	Each

29. ELECTRICAL SERVICE

29.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service pedestals, poles, and meter base/disconnect combination panels to expedite the power service connections. Comply with the current National Electrical Code (NEC), the current 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 Signal Supervisor from NCDOT Division 12 Traffic Services.

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.

29.2. MATERIAL

A. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum of four (4) spaces in the disconnect. Furnish a single pole 15A circuit breaker with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Place barriers so that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Furnish NEMA Type 3R combinational panel rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meets the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600-volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load, and Neutral Terminals accept 4/0 AWG and smaller Copper/Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified.

Furnish 1.25" watertight hub for threaded rigid conduit with meter base.

At the main service disconnect, furnish and install UL-approved lightning arrestors that meet the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single Phase, 3 wire
Maximum current	100,000 amps
Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground wire	Separate

B. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects when the meter base/disconnect combination panel is not adjacent or in the same intersection quadrant as the equipment cabinet. Furnish single pole 15A circuit breaker. 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. 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.

D. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper feeder conductors with THWN rating for supplying power to CCTV field equipment cabinets. Provide conductors with black or red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

E. Grounding System

Furnish 5/8"x10' copper clad steel grounding electrodes (ground rods) and #4 AWG solid bare copper conductors for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

29.3. 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. Route the feeder conductors from the meter base/disconnect to the equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

C. Electrical Service Disconnect

Install equipment cabinet disconnects and circuit breakers as needed. 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

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 required by the load and distance. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

E. 3-Wire Copper Feeder Conductors

Install 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the field equipment cabinets. Size the conductors as required by the load and distance. 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.

29.4. MEASUREMENT AND PAYMENT

New Electrical Service will be measured and paid as the actual number of services furnished, installed, and accepted.

Modify Existing Electrical Service will be measured and paid as the actual number of existing services modified and accepted.

No measurement will be made of meter bases, service disconnects, breakers, lightning arrestors, underground and exposed vertical conduit runs to the cabinet, acquisition of service fees, electrical service conductors, ground rods, ground wire, irreversible mechanical crimping tool, 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.

No separate payment will be made for electrical services with different wire sizes required.

Payment will be made under:

Pay Item	Pay Unit
New Electrical Service.....	Each
Modify Existing Electrical Service.....	Each

30. DIGITAL CCTV CAMERA ASSEMBLY

30.1. 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 City of Gastonia's Traffic Operations Center (TOC), the Region and the Statewide Traffic Operations Center, and the Metrolina Regional Traffic Management Center. 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.

30.2. 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.

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: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
 - Video 1: H.264 (Main Profile, at minimum)
 - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4, IPv6
- 130 db Wide Dynamic Range (WDR)

The video camera shall allow for the simultaneous encoding and transmission of the two digital video streams, one in H.264 format (high-resolution) and one in H.264 or MJPEG format (low-resolution).

Initially use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The 10/100BaseTX port shall support half-duplex or full-duplex and provide auto negotiation and shall be initially configured for full-duplex.

The camera unit shall be remotely manageable using standard network applications via web browser interface administration. Telnet or SNMP monitors shall be provided.

C. Camera Housing

Furnish new dome style enclosure for the CCTV assembly. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of

weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass. The pendant must meet NEMA Type 4X, IP66 rating and use 1-1/2-inch NPT thread. The sustained operating temperature must be -50 to 60C (-58 to 144F), condensing temperature 10 to 100% Relative Humidity (RH).

D. Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit must be integral to the high-performance integrated dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units must meet or exceed the following specifications:

- Pan: continuous 360 Degrees rotation
- Tilt: up/down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: minimum of 128 presets
- Low latency for improved Pan and Tilt Control
- FCC, Class A; UL/cUL Listed

E. Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units must be built into the camera housing and require no additional equipment to transmit encoded video over IP networks.

Encoders must have the following minimum features:

- Network Interface: Ethernet 10/100Base-TX (RJ-45 connector)
- Protocols: IPv4, Ipv6, HTTP, UpnP, DNS, NTP, RTP, RTSP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface
- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps – 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

F. Control Receiver/Driver

Provide each new camera unit with a control receiver/driver that is integral to the CCTV dome assembly. The control receiver/driver will receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan/tilt unit, camera controls, and motorized lens. As a minimum, the control receiver/drivers must provide the following functions:

- Zoom in/out
- Automatic focus with manual override

- Tilt up/down
- Automatic iris with manual override
- Pan right/left
- Minimum 128 preset positions for pan, tilt, and zoom, 16 Preset Tours, 256 Dome Presets
- Up to 32 Window Blanks.

In addition, each control receiver/driver must accept status information from the pan/tilt unit and motorized lens for preset positioning of those components. The control receiver/driver will relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver/driver must accept “goto” preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan/tilt and motorized zoom lens to the correct preset position. The preset commands from the camera control unit will consist of unique values for the desired pan, tilt, zoom, and focus positions.

G. Electrical

The camera assembly shall support Power-over-Ethernet (PoE) in compliance with IEEE 802.3. Provide any external power injector that is required for PoE with each CCTV assembly.

H. CCTV Camera Attachment to Pole

Furnish and install an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer.

Furnish CCTV attachments that allow for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather tight, seal that does not allow moisture to enter the enclosure.

Furnish a CCTV Camera Attachment Assembly that can withstand wind loading at the maximum wind speed and gust factor called for in these Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

I. Riser

Furnish material meeting the requirements of Section 1091-3 and 1098-4 of the 2018 Standard Specifications for Roads and Structures. Furnish a 1” riser with weatherhead for instances where the riser is only carrying an Ethernet cable. For installations where fiber optic cable is routed to the cabinet through a 2” riser with heat shrink tubing the Contractor may elect to install the Ethernet cable in the same riser with the fiber cable.

J. Data Line Surge Suppression

Furnish data line surge protection devices (SPD) shall meet the following minimum requirements:

- UL497B
- Service Voltage: < 60 V
- Protection Modes: L-G (All), L-L (All)
- Response Time: <5 nanoseconds
- Port Type: Shielded RJ-45 IN/Out
- Clamping Level: 75 V
- Surge Current Rating: 20 kA/Pair

- Power Handling: 144 Watts
- Data Rate: up to 10 GbE
- Operating Temperature: -40° F to + 158° F
- Standards Compliance: Cat-5e, EIA/TIA 568A and EIA/TIA 568B
- Warranty: Minimum of 5-year limited warranty

The data line surge protector shall be designed to operate with Power Over Ethernet (POE) devices. The SPD shall be designed such that when used with shielded cabling, a separate earth ground is not required. It shall be compatible with Cat-5e, Cat 6, and Cat-6A cabling.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections.

K. POE Injector

Furnish POE Injectors meeting the following minimum performance requirements and that is compatible with the CCTV Camera and Ethernet Switch provided for the project.

- Working temp/humidity: 14° F to 131° F/maximum 90%, non-condensing
- Connectors: Shielded RJ-45, EIA 568A and EIA 568B
- Input Power: 100 to 240 VAC, 50 to 60 Hz
- Pass Through Data Rates: 10/100/1000 Mbps
- Regulatory: IEEE 802.3at (POE)
- Number of Ports: 1 In and 1 Out
- Safety Approvals: UL Listed

Ensure the POE Injector is designed for Plug-and-Play installation, requiring no configurations and supports automatic detection and protection of non-standard Ethernet Terminal configurations.

30.3. 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 as shown in the plans, at a height to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height is 40 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, or as noted in the plans.

Mount CCTV cameras on the side of poles nearest intended field of view. Avoid occluding the view with the pole.

Install the data line surge protection device and POE Injector in accordance with the manufacturer's recommendations.

Install the riser in accordance with Section 1722-3 of the 2018 Standard Specifications for Roads and Structures. Install the Ethernet cable in the riser from the field cabinet to the CCTV camera.

B. Electrical and Mechanical Requirements

Install an “Air Terminal and Lightning Protections System” in accordance with the Air Terminal and Lightning Protection System Specification for the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

30.4. GENERAL TEST PROCEDURE

Test the CCTV Camera and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested.
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria.
- An estimate of the test duration and a proposed test schedule.
- A data form to record all data and quantitative results obtained during the test.
- A description of any special equipment, setup, manpower, or conditions required by the test.

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor’s responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

30.5. COMPATIBILITY TESTS**A. CCTV System**

Compatibility Tests are applicable to CCTV cameras that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

30.6. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)**A. CCTV System**

Final CCTV locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the camera assembly field site in accordance with the test plans and in the presence of the Engineer. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

➤ Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the camera, PTZ, camera control receiver, and control cabinet.
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the camera control address.

- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.
- Ensure camera field of view is adjusted properly and there are no objects obstructing the view.
- Ensure camera lens is dust-free.
- Ensure risers are bonded and conduits entering cabinets are sealed properly.
- Lightning arrestor bonded correctly.

➤ **Central Operations Testing**

- Interconnect the CCTV Camera's communication interface device with one of the following methods as depicted on the plans:
 - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- OR
- to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

30.7. MEASUREMENT AND PAYMENT

Digital CCTV Camera Assembly will be measured and paid as the actual number of digital CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for electrical cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, PoE Injectors, 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:

Pay Item	Pay Unit
Digital CCTV Camera Assembly	Each

31. CCTV FIELD EQUIPMENT CABINET

31.1. DESCRIPTION

For standalone CCTV Camera installations, furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

The cabinet housing must conform to Sections 6.2.2 (Housing Construction), 6.2.3 (Door Latches and Locks), 6.2.4 (Housing Ventilation), and 6.2.5 (Hinges and Door Catches) of the CALTRANS TSCES. Do not equip the cabinet housings with a police panel.

The cabinet cage must conform to Section 6.3 of the CALTRANS TSCES.

Terminal blocks on the PDA #3 Assembly have internal wiring for the Model 200 switch pack sockets. Do not use terminal blocks on PDA #3 as power terminals for cabinet devices. Do not furnish cabinet with "Input Panels" described in Section 6.4.7.1 of the TSCES. Do furnish cabinet with "Service Panels" as described in Section 6.4.7.1 of the TSCES and as depicted on drawing TSCES-9 in the TSCES. Use service panel #2.

Do not furnish cabinets with C1, C5, or C6 harness, input file, output file, monitor units, model 208 unit, model 430 unit, or switch packs.

Furnish terminal blocks for power for cabinet CCTV and communications devices as needed to accommodate the number of devices in the cabinet.

Furnish all conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment and terminate conduit in the equipment cabinet.

31.2. MATERIALS

A. Shelf Drawer

Provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent in the equipment cabinet. Furnish a pullout drawer that extends a minimum of 14 inches that is capable of being lifted to gain access to the interior of the drawer. Minimum interior dimensions of the drawer are to be 1 inch high, 13 inches deep, and 16 inches wide. Provide drawers capable of supporting a 40-pound device or component when fully extended.

B. Cabinet Light

Each cabinet must include two (2) fluorescent lighting fixtures (one front, one back) mounted horizontally inside the top portion of the cabinet. The fixtures must include a cool white lamp and must be operated by normal power factor UL-listed ballast. A door-actuated switch must be installed to turn on the applicable cabinet light when the front door or back door is opened. The lights must be mounted not to interfere with the upper door stay.

C. Surge Protection for System Equipment

Each cabinet must be provided with devices to protect the CCTV and communications equipment from electrical surges and over voltages as described below.

1. Main AC Power Input

Each cabinet must be provided with a hybrid-type, power line surge protection device mounted inside the power distribution assembly. The protector must be installed between the applied line voltage and earth ground. The surge protector must be capable of reducing the effect of lightning transient voltages applied to the AC line. The protector must be mounted inside the Power Distribution Assembly housing facing the rear of the cabinet. The protector must include the following features and functions:

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must be provided with the following terminals:
 - Main Line (AC Line first stage terminal).
 - Main Neutral (AC Neutral input terminal).
 - Equipment Line Out (AC line second state output terminal, 19 amps).
 - Equipment Neutral Out (Neutral terminal to protected equipment).
 - GND (Earth connection).
- The Main AC line in and the Equipment Line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid-state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must have an MOV similar solid-state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment.

2. Ground Bus

Provide a neutral bus that is not connected to the earth ground or the logic ground anywhere within the cabinet. Ensure that the earth ground bus and the neutral ground bus each have ten compression type terminals, each of which can accommodate wires ranging from number 14 through number 4 AWG.

3. Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output

Output Power Capacity	480 Watts / 750 VA
Max Configurable Power	480 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5:1
Waveform Type	Sine wave
Output Connections	(4) NEMA 5-15R

Input

Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V

Battery Type

Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.

Typical recharge time	2 hours
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Communications & Management

Interface Port(s)	DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating	480 Joules
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Environmental

Operating Environment	-32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%

Conformance

Regulatory Approvals

FCC Part 15 Class A, UL 1778

31.3. CONSTRUCTION METHODS

A. General

For each field equipment cabinet installation, use stainless steel banding or other methods approved by the Engineer to fasten the cabinet to the pole. Install field equipment cabinets so that the height to the middle of the enclosure is 4 feet from ground level. No risers shall enter the top or sides of the equipment cabinet.

Install all conduits, condulets, and attachments to equipment cabinets in a manner that preserves the minimum bending radius of cables and creates waterproof connections and seals.

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

31.4. MEASUREMENT AND PAYMENT

Field Equipment Cabinet will be measured and paid as the actual number of CCTV equipment cabinets furnished, installed and accepted.

No payment will be made for the UPS, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, or any other equipment or labor required to install the field equipment cabinet and integrate the cabinets with the CCTV equipment.

Payment will be made under:

Pay Item	Pay Unit
Field Equipment Cabinet	Each

32. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

32.1. 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.

32.2. 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.

32.3. Construction Methods

A. Wood Pole

Install the vertical air terminal base approximately 12” below the top of the wood pole and install the air terminal to the threaded connection on the base. Install a ½” copper tube strap (conduit clamp) over the air terminal, 6” from the top of the pole. Additionally, secure the copper lightning conductor under both 5/16” diameter cap screws located on the base. Install an additional ½” copper tube strap (conduit clamp) over the bare copper lightning conductor, 6” below the air terminal base. Locate the ¼” mounting hole on the vertical air terminal base and install a ¼” by 3” (minimum) long lag bolt through the base and into the wood pole to support the air terminal assembly.

Route the bare copper lightning conductor to maintain maximum horizontal separation from any risers that traverse up the pole. Secure the bare copper lightning conductor to the pole on 24” centers using copper cable clips. From the bottom of the pole (ground level) install a 2” by 10’ long PVC U-Guard over the bare copper lightning conductor to protect the cable from vandalism.

B. Metal Pole

Install two (2) stainless steel air terminal rod clamps to the side of the metal pole structure starting at 6” below the top of the pole with the second air terminal clamp 12” from the top of the pole (approximately 6” of separation between the 2 clamps). Secure each air terminal rod clamp to the pole structure with two (2) stainless steel banding clamps. Install the air terminal between the horizontal support arms on each air terminal rod clamp and tighten the bolts to provide a secure connection.

C. Copper Lightning Conductor and Ground Rods

Install the 4-point grounding system by installing a central grounding electrode that is surrounded by a minimum of three (3) additional grounding electrodes spaced approximately 20 feet away from the central grounding electrode and approximately 120 degrees apart. Interconnect each grounding electrode using a #4 AWG bare copper conductor back to the central grounding electrode using irreversible mechanical crimps. Additionally, using an irreversible mechanical crimp, connect the bare copper lightning conductor to the central grounding electrode. Install each grounding electrode and its corresponding #4 AWG bare copper grounding wire and 28 strand copper lightning conductor such that the wires are 24” below grade. Install marker tape 12” below grade and above all grounding conductors.

In instances where right-of-way does not allow for ground rod spacing as required above, reference the 2018 Roadway Standard Drawings - Section 1700.02 “Electrical Service Grounding” for “Limited Shoulder” or “Restricted Space” installation alternatives.

Prior to connecting the lightning protection system to an electrical service, perform a grounding electrode test on the lightning protection system to obtain a maximum of 20 ohms or less. Install additional grounding electrodes as need to obtain the 20 ohms or less requirement. The grounding electrode resistance test shall be verified or witnessed by the Engineer or the Engineer’s designated representative.

Follow test equipment’s procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than one ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method. Submit a completed inductive Loop & Grounding Test Form available on the Department’s website.

32.4. 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 furnishing and installing “Digital CCTV Camera Assembly.”

33. UPGRADE CCTV LIGHTNING PROTECTION

33.1. DESCRIPTION

Remove and replace the existing CCTV pole lightning protection at locations as shown in the Plans. The lightning protection upgrade will include air terminal, rope lay bare copper lightning conductor, copper cable clips, galvanized screws, 2-inch PVC U-Guard, and exothermic weld to the existing main ground rod.

33.2. MATERIAL

A. General

Furnish and install the following new items:

- 0.5 inch x 36 inch copper clad steel air terminal (Class II)
- Air terminal pole attachment hardware for wood pole
- Class II 28 strand 15 AWG rope lay bare copper lightning conductor
- Copper cable clips
- 0.25 inch x 1.5 inch hex head galvanized screws
- 2 inch PVC U-Guard
- Exothermic weld to existing main ground rod

33.3. CONSTRUCTION METHODS

A. General

Remove the existing lightning protection at existing CCTV wood poles as shown in the plans. Install new lightning protection as described above and as shown on plan sheet ITS-12. Retain the existing CCTV ground rods and exothermically weld the new rope lay copper lightning conductor to the main ground rod located next to the CCTV pole.

33.4. MEASUREMENT AND PAYMENT

Upgrade CCTV Lightning Protection will be measured and paid as the actual number furnished, installed, and accepted. All cabling, configuration, and testing or other labor or materials required to upgrade CCTV lightning protection will be considered incidental and not be paid for separately.

Payment will be made under:

Pay Item	Pay Unit
Upgrade CCTV Lightning Protection.....	Each

34. REMOVE EXISTING EQUIPMENT

34.1. DESCRIPTION

At locations shown in the Plans, the construction includes the removal of existing equipment and assemblies during the installation of new equipment and assemblies.

34.2. CONSTRUCTION METHODS

A. Remove Existing CCTV Assembly

Remove existing CCTV cameras at locations shown in the Plans. Remove the existing camera, pole attachment hardware, and cabling. Ensure that the existing wood or metal pole is not damaged during the CCTV removal. Deliver removed CCTV equipment to the City of Gastonia Traffic Signal Shop.

B. Remove Existing CCTV Cabinet

Remove existing CCTV cabinets at locations shown in the Plans. Remove the existing control and communications equipment and cabinet. Deliver removed CCTV equipment cabinet to the City of Gastonia Traffic Signal Shop.

If the CCTV cabinet has a dedicated electrical service, the Contractor shall also remove this service. Coordinate with the Engineer to have the electrical service de-energized. Once the service is de-energized, remove the existing conductors and conduit between the cabinet and service. Remove the existing electrical meter and deliver the meter to the Engineer.

If the CCTV cabinet shares an electrical service with other signal equipment, the Contractor shall only remove the existing conductors and conduit between the cabinet and disconnect. Any existing breakers removed shall be replaced with appropriate breaker filler plates as needed cover the existing knockouts.

C. Remove Existing Terminal Splice Cabinet

Remove existing terminal splice cabinets for signal cable at locations shown in the Plans. Remove the existing cabinet, pole attachment hardware, and any unused cabling. Ensure that the existing wood or metal pole is not damaged during the cabinet removal. Deliver removed terminal splice cabinets to the City of Gastonia Traffic Signal Shop. Dispose of unused cabling.

34.3. MEASUREMENT AND PAYMENT

Remove Existing CCTV Assembly will be measured and paid as the actual number removed. All cabling, configuration, and testing or other labor or materials required to remove the CCTV assembly will be considered incidental and not be paid for separately.

Remove Existing CCTV Cabinet will be measured and paid as the actual number removed. All cabling, configuration, and testing or other labor or materials required to remove the CCTV Cabinet will be considered incidental and not be paid for separately.

Remove Existing CCTV Electrical Service will be measured and paid as the actual number removed. All cabling, configuration, and testing or other labor or materials required to remove the electrical service will be considered incidental and not be paid for separately.

Remove Existing Terminal Splice Cabinet will be measured and paid as the actual number removed. All labor or materials required to remove the cabinet and cabling will be considered incidental and not be paid for separately.

Payment will be made under:

Pay Item	Pay Unit
Remove Existing CCTV Assembly	Each
Remove Existing CCTV Cabinet.....	Each
Remove Existing CCTV Electrical Service.....	Each
Remove Existing Terminal Splice Cabinet.....	Each

35. LOCAL AREA NETWORK EQUIPMENT

35.1. DESCRIPTION

Furnish, install, configure, and test a 10 Gigabit Ethernet local area network (LAN). Furnish LAN that interconnects field devices including signal controllers and CCTV cameras with central hardware including computer workstations, server computers, and CCTV central equipment. Furnish LAN connections as shown on the block diagram.

35.2. MATERIAL

B. General

Furnish equipment for the LAN that complies with IEEE standard 802. Furnish Ethernet Switches of all types that are fully compatible and interoperable with the network performance management software and network hardware operating system software.

Furnish Ethernet Switches of all types that comply with the following electrical safety requirements: UL60950 or CSA C22.2 No. 60950 (safety requirements for IT equipment) and FCC Part15 Class A for EMI emissions.

For installations routing cables inside buildings, utilize existing cable raceways, electrical boxes, and metallic conduit where feasible. Where called for in the Plans, install new thin-walled EMT conduit that complies with the NEC and EIA/TIA Standard 569 and commercial building standards for telecommunications pathways.

C. Network Performance Management Software

Furnish network performance management and remote monitoring (RMON) software. Furnish the license(s) and additional copies of the software to allow it to be installed on all workstations (up to 10) designated by the Engineer.

Furnish software capable of monitoring all nodes and utilized ports on the enterprise. Furnish software capable of 50% expansion in the number of nodes and ports managed over the number of nodes and ports present and utilized at the final acceptance of the project.

The software shall use a GUI to configure, manage, and monitor the local network. At a minimum, the software shall provide the following functions and features:

- SNMP based
- Full management of network firewall
- Support SSH
- Utilize a GUI Web/browser style interface
- Provide a schematic display of the entire network enterprise that may be drilled down to the port level or panned out to the System level
- Provide Inventory tracking
- Provide bandwidth monitoring

- Provide SMTP support
- Provide auto alerting
- Monitor QOS
- Support management VOIP
- Support NETFLOW
- Support Wireless network management
- Receive SYSlog messages
- Generate usage/error reports
- Be capable of “pushing” upgrades to network gear via TFTP
- Detect switch failures
- Detect router failures
- Detect cable failures
- Provide network performance information
- Support the monitoring of cabinet and equipment temperature alarms via use of SNMP traps.
- Provide switch configuration backup capabilities via TFTP
- Provide configuration change tracking capabilities

D. SFP Modules

All SFP modules for Ethernet equipment furnished under this Project shall be rated to transmit and receive Ethernet data for the distance required and shall be compatible with the corresponding SFP module it is mated with.

The Contractor shall be responsible for verifying the distance between mated SFP modules and providing the correct type.

E. Field Ethernet Switch

Furnish Field Ethernet switches fabricated for use in field equipment cabinets that are ruggedized to meet or exceed NEMA TS-2 requirements for temperature, shock, humidity, and vibration.

Furnish Field Ethernet Switches that are DIN rail mounted and come equipped with hardware to permit mounting in an EIA 19” equipment rack.

Furnish Field Ethernet Switches that weigh no more than 15 lbs. and are no more than 250 cubic inches in volume.

Furnish Field Ethernet Switches with the following minimum characteristics and features:

- Eight (8) 10BASE-T/100BASE-TX ports:

- Minimum of two (2) 1000 BaseX Optical uplink ports that utilize small form-factor pluggable (SFP) connectors.
- Furnish SFP modules that are rated to transmit and receive Ethernet data for the distance required. Use SFP modules that are compatible with the SFP module it is mated with.
- Furnish SFP modules rated for use with the new optical cable installed under this project.
- Furnish SFP modules with LC connectors.
- SFP modules shall be considered incidental to the field Ethernet switch.
- Management console port

Furnish Field Ethernet switches with the following features:

- 10/100BaseTX ports:
 - RJ45 connectors
 - Cable type: Category 5e, unshielded twisted pair
 - Segment Length: 100m
 - Auto-negotiation support (10/100Mbps)
 - Auto MDIX crossover capability
 - Full Duplex operation (IEEE 802.3x)
 - TVS (transient voltage suppression) between Line +/-, Line +/-ground, and Line - ground to protect the circuitry

Furnish Field Ethernet switches with the following networking requirements:

- The switch shall support automatic address learning of up to 8192 MAC addresses.
- The switch shall support the following advanced layer 2 functions:
 - IEEE 802.1Q VLAN, with support for up to 4096 VLANs
 - IEEE 802.1p priority queuing
 - IEEE 802.1w rapid spanning tree
 - IEEE 802.1s multiple spanning tree
 - IEEE802.1AD link aggregation
 - IEEE 802.3x flow control
 - IGMPv2 with 256 IGMP groups
 - Port Rate Limiting
 - Configuration via test file which can be modified through standard text editor
 - Forwarding/filtering rate shall be 14,880 packets per second (PPS) for 10Mbps, 148,800 for 100Mbps, 1,488,000 for 1000Mbps
 - DHCP Option 82

Furnish Field Ethernet switches with the following network management functionality requirements:

- SNMPv2, SNMPv3
- RMON
- GVRP
- Port Mirroring
- 802.1x port security
- Radius Server
- TACACS+ Server
- SSL – Secure Socket Layer
- SSH – Secure Shell
- TFTP
- Network Time Protocol (NTP)
- Simple Network Time Protocol (SNTP)
- Management via web or Telnet

F. Core Ethernet Switch

Furnish Core Ethernet Switch with the following minimum characteristics and features:

- L3 core modular, high-availability, switch equipped with redundant fans, power supplies, and support for redundant supervisor/route processor engines, or approved equivalent functionality.
- A minimum of four (4) slots for switch/routing processor modules, but at least one spare slot shall remain after configuring required ports/interfaces herein.
- The following minimum connectors:
 - Minimum of four (4) 10,000 BASE-X SFP-based ports with LC fiber connectors (single-mode).
 - Minimum of twenty-four (24) 1000 BASE-X SFP-based ports with LC fiber connectors (single-mode).
 - LC fiber connectors (single-mode) as needed to meet distance requirements at Core Switch and to be compatible with matched field Ethernet Switches to support the distances shown in the Plans for switches connected to the Core switches. Attenuators will be furnished if required to service link without saturating receiving optics.
 - Fiber jumper cables with appropriate connectors to connect with switch and adjacent drop cable connectors and/or other switches.

- Ethernet management port: RJ-45 connectors
- Management console port: RJ-45-to-DB9 cable for PC connections
- Minimum of twenty-four (24) 10/100/1000 Base-TX copper RJ-45 connectors
- Dynamic Host Configuration Protocol (DHCP)
- Automatic QoS (AutoQoS)
- Autonegotiation on all ports for auto selection of speed and duplexing modes.
- Link Aggregation Control Protocol (LACP)
- Automatic media-dependent interface crossover (MDIX)
- Switching Capacity per line card 300 Gbps
- 256 MB DRAM or greater
- 128 MB FLASH or greater
- 1000 VLANs
- 4000 VLAN IDs
- 1000 Switched Virtual Interfaces (SVIs)
- 9216 Byte Jumbo Frames or greater
- 100 Mpps Forwarding Rate or greater
- Support 1000 IGMP groups and multicast routes
- Support automatic address learning of up to 12,000 MAC addresses
- Security:
 - DHCP Snooping
 - Dynamic ARP Inspection (DAI)
 - Secure Shell (SSH) Protocol, EAP, and Simple Network Management Protocol Version 3 (SNMPv3), Network Time Protocol Version 3 (NTPv3)
 - Port Mirroring
 - TACACS+ and RADIUS authentication
 - MAC Address Notification
 - Port Security
 - Bridge protocol data unit (BPDU) protection and filtering

- Root Guard
- IGMP snooping
- Dynamic VLAN assignment
- Standards: Supply a L3 Ethernet switch that meets or exceeds the following standards:
 - IEEE 802.1s Multiple Spanning Tree Protocol (64 regions)
 - IEEE 802.1w Rapid Reconfiguration Spanning Tree Protocol
 - IEEE 802.1x
 - IEEE 802.3ad
 - IEEE 802.3af
 - IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports
 - IEEE 802.1D Spanning Tree Protocol
 - IEEE 802.1p CoS Prioritization
 - IEEE 802.1Q VLAN
 - IEEE 802.3 10BASE-T specification
 - IEEE 802.3u 100BASE-TX specification
 - IEEE 802.3ab 1000BASE-T specification
 - IEEE 802.3z 1000BASE-X specification
 - An IP gateway redundancy protocol such as virtual router redundancy protocol (VRRP – RFC 2338), hot-standby router protocol (HSRP - proprietary) or gateway load balancing protocol (GLBP - proprietary), or an approved equal will be used to provide a redundant IP gateway in the event of a primary gateway failure.
 - OSPFv2 and v3: RFC 2328 for IPv4 and RFC 5340 for IPv6
- The following Indications:
 - Per-port status LEDs: link integrity, disabled, activity, speed, and full-duplex indications
 - System-status LEDs: system, power supplies, fans, and bandwidth utilization indications
- Environmental Requirements:
 - Operating temperature: 0°C to 40°C minimum range
 - Relative humidity operating: 5 to 90% (non-condensing)

- Mean Time Between Failures of greater than 80,000 hours
- Power Supply
 - Rated to handle input power of 115 VAC/60Hz ($\pm 10\%$), unless otherwise approved by the Engineer
 - Hot-swappable redundant modules
- Physical Requirements
 - EIA standard rack mounting in an IT equipment cabinet
 - No larger than 10 RU
- Safety Requirements
 - FCC Part 15 Class A for EMI emissions

G. VPN Firewall

Furnish network firewall and virtual private network (VPN) server integrated in a single unit. Furnish unit with the following minimum features:

- Integrated bandwidth management functionality
- Integrated intrusion detection functionality
- Four (4) Fast Ethernet (10/100 Mbps) ports
- One (1) serial com port
- Up to 60 Mbps of firewall throughput
- 3 Mbps of Triple Data Encryption Standard (3DES) VPN throughput
- 4.5 Mbps of Advanced Encryption Standard-128 (AES) VPN throughput
- Diagnostic LEDs on front of unit showing states for power, status, and LAN at a minimum

H. Cable

Furnish coaxial, Category 6 network cable, RS-232, monitor cabling, and all other cabling in the lengths required to interconnect devices as called for in the plans, specifications, and manufacturers requirements. Furnish quality and grade of cable capable of being operable at up to twice the distance installed on this project. Furnish cabling meeting all manufacturers' requirements and all applicable standards for performance and safety.

35.3. CONSTRUCTION METHODS

A. General

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

In field equipment cabinets, fully integrate new Ethernet switches with the fiber optic interconnect centers. Integrate all field equipment as call for.

Fully integrate LAN to accomplish local device failover and fault tolerance.

Fully integrate LAN equipment to provide virus protection, user authentication, and security functions to prevent unauthorized users and data from entering the LAN.

B. Requirements Definition Document

Prior to commencing work, the Contractor shall request from the Engineer a copy of the "IP/Ethernet Communications Plan Document" (prepared by Kimley-Horn) as a reference to develop a Requirements Definition Document (RDD) that will form the basis for the overall network architecture and design. The RDD shall include:

- Text describing the proposed implementation of the access, distribution and core layers for the network as described in the Plans and these Project Special Provisions
- Table of IP addresses to be assigned to each device within each node based on the IP scheme in the "IP/Ethernet Communications Plan Document"

The RDD shall be prepared and signed by a qualified networking professional (minimum CCNA or a manufacturer-approved equivalent based on the approved hardware vendor) and will be approved by the Engineer. The Qualified network professional will be present during the installation and testing of the local area network as well as during system testing.

C. LAN Integration

Fully integrate field, core, and network switches to form a complete local area network for communications between the TOC, fiber termination point, and each field device.

Fully integrate switches and firewall with computer and central system hardware to form a complete local area network that allows users from the TOC as shown on the block diagram in the Plans to access applications on application servers. Fully integrate network to allow the notebook computer users to be able to connect to the network via the LAN port on the notebook computer using a network cable.

Fully integrate LAN equipment to provide virus protection, user authentication, and security functions to prevent unauthorized users and data from entering the signal system LAN.

All cables for each piece of hardware installed shall be clearly labeled, using a label convention approved by the Engineer. All cabling shall be manufacturer assembled and without any adapters, unless otherwise approved by the Engineer.

D. Network Performance Management Software

Install and fully integrate the network performance management and remote monitoring software on all workstations being integrated with new Core Ethernet Switches in the TOC.

E. Field Ethernet Switch

Prior to installation of any field Ethernet switches, the Engineer shall approve the Contractor's desired mounting method and mounting location of the switch in the signal cabinet or CCTV cabinet. Should the Contractor need to modify the approved mounting method and location at a cabinet, notify the Engineer prior to installation for approval of the alternate mounting method or location.

Install and integrate all field Ethernet switches at field locations as depicted in the diagrams and tables and called for in these Project Special Provisions. Integrate with signal controller, conflict monitor, CCTV camera (if present), and existing fiber optic communications.

Furnish SMFO jumpers that are a minimum of 3 feet in length with the appropriate type of factory assembled connectors on each end. Ensure that SMFO jumpers meet the operating characteristics of the SMFO cable with which it is to be coupled.

Provide inline surge protection for all Ethernet connections in field cabinets.

F. Core Ethernet Switch

Install Core Ethernet Switches in the TOC. Integrate the core Ethernet switch with the new fiber optic cable terminations, using new jumper cables to establish the communications architecture and topology. Route cables in existing overhead raceways.

Fully configure switch with performance monitoring software and operating system software/firmware. Furnish SMFO jumpers with the appropriate type of factory assembled connectors on each end. Ensure that SMFO jumpers meet the operating characteristics of the SMFO cable with which it is to be coupled.

Configure and test all Ethernet equipment prior to installation.

G. Cellular Modem and Antenna

Install a Department-furnished cellular telephone modem for ethernet communications to remote signal controllers at locations shown in the Plans. Install the antenna on the cabinet. Connect the modem power supply to an available receptacle inside the signal cabinet. Connect the modem to the ethernet switch using appropriate cables.

Request cellular telephone modems and antennas from the Regional ITS Engineer a minimum of 8 weeks in advance of need.

H. VPN Firewall

Install one (1) VPN firewall switch. Integrate with the core Ethernet switch to allow only authorized remote users to access the signal system LAN. Install VPN software as required on all laptop computers provided under this project.

35.4. MEASUREMENT AND PAYMENT

(____) *Ethernet Switch* will be measured and paid as the actual number furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators, configuration, and testing or other labor or materials required to install and integrate the Ethernet Switch will be considered incidental and not be paid for separately.

Install Cellular Modem and Antenna will be measure and paid as the actual number of Department-furnished modems and antennas installed, integrated, and accepted. No separate payment will be made for any required cables or for any hardware and fasteners required to mount the antenna.

VPN Firewall will be measure and paid as the actual number furnished, installed, integrated, and accepted.

Network Performance Management Software will be paid at the contract lump sum price. This shall include furnishing, installing, configuring, and testing the software.

LAN Integration will be measured and paid as a lump sum. LAN integration includes configuration and integration of all LAN hardware, firmware, software, and VPN firewall to complete the LAN architecture, and submittal of the RDD. All cabling, hardware, patch panels, accessories, labor, and materials required to make the unit function as part of this project shall be considered incidental and not paid for separately. Partial payments for this item will be made on the following schedule: 20% upon completion and acceptance of the RDD; 20% upon installation, integration, and acceptance of LAN equipment, 40% upon installation, integration, and acceptance of LAN equipment at Routing Switch locations, and 20% upon installation, integration and acceptance of the entire project furnishing of and acceptance of network as-built documentation.

No separate payment will be made for cable routing within building as this will be considered incidental to equipment installation and integration.

No measurement will be made for the removal of existing transceivers or communications equipment as part of signal cabinet or CCTV cabinet replacements.

Payment will be made under:

Pay Item	Pay Unit
Field Ethernet Switch.....	Each
Core Ethernet Switch	Each
Install Cellular Modem and Antenna	Each
VPN Firewall	Each
Network Performance Management Software.....	Lump Sum
LAN Integration.....	Lump Sum

36. SYSTEM SOFTWARE

36.1. DESCRIPTION

Install the following software as furnished by the Engineer:

- Local Controller Software for State-Owned and City-Owned Signals. The Engineer will furnish the latest version of NCDOT's state-licensed software package at the time of burn-in. Request the software from the Engineer a minimum of five business days prior to burn-in.

Furnish and install the following software:

- Enterprise Video Management System Software
- Distributed Processing System Software. The software package furnished shall be fully compatible and interoperable with the local controller software being installed as detailed in this Section.

The Contractor shall be responsible for the development and integration of all system graphics (and associated system devices) described in the following specifications.

36.2. MATERIAL

A. General

Provide a perpetual, irrevocable software license to the Department and the City of Gastonia that gives them the right to copy and use all software furnished or upgraded with this project at any facility within the signal system limits.

Furnish software that may be used at the TOC, or at any other offices in the State of North Carolina that the City and State, or their authorized agent, may establish for the purpose of traffic signal monitoring and control of the Gastonia Signal System.

Provide any third-party software licenses to the Department and the City of Gastonia for software that may be used. Example: report-configuring, diagnostic, or monitoring software.

B. Distributed Processing System Software

1. General

Furnish Distributed Processing System Software that is a commercial off-the-shelf software package and not custom software being developed to meet the requirements of this Project. The software package furnished shall have been successfully deployed for at least one public sector agency within the United States within the previous three (3) years from the date of advertisement.

2. Compatibility

Furnish Distributed Processing System Software that is fully compatible and interoperable with the local controller software being installed under this Project. All signal parameters, modes, functions, and settings that are in the local software shall be integrated in, and accessible from, the central software without a loss in functionality and using the same nomenclature. The use of translators or converters, whether through software or physical hardware, is strictly prohibited.

3. Graphical User Interface

All changes to the system, including adding new controllers, configuring communications, creating maps and intersection displays, etc., shall be performed through the system graphical user interface or by updating files in the system software folders. The use of initialization files and external editors shall not be required.

4. NTCIP Standards

The software shall use NTCIP Standards 1201 and 1202. The central to field device communications shall utilize NTCIP 1202.

5. Database Preparation

Complete all data entry necessary to implement the operation of the system software.

The Engineer (by way of the City or Division 12 Traffic Services) will furnish intersection timing information and coordination parameters (cycle, split, offset). Any custom intersection displays will also be provided by the Department or City. Otherwise, default intersection timing data and standard intersection maps will be utilized when configuring intersections onto the system. Program all system detectors shown in the plans. Coordinate with the City to provide setup, naming/labeling, logging, and any features required for the operation of all system detectors.

TOD/DOW/DOY plans, alarms, and other information for the operation of the signal system shall be entered by the contractor.

6. System Graphics

The Contractor shall be responsible for the development and integration of all system graphics (and associated system devices) described in the following specifications.

The intersection graphics shall display both static and dynamic information. The static information shall include the intersection name, signal inventory number, geometrics of the intersection (including a graphic display of the number of lanes and their associated use), the location of the signal cabinet, and a layout of the intersection showing signal head configurations. The dynamic information to be displayed shall include:

- All vehicle signal indications for each active phase, and up to sixteen (16) overlaps with red, yellow, and green indicators as well as flashing yellow indicators
- All pedestrian signal indications, for up to sixteen (16) active phases. WALK, flashing DONT WALK, steady DONT WALK, and countdown shall be shown
- Vehicle and pedestrian detector actuations for each active phase
- Cycle timer (central and local clocks)
- Timing plan in effect (with cycle length and offset)
- Operational status of the intersection shall include the following, but not be limited to:
 - Timing in effect (in coordination, TOD, TR, etc.)
 - Status mode (transition, free operation, flash, pre-emption (railroad, emergency vehicle, or transit)

- Control mode (manual control, local control, failed, etc.)

The intersection display shall accommodate all phasing of the state-licensed local controller software.

The intersection display shall be capable of being dynamically sized by a workstation user. Resizing the window shall not reduce the amount of data displayed on a workstation monitor.

C. Enterprise Video Management System Software

1. General

Furnish and install new video management system (VMS) software to enable:

- Pan, tilt, and zoom control of all CCTV units in the Gastonia traffic control video enterprise; existing and those installed under this Project.
- The management and assignment of H.264 and MJPEG IP video streams from field CCTV units and remote VMS' to display devices in the City of Gastonia VMS enterprise
- The ability to scale to a up to 300 input video streams, and 100 output client views with no additional software
- The management of user access rights as assigned by a system administrator. User rights shall be able to be assign view-only; pan, tilt, zoom; on a camera by camera basis. Following, the ability to assign CCTV video streams to video output devices shall also be assignable by device and by user,
- The ability to allow remote users outside of the City of Gastonia enterprise including NCDOT, and adjacent municipalities to obtain remote view only and full CCTV control as assigned by the video management system administrative as permitted via the network environment.

Furnish VMS software that operates in a client/server environment.

Furnish software that is ONVIF compliant.

Integrate software to maintain ability to share video view and control with the NCDOT MRTMC in Charlotte, NC.

Provide VMS software to manage video outputs that provides the following features:

- Windows-based,
- Wall configuration,
- Manage and select display sources (CCTV, workstations, TV tuner, and applications),
- Share content to remote display outside the TOC,
- System management (user rights, database configuration, devices, user authentication),
- Wall control,
- Establish user account,
- Manage user privileges and access rights to devices and content

2. Video Output Display Management

Interface and integrate the remote video access points that will use new video monitors.

The video wall management software shall be compatible with the latest Windows operating system at the time of installation.

3. Security

Comply with Federal Information Processing Standards (FIPS) encryption as follows:

- 160-bit SHA1 has encryption for passwords
- 192-bit TripleDES encryption for communications with devices
- 256-bit encryption with client agent applications
- Strong password protection for database files
- Strong user password enforcement
- Role based security policies
- Real-time logging of user activities

4. System Configuration

Configure the software with the following components:

- System software server (1),
- Video servers (1),
- Video wall monitors,
- Ethernet communications network in the building, and
- Ethernet communications over fiber-optic cable to field devices.

The software shall allow users to create windows and layouts of video wall content. The software shall permit the user to add, resize, move, or delete windows. The software shall permit to share content to more than one display.

The software shall allow users with appropriate access rights, to manage content to remote devices.

Provide full KVM control of video wall servers.

The software shall obtain content from:

- IP based HD CCTV cameras (H.264 encoding at 30 frames per second)
- Cable TV tuner
- Workstation screen content
- ITS applications on the network
- Internet based content

The software shall consist of the following components:

- Control Software: Client-based software based by the user to control/manage/ configure the video wall management system
- Client Capture Software: Client workstation, captures content from client workstations, display screens, and application windows for sharing anywhere on the network,
- Display Services: Server software to drive any shared display

36.3. CONSTRUCTION METHODS

A. General

Fully integrate the distributed processing signal system software on the Distributed Processing Signal System Server and Communication Server called for in these Project Special Provisions. Fully integrate the distributed processing signal system software on each workstation in the TOC.

Fully integrate the CCTV central software on the Video Management System Server called for in these Project Special Provisions. Fully integrate the CCTV software on each workstation in the TOC.

Register all software products furnished with this project with the software supplier. The City of Gastonia and the NCDOT shall be identified as the registered owner of all software.

B. Local Controller Software

Install NCDOT-furnished local controller software on all new controllers at state-owned and city-owned signals. Use the latest version available at the time of installation as directed by the Engineer. Request local controller software from Engineer a minimum of one (1) week prior to use of software during burn-in period.

All controllers in the final Signal System shall have identical local software.

C. Distributed Processing System Software

Integrate the distributed processing traffic control applications software and all other software with the communications system and local controllers to provide a traffic signal system that provides the functionality required by these Project Special Provisions.

Load all parameters necessary to implement coordinated signal operations. The Engineer will furnish the timing parameters in standard traffic engineering format (cycle, split, and offset) prior to the initiation of the 60-day observation period. Make any modifications to the cycle, split, and offset information furnished by the Engineer that are necessary to implement the timing plans into the system database. The test period may not begin until the timing parameters have been loaded. The Engineer may, at his/her option, observe the loading of the timing plans.

As directed by the Engineer, make modifications to the coordinated signal timing parameters (cycle, split and offset) prior to system acceptance to improve system coordination and efficiency. The Engineer will furnish the parameters to be modified by the Contractor. Make these modifications at no additional cost. No timing plan changes will be required after the successful completion of the system operational test (as approved by the Engineer).

Prepare comprehensive, detailed graphic displays for the system display, for all control section displays, and for all intersection displays. Contractor shall install all displays and fully integrate with system software. **Submit all graphics to the Engineer for approval prior to the System Operational Test.**

D. Enterprise Video Management System Software

1. General

Install new VMS Software on the City's workstations and laptops.

Configure administrative and user VLANs for the VMS servers in the TOC Ethernet core switch to enable video sharing.

The software shall allow remote users to view and control all CCTV cameras connected to the TOC through the Ethernet network and the CCTV Control GUI furnished as part of this software such that a user can switch, view, and control cameras.

Install VMS software to display and map the CCTV devices from the network so that the CCTV video can be displayed on the video walls, monitors, and workstations.

Interface and integrate remote video access points at locations shown in the Plans.

2. Configuration

Work with the City of Gastonia to configure the user rights for each employee authorized to access the video wall system. The user rights will address access to specific source and destination devices, and content.

Configure the client control software on each workstation for the user interfaces. Configure user interface for each user.

Configure the system to automatically backup configuration and database files.

36.4. MEASUREMENT AND PAYMENT

Signal System Software will be paid at the contract lump sum price. This shall include the upgrading, testing, and all materials, 3rd party software for reporting, equipment, labor, tools, storage, shipping, and incidentals necessary to upgrade the existing software, complete system integration, and provide a complete operating system. Partial payment for this item will be made as follows: 50% of the lump sum price upon upgrade and configuration of the software and 50% of the lump sum price upon successful completion of the Observation Period. No payment will be made for providing software license as required in these Project Special Provisions.

Enterprise Video Management System Software shall be measured and paid as a lump sum. This shall include furnishing, installing, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to install software on the new video server, workstations, and video wall systems to provide a complete operating system

All other software and hardware otherwise required to accomplish the functionality required by the Project Special Provisions will not be paid for separately but will be considered incidental. No payment will be made for providing software license and source code as required in these Project Special Provisions.

No measurement will be made for furnishing or installing local controller software on new controllers, as this will be considered incidental to Controller with Cabinet pay item.

Testing will not be paid for separately but will be considered incidental to equipment installation.

Payment will be made under:

Pay Item	Pay Unit
Signal System Software	Lump Sum
Enterprise Video Management System Software	Lump Sum

37. COMPUTER HARDWARE

37.1. DESCRIPTION

Furnish and install server computers and workstation computers at the location desired by the City of Gastonia with all software and hardware to provide fully operational computing platforms and systems to accomplish the operational requirements of the computerized signal system.

Install and integrate all computer hardware as shown in the Block Diagram contained in the Plans.

The Contractor may, at their discretion and if approved by the Engineer and City of Gastonia, replace the individual servers installed with a virtual machine configuration where the processes of each server are allocated across a single or multiple servers.

37.2. MATERIAL

A. General

Furnish hardware that operates at 115 VAC \pm 10 percent at 60 Hz. Furnish hardware that operates in a +40 to +122 degree Fahrenheit environment at 20 to 80 percent relative humidity.

All workstations and servers shall be from the same manufacturer. Servers and workstations that use proprietary power supplies will not be accepted.

Furnish all software licenses, compact discs, manuals, and documentation for all software installed on computers furnished under this project.

For installations routing cables inside buildings, utilize existing cable raceways, electrical boxes, and metallic conduit where feasible.

B. Distributed Processing Signal System Server

Furnish Distributed Processing Signal System server (herein referred to as the "Signal System Server") to host the signal system central software on a client/server environment over the Gastonia Signal System LAN.

The server shall have the following minimum features:

- Processor: Dual CPUs, Intel Xeon E-2300 or better
- Memory: 16 GB minimum
- Hard Drives: 600 GB minimum
- Network: Two 10/100/1000 network interface cards
- Optical Drive: Internal DVD+/-RW
- Rack mountable in standard EIA 19" equipment rack with a maximum height of 4 RU

The operating system for the Signal System Server shall be the latest released revision available as recommended by the supplier of the system software.

The Signal System Server shall be furnished with all necessary software required to operate the signal system properly, including database or similar software that is compatible with the signal system software and approved by the Engineer, along with all applicable licenses.

C. Distributed Processing Signal System Communications Server

Furnish a Distributed Processing Signal System Communications Server (herein referred to as the “Communications Server”). Furnish Communications Server that is equipped with all hardware and software required to meet all of the data communications requirements, including once-per-second polling of all traffic signal controllers.

The server shall have the following minimum features:

- Processor: Dual CPUs, Intel Xeon E-2300 or better
- Memory: 8 GB minimum
- Hard Drive: 100 GB minimum
- Network: Two 10/100/1000 network interface cards
- Optical Drive: Internal DVD+/-RW
- Rack mountable in standard EIA 19” equipment rack with a maximum height of 4 RU

The operating system for the Communications Server shall be the latest released revision available as recommended by the supplier of the system software.

D. Enterprise Video Management System Server

Furnish Enterprise Video Management System Server (herein referred to as the “Video Management System Server”) to host the CCTV video system central software on a client/server environment over the Gastonia Signal System LAN.

The server shall have the following minimum features: The server shall have the following minimum features:

- Processor: 4th Generation Intel Core i7 4770 or latest equivalent
- Memory: 8 GB
- 64-bit processor
- 120 GB Solid State Drive
- GBE Network Interface Card
- NVIDIA QUATRO K 620 2GB Video Card
- Rack mountable in standard EIA 19” equipment rack with a maximum height of 4 RU

The operating system for the Enterprise Video Management Server shall be the latest released revision available as recommended by the supplier of the system software.

E. Vehicle Preemption System Server

Furnish Vehicle Preemption System server to host the Vehicle Preemption System central software on a client/server environment over the Gastonia Signal System LAN

Furnish server that has the same features as the Signal System Server.

F. Remote Access Server

Furnish Remote Access Server to host remote access software and allow up to eight simultaneous users to access all services on the LAN via Ethernet connection. Furnish minimum six client licenses of remote access software.

Furnish Remote Access Server with same features as the Signal System Server.

Furnish remote access server with remote access software with the following features:

- Support of up to 8 simultaneous users initially with expansion capability of up to 12 simultaneous users
- Provision of each user with a Windows desktop with access to all applications and services on the TOC LAN at their remote location. When logged into remote access server, upon providing username and password, remote user shall be provided with a Windows desktop on their remote computer.
- Client software that is fully functional on all currently supported versions of MS Windows (version Windows 10 and later)
- Allows remote user to access all drives on servers on the LAN and transfer files between their remote station and server on the LAN through windows file access methods such as Windows Explorer
- Supports remote user automatic reconnection if communication connection is lost
- Supports use of client remote access configuration by means of standard windows, menu driven interface.
- Shall support all services available over the LAN (including printers and servers)
- Shall require no more than 64 Mb of RAM to support each user
- Provide security and user authentication features and functionality
- Utilize Windows Remote Desktop functionality or approved equal.

Furnish server with all required operating system and third-party support software to fully operate remote access server.

G. Backup Storage Server

Furnish Backup Storage server to provide backup and restore functionality of the hard-drive(s) in the Signal System Server.

Furnish Backup Storage Server that has the same features as the Signal System Server.

H. Computer Workstations

Each microcomputer workstation shall be upgradeable and shall meet the following minimum requirements:

- Processor: Intel Xeon E5-1603
- Memory: 8 GB
- Hard Drive: 250 GB
- Network: 1 GB network interface card
- Video: 2.0 GB NVIDIA Quadro NVS 510, or equivalent, that can drive 4 video displays
- Optical Drive: Internal DVD+/-RW
- Provide dual (2) flat screen monitors and required video cables. Minimum monitor size shall be 20", 18.5" viewable with a 1,600 × 1,200 resolution
- Mini-Tower chassis
- Microsoft 2-button/scroll mouse
- Full function, 104 keyboard with separate numeric and cursor control keys
- Speakers
- A minimum of four (4) universal serial bus (USB) ports
- Stand-alone UPS unit, with a minimum
 - Surge protection and filtering
 - Battery capable of providing 6 minutes of backup time at full load
 - Three (3) NEMA 5-15R output connections (with battery backup)
 - Three (3) NEMA 5-15R output connections (with surge protection)

The operating system for the signal system workstation(s) shall be Microsoft Windows 10 Professional or newer. The release used shall be the latest revision available as recommended by the supplier of the system software. Install antivirus software.

The operating system shall provide for true multi-tasking and graphical user interface. It shall be possible for workstation users to run Windows-based programs in one or more windows while the traffic signal system applications software continues in full operation.

I. Laptop Computers

Furnish rugged and environmentally hardened laptop computers. Each laptop shall be upgradeable and shall meet the following minimum requirements:

- Certified for MIL-STD-810G, MIL-STD-461F, and IP65

- Processor clock speed 2.8 GHz,
- 16 GB of RAM,
- 13-inch XGA touchscreen display,
- 256 GB SSD storage,
- one internal 24X CD-RW/DVD-ROM drive,
- one RS-232 serial port, or provided adaptor that replicates an RS-232 serial connection using one of the other data ports
- two USB ports
- AC adapter/charger, and a car cigarette lighter adapter cable,
- fully charged battery capable of a minimum of 8 hours of continuous operation,
- one spare battery,
- sound card with built in speakers,
- full function keyboard,
- pointing device that is integral to the case (clip on devices will not be acceptable),
- one cable 10 feet long for connection to a controller port,
- one cable 10 feet long for connection to network port,
- 10/100/1000 Base TX (100 Mbps/1 Gbps Ethernet) with RJ-45 connector on board,
- IEEE 802.11g wireless network adapter card
- USB to Serial cable adapter
- Compatible docking station
- Stylus pen

The operating system for the laptop computers shall be Microsoft Windows 10 Professional or newer. The release used shall be the latest revision available as recommended by the supplier of the system software. Install antivirus software.

J. Surge Suppression Strips

All computer hardware and peripherals not connected to an Uninterruptible Power Supply (UPS) shall be connected to a surge suppression power strip. Provide surge suppression power strips equipped with an on-off switch, an indicator lamp, isolating filter banks, and a minimum of six (6) 120 VAC, 60 Hz outlets. At a minimum, the filter banks shall attenuate high frequency noise

K. Equipment Rack Cabinet

Furnish equipment cabinets with railings and sockets for mounting of EIA 19" mountable equipment. Furnish units with removable and adjustable shelves and pull out drawers capable of holding 1.5 times the heaviest component required to be placed on shelf or drawer (when fully extended). Furnish Rack cabinets that are modular with removable side panels with open front and back sections. Furnish racks with cable management and raceways to facilitate neat and orderly organization of all cables routed to equipment on the rack. Furnish rack cabinets with accessories to ensure cables are not kinked or pinched and that all minimum bend radii of cables are preserved. Furnish rack cabinet units that may be aggregated into single units of up to four bays wide. Furnish units made of quality, non-corrosive materials and non-peeling paint.

Furnish equipment rack cabinets for installation within buildings as shown in the Plans. Furnish units with ventilation fans audible no more than 46 dba at a distance of 4 feet from the unit. Furnish units with each bay a width of no more than 24" and a minimum of 84" of continuous useable rack space beginning no more than 6" above the floor.

L. Uninterruptible Power Supply

Furnish UPS units that are capable of detecting a power failure and providing back-up power to the listed components within twenty (20) milliseconds. The transition to the UPS source from primary power shall occur without loss of data or damage to the equipment being provided with back-up power.

Furnish UPS units that are sized such that each is capable of providing back-up power for the total load of all equipment connected to the UPS plus an additional load of twenty-five percent of the total load for at least thirty (30) minutes of operation. The UPS units shall be capable of interfacing with the Distributed System Software such that upon sensing a loss of power, a system shutdown can be initiated and completed within the specified UPS span of operation.

The UPS unit shall include:

- Commercial 115 VAC, 60 Hz power interconnection and power loss sensing and alarm report via the Distributed System Software
- Power protection and filtering
- Power conversion for battery charging
- Batteries to support thirty (30) minutes of operation with loss of power
- Battery status sensing and low battery alarm reporting via the System Software
- Battery charging and charge management
- Battery power conversion and filtering as necessary for interface compatibility with installed equipment

UPS units shall be connected to commercial power. The UPS units and power interconnect shall comply with article 645 of the National Electric Code (NEC).

37.3. CONSTRUCTION METHODS

A. General

Furnish and install the central hardware required to support the software functions called for in these Project Special Provisions.

Furnish and install the hardware as shown in the block diagram in the Plans.

Whenever possible, use existing cable raceways, ducts, raised floors, and drop ceilings to route cables.

All computer hardware called for in this section shall be installed, integrated, and in use within sixty (60) days of date of purchase. Provide receipt with purchase date to Engineer during hardware installation. Any hardware older than sixty (60) days may be integrated and put in use at the sole discretion of the Engineer.

All cables for each piece of hardware installed shall be clearly labeled, using a label convention approved by the Engineer. All cabling shall be manufacturer assembled and without any adapters, unless otherwise approved by the Engineer.

B. Distributed Processing Signal Server

Install distributed processing signal system server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch, and rack cabinet power source. Integrate with signal system communications server using direct serial, parallel, USB, or network connection. Fully configure server to operate distributed system processing software. Integrate with backup storage server to support scheduled and on-demand backup of data.

C. Signal System Communications Server

Install signal system communications server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch, and rack cabinet power source. Fully configure server and ports to facilitate signal system communications.

D. Enterprise Video Management System Server

Install video server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch and rack cabinet power source.

E. Vehicle Preemption System Server

Install server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch and rack cabinet power source.

F. Remote Access Server

Install remote access server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch and rack cabinet power source.

Install and configure software with usernames, passwords, and Remote Access Windows desktop that allows client user gaining access to the LAN via the server, has complete access to all software applications on the LAN, available to a local user. Install all third-party software and drivers required to create fully functional remote access server.

G. Backup Storage Server

Install backup storage server into new equipment rack cabinet in the TOC. Integrate with core Ethernet switch and rack cabinet power source.

Integrate with distributed processing signal server to support scheduled and on-demand backup of data.

H. Computer Workstations

Install three (3) computer workstations with dual monitors at the Gastonia TOC as shown in the Plans. Integrate with network Ethernet switch. Fully configure microcomputer workstation with all client software to operate all signal system subsystems including distributed processing signal system and CCTV subsystem. Integrate one of the video card outputs of each workstation with the new video wall system.

Configure Windows Remote Desktop on the TOC workstations so that a user can remotely connect to each application server on the LAN and be presented with the same graphical user interface as if they were locally connected to the server.

I. Laptop Computers

Furnish three (3) laptop computers for use by signal technicians at the TOC. Integrate the laptops with the wireless access point to establish a connect to the signal system network.

J. Surge Suppression Strips

Furnish and install surge suppression power strips for all computer hardware and peripherals, video subsystem, local area network, and central communications equipment not connected to a UPS.

K. Rack Cabinets

Install new rack cabinets in the TOC as shown in the Plans. Install full rack cabinets such that access to both the front and back of cabinet is available. Route cabling in cabinets using raceways. Bolt the cabinets to the floor to prevent any rack from falling over if loaded in a top-heavy manner.

Install equipment in rack cabinets according to manufacturer recommendations. The final layout of equipment within racks shall be approved by the Engineer.

L. Uninterruptible Power Supply

Install uninterruptible power supply (UPS) units in the top of each new equipment rack cabinet to supply uninterrupted power in the event of a failure of primary power to supply 30 minutes of backup power for all devices that will ultimately populate the rack bay under this project. Integrate with equipment in rack bay. Configure UPS unit servicing the signal system server to provide the alarm notifications detailed above.

M. Computer Hardware Integration

Fully integrate computer hardware equipment to form complete and operational systems as called for in these Project Special Provisions and shown on the block diagram in the plans. Install and configure all central computer hardware at TOC to accomplish the functionality called for in these Project Special Provisions and hardware functionality required to support the computer software to be installed on to the computing hardware called for under this project. Integrate with LAN equipment and field equipment.

Prior to installing and configuring the computer hardware at each facility, develop a computer hardware architecture and system design document that shows the entire layout of the computer hardware systems and their interconnection. The function, description, and model number of each computer hardware component will be shown in the document. The report will describe the network topology in text and using graphics.

37.4. MEASUREMENT AND PAYMENT

(____) *Server* will be measured and paid as the actual number furnished, installed, integrated, and accepted. For a virtual machine environment, the measurement and payment will be as the number of server instances integrated and accepted and the physical server(s) shall be incidental.

Computer Workstation will be measured and paid as the actual number furnished, installed, integrated, and accepted.

Rack Cabinet will be measured and paid as the actual number furnished, installed, integrated, and accepted. UPS units shall be considered incidental and shall not be paid for separately.

Computer Hardware Integration will be measured and paid as a lump sum price. This item shall include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to install and make fully operational the computer hardware equipment at the TOC.

All cabling, labeling, sockets, outlets, conduit, cable routing, or other accessories required to configure, integrate, and interconnect computer equipment shall be considered incidental and shall not be paid for separately. This shall include provision of the surge suppression power strips and UPS.

No measurement will be made for the removal of existing computer hardware or rack cabinets as needed for the installation and integration of new computer hardware.

Payment will be made under:

Pay Item	Pay Unit
Distributed Processing Signal System Server.....	Each
Signal System Communications Server.....	Each
Video Management System Server.....	Each
Vehicle Preemption System Server	Each
Remote Access Server	Each
Backup Storage Server.....	Each
Computer Workstation.....	Each
Laptop Computer	Each
Rack Cabinet.....	Each
Computer Hardware Integration	Lump Sum

38. CCTV VIDEO MONITORS**38.1. DESCRIPTION**

Provide the central video hardware and/or software at the Gastonia TOC necessary to control and monitor the closed-circuit television (CCTV) cameras installed at locations shown in the Plans.

38.2. MATERIAL**A. General**

All central video equipment shall operate at 115 VAC (+/- 10 percent) at 60 Hz (+/- 10 percent). The equipment shall operate in a +32 to +120 degree F environment at 20 to 80 percent relative humidity.

B. Video Wall System**1. General**

Furnish a new video wall for Office #1 in the TOC and remove the existing wall monitors. The video wall shall be a fully integrated system of monitors and hardware and/or software. The monitors shall be arranged in a matrix that is two (2) rows high by four (4) columns wide for a total of eight (8) monitors.

Furnish a new video wall for Office #2 in the TOC and remove the existing wall monitors. The video wall shall be a fully integrated system of monitors and hardware and/or software. The monitors shall be arranged in a matrix that is two (2) rows high by three (3) columns wide for a total of six (6) monitors.

2. Monitors

The monitors of the video wall shall meet the following minimum requirements:

- Size: 46" monitor/tile
- Active screen area: 40.1 inches by 22.5 inches
- Outer dimensions: 40.24 inches by 22.7 inches by 3.6 inches
- Technology: commercial grade direct view LCD
- Resolution: 1920x1080
- Aspect ratio: 16:9
- Contrast ratio: 3500:1
- Response time (white to black): 8 ms

- Refresh rate: 60 Hz
- Full viewing angle: 178 degrees (vertical and horizontal)
- Luminance: 2 brightness levels available; 500-800 cd/m²
- Backlight technology: LED
- Backlight life: at 1/2 brightness, 50,000 hrs
- Acoustic noise: fanless operation
- Advanced cooling system for 24/7 operations
- Bezel width: max of 5.5mm
- Display control: IR, RS-232
- Orientation: portrait and landscape
- Automatic color and brightness calibration
- Inputs: HDMI
- Power consumption: 160 watts
- Internal or external power supply

3. Mounting System

Furnish a wall-mounted frame for securing monitors in place and routing cables.

4. Management

The Contractor shall provide a solution to scale video across the entire video wall or any section of the video wall.

The video wall system shall meet the following functionality:

- Creation of customized layouts using drag-and-drop configurations in the graphical user interface
- Ability to display a video feed on a single monitor (full-screen) or across multiple monitors
- Ability to display multiple video feeds on a single monitor, up to a 4x4 grid
- Ability to interface with the CCTV video management system software for selecting layouts and video feeds
- Ability to act as an additional monitor output for the workstation in the office

5. Video Wall Controller

Furnish a video wall controller that is capable of processing video outputs to the wall monitors. Furnish unit with the following minimum specifications:

- Rack mountable with a maximum height of 6 RU
- Operating system of Microsoft Windows 10, and compatible with operating system of the video server installed under this project
- Intel Core i7 3.4 GHz (or greater) processor
- Minimum of 8 GB of RAM
- Minimum of 16 video display outputs with a resolution of 2560 x 1600 at 60 Hz
- Minimum of 4 video inputs that are HDMI or DVI
- 10/100/1000 MB network interface card

38.3. CONSTRUCTION METHODS

A. General

Install and test all central video equipment in accordance with the manufacturer's recommendations. Furnish and integrate any manufacturer software not explicitly stated in these Project Special Provisions but required for any central video equipment to provide full the stated functionality. Provide a copy of any installed manufacturer software to the Department.

Route all cabling in ceiling, floor, conduit, or cable raceways unless otherwise approved by the Engineer.

All cables for each piece of hardware installed shall be clearly labeled, using a label convention approved by the Engineer. All cabling shall be manufacturer assembled and without any adapters, unless otherwise approved by the Engineer.

B. Video Wall System

As shown in the Plans, install the video wall systems in the TOC. Follow manufacture recommendations. Furnish cable raceways or wire molds of the same color as the wall for the discrete placement of cabling.

Prior to installation of the video displays, develop shop drawings and submit to Engineer for approval prior to commencement of installation of the units.

Integrate the video wall system with the CCTV video management system software.

38.4. MEASUREMENT AND PAYMENT

Video Wall System (___ Monitors) will be measured and paid as a lump sum price. This item shall include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and

incidentals necessary to install and make fully operational each video wall system at the TOC. No separate measurement will be made for monitors, power supplies, cables, image processor hardware, configuration software, controllers, framing system, brackets, spacers, mounting hardware, cabling, and other materials required.

No direct measurement will be made for surge suppression strips. These will be considered incidental to the devices attached to them.

No direct measurement will be made for cabling used to interconnect devices within buildings including coaxial cabling, network cabling, serial cabling, and power cabling. These items will be considered incidental to the devices they are connected.

No direct measurement will be made for the removal of existing video monitors as part of the installation of new monitors and video equipment.

Configuration and integration of central video components will be considered incidental and shall not be measured separately.

Payment will be made under:

Pay Item	Pay Unit
Video Wall System (8 Monitors).....	Lump Sum
Video Wall System (6 Monitors).....	Lump Sum

39. BUILDING MODIFICATIONS AND FIBER OPTIC CABLE TERMINATION

39.1. DESCRIPTION

At locations called for in the Plans, route fiber optic cable in new and/or existing conduit and install conduit into buildings as shown. Terminate fiber optic cable into fiber interconnect centers in building as shown in the Plans. Modify rooms and furnish and install cable and cable routing facilities as shown in the Plans.

All construction to reach a building (including up to installing a new junction box at an exterior wall) is paid for using other pay items in these Project Special Provisions. All construction to enter a building (including all work from creating a new entrance or integrating with an existing entrance) and making internal provisions for terminating cables are covered under these building modification pay items.

39.2. MATERIALS

A. General

Use risers and conduit materials as called for in the Standard Specifications or these Project Special Provisions.

Use caulking and sealing materials for sealing entrances into buildings as approved by the Engineer and according to prevailing building codes.

Use new cable raceways, electrical boxes, and metallic conduit as approved by the Engineer. Where called for in the Plans, use thin-walled EMT conduit that complies with the NEC and EIA/TIA Standard 569 and commercial building standards for telecommunications pathways.

The Owner of each facility will be providing any furniture noted in the Plans.

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

B. Central Interconnect Center

Furnish a central interconnect center in the TOC for fiber termination. Provide splice trays that hold, protect, and organize optical fibers, and secure fibers inside splice tray. Design and size splice trays to be dielectric, to accommodate all fibers entering the splice tray, and to provide sufficient space to prevent microbending of optical fibers. Provide connector panels with LC-type connectors. For fiber termination and route to enter the TOC, see Building Details in the Plans.

Furnish SMFO pigtails with each interconnect center. Provide pigtails that are a maximum of 6 feet in length with a factory assembled LC connector on one end. Ensure that the SMFO pigtails meet the operating characteristics of the SMFO cable with which it is to be coupled.

Furnish SMFO jumpers that are a minimum of 3 feet in length with factory assembled LC connectors on each end. Ensure that SMFO jumpers meet the operating characteristics of the SMFO cable with which it is to be coupled.

39.3. Construction Methods

A. General

Contact Engineer prior to entering any building. Coordinate and obtain approval from Engineer regarding allowable working time in buildings.

Prior to core drilling or otherwise creating new entrance into an existing building, obtain approval of methods and materials from the Engineer. In all cases create entrance that is weatherproof and watertight.

Whenever possible, use existing cable raceways, ducts, raised floors, and drop ceilings to route fiber optic cable.

Perform all work called for in the plans to enter building, install cable conduits and cable raceways, and to route cabling in raised floors, drop ceilings, and new and existing conduits.

Terminate all optical fibers in interconnect centers unless otherwise shown on the Plans.

Install interconnect centers with connector panels, splice trays, storage for slack cable or fibers, mounting and strain relief hardware, and all necessary hardware. As shown in the plans, some locations call for interconnect centers to be installed in existing rack cabinets. Coordinate with Engineer or Agency representative on exact placement for interconnect center within rack as existing conditions may have changed from that shown in the Plans.

Label all fiber-optic connectors, whether on jumpers, connector panels, or other equipment, to prevent improper connection. Obtain approval of the fiber-optic connector labeling method.

For all fibers designated for termination to connector panel within the interconnect center, fusion splice the fibers to the pigtails.

For all cut fibers designated to pass through interconnect center, fusion splice fibers.

B. MOC Modifications

Install equipment and route cables into the MOC as shown in the Plans. Where new cables are to be installed in existing conduit, the Contractor shall blow pull-rope in the conduit prior to installation to ensure conduit can be re-used.

39.4. Measurement and Payment

Building Modifications will be measured and paid as a lump sum price.

This item shall include all work required to route and terminate the fiber optic cable into the buildings as shown as well as any other work not called for under other items but required to accomplish the building modifications.

No separate payment will be made for rack cabinets, interconnect centers, patch panels, wall sockets and outlets, splicing, conduit, and cable routing within building as this will be considered incidental to building modifications.

No measurement will be made for the removal of existing materials required for completing the work in this section.

Payment will be made under:

Pay Item	Pay Unit
Building Modifications	Lump Sum

40. SYSTEM SUPPORT EQUIPMENT

40.1. DESCRIPTION

Furnish signal system support equipment with all necessary hardware in accordance with the plans and specifications.

All system support equipment shall be delivered to the City at the start of the Observation Period.

40.2. MATERIAL

A. Signal System Support Equipment

Furnish new, unused signal system support equipment to the Engineer in the quantities shown below:

- Three (3) 2070LX signal controllers as installed and accepted under this project
- Three (3) 2070-1C CPU modules as installed and accepted under this project
- Three (3) base-mounted 332 cabinets as installed and accepted under this project
- Three (3) DC isolators as installed and accepted under this project
- Three (3) AC isolators as installed and accepted under this project
- Six (6) detector cards as installed and accepted under this project
- Three (3) conflict monitors as installed and accepted under this project
- Three (3) model 200 load switches as installed and accepted under this project
- Three (3) surge protectors as installed and accepted under this project
- Three (3) flasher modules as installed and accepted under this project
- Three (3) flash transfer relays as installed and accepted under this project
- One (1) test cabinet and controller as specified below
- One (1) conflict monitor tester with notebook computer as specified below

B. Test Cabinet/Controller

Furnish and install a test cabinet/controller at the TOC as shown in the Plans. The test cabinet shall include a 2070LX controller in a Type 332 cabinet. The test cabinet shall include a full complement of detector amplifiers, switch packs, a conflict monitor, and one fiber optic field Ethernet switch. The test cabinet shall also contain two (2) AC Isolators and two (2) DC Isolators. The test cabinet and panel shall be fully labeled.

Construction

The test cabinet shall have a heavy-duty aluminum dolly base with heavy duty casters. The base shall accommodate a fully equipped base-mounted 332 cabinet/controller. A pole or pedestal shall be attached to the base to support a display panel, which shall be located beside the cabinet convenient

for use by maintenance personnel. The panel shall have all indicators and switches on the front and shall have a suitable aluminum enclosure. The panel shall be fully labeled.

Indicators

The panel shall contain indicators to display the outputs of all the cabinet's traffic signal load switches. Red, yellow, and green indicators shall be used to display the outputs of the traffic signal load switches. In addition, indicators shall be provided for four (4) pedestrian displays and four (4) special functions. The indicators shall use incandescent bulbs or LED's that are user replaceable.

Controls

The panel shall be equipped with controls which are connected to simulate all of the inputs, for test purposes, to the controller which are not already accommodated by switches in the controller cabinet.

Harnesses

The panel shall be connected to the controller cabinet by means of harnesses. The harnesses shall be concealed in the pedestal or pipe supporting the panel and shall enter the cabinet from the bottom.

Connection to System

The test cabinet/controller will be connected to the system on dedicated communication channels. Furnish and install a jumper cable of sufficient length. This jumper cable shall be used to connect the test cabinet's fiber optic Ethernet switch to the communication system.

C. Conflict Monitor Tester with Notebook Computer

Furnish a stand-alone portable signal monitor test unit with an included notebook computer intended for use on work-bench. The Tester shall use/control a notebook computer of equal requirements to other notebook computers furnished under this project. The Tester shall test Conflict Monitor displays, timing and voltage functions, and input/output combinations of either true or false conflicts. Any software provided with the tester shall be modular, menu driven, and offer a "help" screen. A video "setup/usage" training tape shall be provided with each unit. All input/outputs shall be in plain English. It shall be possible to generate a hardcopy printout, or to store the results to a disk file. A "No Faults Detected" indication shall be displayed as appropriate.

D. Communication System Support Equipment

Furnish new, unused communication system support equipment to the Engineer in the quantities shown below:

- Three (3) interconnect centers (standard) as installed and accepted under this project
- Five (5) splice enclosures as installed and accepted under this project
- Ten (10) factory connectorized hybrid (ST-LC) jumpers of three-foot length as installed and accepted under this project
- Five (5) factory connectorized (ST-type) pigtails of ten-foot length as installed and accepted under this project
- Three (3) fiber optic field Ethernet switches as installed and accepted under this project

E. CCTV System Support Equipment

Furnish new, unused CCTV system support equipment to the Engineer in the quantities shown below.

- Two (2) CCTV assembly as installed and accepted under this project
- One (1) CCTV field equipment cabinet as installed and accepted under this project

40.3. MEASUREMENT AND PAYMENT

Furnish 2070LX Controller will be measured and paid as the actual number furnished and accepted.

Furnish 2070-1C CPU Module will be measured and paid as the actual number furnished and accepted.

Furnish Base Mount 332 Cabinet will be measured and paid as the actual number furnished and accepted.

Furnish DC Isolator Card will be measured and paid as the actual number furnished and accepted.

Furnish AC Isolator Card will be measured and paid as the actual number furnished and accepted.

Furnish Detector Card will be measured and paid as the actual number furnished and accepted.

Furnish Conflict Monitor will be measured and paid as the actual number furnished and accepted.

Furnish Load Switch will be measured and paid as the actual number furnished and accepted.

Furnish Surge Protector will be measured and paid as the actual number furnished and accepted.

Furnish Flasher Module will be measured and paid as the actual number furnished and accepted.

Furnish Flash Transfer Relay will be measured and paid as the actual number furnished and accepted.

Furnish Test Cabinet and Controller will be measured and paid as the actual number furnished and accepted.

Furnish Conflict Monitor Tester will be measured and paid as the actual number furnished and accepted. No measurement will be made for the included notebook computer as it will be considered incidental to the conflict monitor tester.

Furnish ST-LC Hybrid Jumpers will be measured and paid as the actual number furnished and accepted.

Furnish ST Pigtails will be measured and paid as the actual number furnished and accepted.

Furnish Field Ethernet Switch will be measured and paid as the actual number furnished and accepted.

Furnish CCTV Assembly will be measured and paid as the actual number furnished and accepted.

Furnish CCTV Cabinet will be measured and paid as the actual number furnished and accepted.

Payment will be made under:

Pay Item	Pay Unit
Furnish 2070LX Controller.....	Each
Furnish 2070-1C CPU Module.....	Each
Furnish Base Mount 332 Cabinet.....	Each
Furnish DC Isolator Card.....	Each
Furnish AC Isolator Card.....	Each
Furnish Detector Card.....	Each
Furnish Conflict Monitor.....	Each
Furnish Load Switch.....	Each
Furnish Surge Protector.....	Each
Furnish Flasher Module.....	Each
Furnish Flash Transfer Relay.....	Each
Furnish Test Cabinet and Controller.....	Each
Furnish Conflict Monitor Tester.....	Each
Furnish Interconnect Center.....	Each
Furnish Splice Enclosure.....	Each
Furnish ST-LC Hybrid Jumpers.....	Each
Furnish ST Pigtailes.....	Each
Furnish Field Ethernet Switch.....	Each
Furnish CCTV Assembly.....	Each
Furnish CCTV Cabinet.....	Each

41. TRAINING

41.1. DESCRIPTION

Provide training for the installation, operation and maintenance of the computerized traffic system.

41.2. MATERIAL

A. General

Provide training to properly install, operate, maintain, diagnose and repair each piece of equipment and the software associated with the system. Provide approved manufacturer's representatives or other qualified personnel to conduct training courses. Provide training for a total of fifteen (15) City and Department personnel.

1. Submittal Requirements

At least thirty (30) days prior to commencement of the training course, submit the following to the Engineer for review and approval:

- Schedule of training session dates
- Detailed course curricula
- Draft training manuals and course handouts
- Resumes of all instructors

The Engineer may request modification to the submitted material

For all training programs, a staff of engineers, technicians, and maintenance personnel familiar with traffic signal systems will be the training participants. A "day" of training shall consist of training conducted between the hours of 8:30am and 4:30 pm. For each session, provide all training materials (manuals, notebooks, hand-outs, etc.) as specified in the Documentation Section of these Project Special Provisions.

Qualified instructors shall present all training courses, lectures, and demonstrations in person. The Engineer shall approve all instructors.

Unless otherwise specified, accommodate a minimum of fifteen (15) persons at each session. Limit all hands-on computer exercises to two participants per computer. Contractor shall furnish at no cost to the Department or City additional networked computers (equivalent to those furnished with the project) as necessary to maintain that ratio of two participants per computer.

Conduct all training courses at a location provided by the Contractor within the City of Gastonia and at a time mutually agreed upon, but not later than the start of system acceptance testing. Provide training material, manuals, and other handouts to serve not only as subject guidance, but also as quick reference for use by the students. Deliver course material in reproducible form at least three (3) days prior to the course.

B. Subject Areas

Provide the training sessions at the required durations as listed in the Table below. A more detailed description of the required content of each training session is provided in the following sections. As part of the Project Implementation Schedule, propose the time of occurrence of each such training schedule.

Subject	Minimum Duration
System Overview	½ Day
Traffic Control Center Computer Hardware	1 Day
Traffic Control Applications Software	1 Day
Signal Controller and Cabinet Assemblies (for Signal Timing Personnel and Maintenance Personnel)	2 Occurrences at 3 Days Each
Communications Hardware – Fiber Optic Ethernet Switches (Session 1)	1 Day
Communications Hardware – Wireless Radio Systems (Session 2)	1 Day
Central Communications, LAN Equipment, and Software	3 Days
CCTV Central and Field Equipment – System Maintenance (Session 1)	½ Day
CCTV Central and Field Equipment – System Operations (Session 2)	1 Day
Vehicle Preemption System – Field Equipment (Session 1)	½ Day
Vehicle Preemption System – Central Management Software (Session 2)	½ Day

C. Required Content and Format**2. Traffic Control System Overview**

This training session shall consist of a lecture and discussion on the overall. The purpose of the session is to provide an overview of the traffic control system. This training session shall have a minimum duration of one-half (0.5) day.

3. Traffic Control Center Computer Hardware

The training session shall consist of classroom training and workshops regarding the operation of each of the traffic control system hardware elements and the operator interface. Conduct training by experienced vendor personnel.

The first session shall involve the operation and maintenance procedures for each element of the traffic control system hardware. As part of this session, stress the precautions that must be observed when operating the equipment. As a minimum, cover the following subjects in this segment of the training session:

- Overview of equipment functions and interactions.
- Computer system operation; restart, cold start.
- Functional operation of the servers, Ethernet Control Center LAN and backup system (including maintenance, proper replacement, etc.)
- Workstation operation, maintenance, proper replacement, etc.
- Central communication operation.
- Troubleshooting and problem identification of equipment.
- Operating system, including network operating system
- Operating system commands, including loading and executing programs, and archiving data to the backup system
- Detection of abnormal conditions within the operating system and hardware
- File management and disk organization
- Techniques for creating and editing files, including those used for the traffic control system databases

This training sessions shall have a minimum duration of one (1) day (lectures and/or workshops).

4. Traffic Control Applications Software

These sessions of training for NCDOT and City staff shall include a review of the basic theory and functional application and operation of the traffic control software supplied by the Contractor, including the interface between the application program and the microcomputer operating system. This training system shall include but not be limited to:

- Time-of-day operation and event scheduling
- Traffic responsive pattern selection algorithms
- Reporting capabilities
- Interactive database manipulation
- Theory and application of traffic responsive operation
- Special function features
- Development and modification of screens used in the graphics display
- Creation, placement and operation of the dynamic portions of the graphics display

This session shall include lecture and classroom exercises and shall have a minimum of duration of one (1) day. Course material shall include the software documentation and the system user's manuals.

5. Signal Controller and Cabinet Assemblies

Hold two identical controller training sessions for maintenance personnel. Each of the identical training sessions shall consist of three (3) consecutive days. Conduct one of these training sessions prior to the installation of any new controllers and cabinets on the project.

Training for controllers and cabinets shall be integrated into a single session with training exercises for cabinets and training exercises for controllers running concurrently. Instructors from the controller vendor and instructors from the cabinet vendor shall be in attendance during all days of the session.

Controller-specific instruction during the session shall be taught by experienced vendor personnel who thoroughly understand both the traffic engineering aspects of signal timing and the entry of timing into the controller and internal TBC's. Cabinet-specific instruction during the session shall be taught by a field service specialist(s) employed by the manufacturer.

These sessions include training for NCDOT and City traffic engineering, signal timing, and maintenance personnel on controller and internal TBC operation and cabinet assemblies.

The signal controller and cabinet assemblies session shall include, but not be limited to, the following:

- Review of the functional operation of the signal cabinet, including a discussion on each individual component of the cabinet that details its function, installation techniques, and normal operation.
- Formal classroom presentation of the functional operation of the 2070LX controller.
- Review of proper cabinet wiring procedures.
- Review on installation of electrical components and surge protection for cabinets.
- Review on operation of signal monitor tester.
- Hands-on workshop on timing data entry for 2070LX controller, including:
 - All local intersection timing parameters
 - All coordination timing parameters
 - All parameters and threshold levels associated with traffic responsive operation
- Formal classroom presentation and hands-on workshop on operation of local controller utility software.
- Review of proper installation, programming, and troubleshooting of conflict monitors.
- Review of proper installation, programming, and troubleshooting of detector cards and lead-in cable.
- Hands-on workshop wherein maintenance personnel will troubleshoot simulated controller and cabinet assembly faults to the component level.

6. Communications Hardware

The training session shall consist of classroom training and workshops regarding the operation of each of the communications system hardware elements and the technician interface. Conduct training by experienced vendor personnel.

The first session shall involve the operation and maintenance procedures for the fiber optic Ethernet switches (field and central models). At a minimum, cover the following subjects in this segment of the training session:

- Overview of equipment functions and interactions.
- Initialization startup and restarting of hardware.
- Setup and configuration of hardware.
- Functional operation of the fiber optic Ethernet switches (including maintenance, proper replacement, etc.)
- Programming required functionality of Ethernet switches
- Troubleshooting and problem identification of equipment.

The second session shall involve the operation and maintenance procedures for the wireless radio systems. At a minimum, the second session shall consist of the following:

- Overview of equipment functions and interactions.
- Overview of setup and operation of any associated software.
- Initialization startup and restarting of hardware.
- Functional operation of the wireless radio systems (including maintenance of fiber optic Ethernet switches and antennas, integration with signal controller and cabinet, etc.)
- Troubleshooting and problem identification of wireless radio equipment.

Each of these two training sessions shall have a minimum duration of one (1) day (lectures and/or workshops).

7. Central Communications, LAN Equipment, and Software

Provide a training session, conducted by experienced vendor personnel and consisting of both operation and maintenance training of the Central Communication and LAN Equipment for the signal system. As a minimum, this session shall include the following subjects:

- Present system topology
- Operational theory of IP/Ethernet communications
- Initial setup and configuration of core Ethernet switch
- Initial setup and configuration of network and field Ethernet switches

- Operational procedures for network performance management software
- Operational procedures for Ethernet switches
- Operational procedures for remote user operation
- Procedures for adding future devices to the network
- Troubleshooting procedures

Provide a workshop session to reinforce the lectures and demonstrate troubleshooting and problem identification of equipment to the component level as well as validation of communications.

This lecture/workshop training session shall have a minimum duration of three (3) days.

8. CCTV Central and Field Equipment

Provide two sessions for the CCTV central and field equipment training.

The first session shall review the maintenance of the CCTV equipment. The training shall address the preventative maintenance and troubleshooting procedures for all the field and central equipment.

This session shall consist of a mixture of lecture and hands-on workshops and shall have a minimum duration of one-half (0.5) days.

The second session shall address the operational theory and procedures of the CCTV system. This training shall be oriented towards users of the system. The training shall address the use of, but not limited to, the following:

- Camera programming
- Video Server
- Camera control software
- Video wall system hardware and software

Include "hands-on" training workshop with a minimum duration of one (1) day as part of this session. The CCTV training sessions shall be presented by field service specialist(s) employed by the suppliers of the CCTV system components.

9. Vehicle Preemption System

Provide two sessions for the vehicle preemption system central and field equipment training.

The first session shall review the installation, configuration, troubleshooting, and maintenance of the intersection equipment. This session shall consist of a mixture of lecture and hands-on workshops and shall have a minimum duration of one-half (0.5) days.

The second session shall address the operations and procedures of the central management software. This training shall be oriented towards users of the system. This session shall consist of a mixture of lecture and hands-on workshops and shall have a minimum duration of one-half (0.5) days.

The vehicle preemption system training sessions shall be presented by field service specialist(s) employed by the suppliers of the vehicle preemption system components.

41.3. MEASUREMENT AND PAYMENT

Training will be paid for at the contract lump sum price.

Payment will be made under:

Pay Item	Pay Unit
Training.....	Lump Sum

42. TESTING AND ACCEPTANCE

42.1. DESCRIPTION

Test all equipment, cable and software furnished and installed under this Contract according to the Standard Specifications. Conduct testing in the presence of the Engineer. **The Department reserves the right to perform any inspections deemed necessary to assure that the equipment conforms to the requirements specified herein.**

Perform factory and field testing (both pre- and post-installation) on the controllers, cabinets, and related hardware.

Cable provided under this contract shall have been pre-tested in accordance with the EIA/TIA Fiber Optic test procedures and as required by Bellcore GR-20-CORE. Supply proof of successful testing, including documentation of test results.

42.2. CABLE TESTS

Prior to installation, provide cable manufacturer's attenuation and Optical Time Domain Reflectometer (OTDR) testing data for each reel of cable upon request.

After installation and splicing is complete, perform cable tests according to the *Fiber Optic Splice Centers* section of these Project Special Provisions.

42.3. EQUIPMENT TESTS

Cabinets and controllers shall be tested according to the *Controllers with Cabinets* section of these Project Special Provisions.

42.4. TRAFFIC SIGNAL SUBSYSTEM

After completion of the integration of traffic signals for each communications group into new signal system software conduct a minimum of a seven-day test of the traffic signal system hardware and that portion of the communications network serving the traffic signal subsystem.

42.5. INTERSECTION OPERATIONAL TESTS

The Department will conduct complete intersection inspections and operational tests for each project intersection. These inspections and tests will determine whether all the field equipment at each location is installed and permanently labeled properly, and that all functions are in conformance with the Contract Documents. The intersection operational tests will be a non-central controlled functional test of the local controller, including the time-base coordination, emergency vehicle preemption and railroad preemption functions, system detectors, and the full operation of the intersection. All work at the intersection except fiber optic cable installation and termination must be completed for the operational test. This work includes the installation of risers, conduit, junction boxes, conduit entrance into the existing foundation, fiber optic interconnect center, and fiber optic field Ethernet switch.

42.6. SYSTEM OPERATIONAL TEST

All equipment and software provided in this project shall be fully installed and operational prior to the start of the system operational test. These test procedures shall demonstrate that all equipment is fully integrated and operational and is properly controlling the system.

Testing of the software and hardware at the TOC shall include demonstrating proper operation based on these project special provisions. These tests shall also demonstrate the proper function of the CCTV surveillance system, including camera selection, pan/tilt/zoom functions, and remote monitoring of video images. These tests shall also demonstrate the proper operation of the new intersections on the graphics display system, the full functionality of the installed operator workstation, and demonstrating proper reception of video signals on the monitor and control panels.

Submit a System Operational test plan a minimum of sixty (60) days prior to the scheduled start of the test. The test plan will be reviewed by the Engineer, and either approve it or indicate changes that are required for approval. The Contractor shall then submit the revised test plan. This process shall be repeated until the Engineer is able to approve the test plan.

Provide an operational test matrix at least four weeks prior to the scheduled beginning of the system operational test. The test matrix shall include columns for a description of the test, a summary of the test procedures, a column with sufficient space for comments and a status (pass/fail) column.

Repair or replace any component or software module that fails the System Operational Test. Retest repaired or replaced component(s) or software module.

The testing shall include, but not be limited to, the following:

- Demonstration of all key functions of the distributed processing signal system software, including but not limited to:
 - Uploading and downloading of controller data
 - Remote access and paging
 - All monitoring functions
 - Detector logging
 - Signal monitor logging and uploading
 - Traffic responsive operations
 - Event scheduler
 - Security functions
 - Graphic displays
 - Reports
- Power failure recovery, auto re-boot, and start-up of the distributed processing signal system software

- Database access, modification, storage, and retrieval
- Database backup and restoration from archived backup
- Remote access to the signal system software and CCTV software
- Local Area Network operations including monitoring network status and individual field Ethernet switch status
- Demonstrate that all features of the CCTV central software operate as called for with all field equipment

42.7. OBSERVATION PERIOD

A 60-day observation period shall begin upon the successful completion of the tests described in this Section of the Project Special Provisions as well as the correction of all known deficiencies, including minor construction items and punch-list items developed by the Engineer. During the observation period, the City or Department shall observe equipment and software operations to determine that all components of the signal system operate properly and function according to the requirements of the Plans and these Project Special Provisions over an extended length of time.

During the observation period, respond to failures of the Contractor's equipment within two (2) hours and make repairs within eight (8) hours. For items that pose a traffic safety hazard (such as a controller failure), make repairs within four (4) hours. If any failures affect major system components (as defined below) for more than forty-eight (48) hours, the Department shall suspend the observation period beginning when the failure occurred. Resume the observation period after successful repair or replacement of equipment or software. Failures that necessitate a redesign of any component or failures in any of the major system components exceeding a total of three (3) instances of like nature in any thirty (30) day period shall terminate the observation period. Once the redesigned component has been installed and/or the failures corrected, the observation period shall be restarted from zero with the approval of the Engineer.

The major system components are:

- Local controllers and cabinets
- Fiber Optic Communication Network, including field Ethernet switches
- System hardware and software
- CCTV System, including Video wall system
- Wireless Ethernet Radio System
- Local Area Network

A successful 60-day observation period shall consist of continuous operation with no more than a total of five (5) calendar days on non-operation due to mechanical, electrical, or other malfunctions.

The observation period shall be completed by the project completion date and prior to final acceptance of the project. The observation period shall not begin until all testing has been successfully completed and shall not begin without the approval of the Engineer.

42.8. 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 60-day observation period.

The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in this Section of the Project Special provisions; the rectification of all punch-list discrepancies; the submittal of all project documentation; and the completion of all required training.

42.9. MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this Section. Payment at the contract unit prices for the various items in the Contract will be full compensation for all work covered by this Section.

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
ROADWAY ITEMS						
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	2591000000-E	848	4" CONCRETE SIDEWALK	3 SY		
0003	4457000000-N	SP	TEMPORARY TRAFFIC CONTROL	Lump Sum	L.S.	
0004	4510000000-N	1190	LAW ENFORCEMENT	2,000 HR		
0005	4590000000-E	SP	GENERIC TRAFFIC CONTROL ITEM PEDESTRIAN CHANNELIZING DEVICES	200 LF		
0006	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0007	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	132 EA		
0008	7060000000-E	1705	SIGNAL CABLE	49,736 LF		
0009	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	91 EA		
0010	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	20 EA		
0011	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	8 EA		
0012	7180000000-N	1706	BACKPLATE	30 EA		
0013	7204000000-N	1705	LOUVER	5 EA		
0014	7216000000-N	1705	MODIFY EXISTING VEHICLE SIGNAL HEAD	19 EA		
0015	7252000000-E	1710	MESSENGER CABLE (1/4")	58,250 LF		
0016	7279000000-E	1715	TRACER WIRE	22,135 LF		
0017	7288000000-E	1715	PAVED TRENCHING (***** (2, 2"))	451 LF		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	7300000000-E	1715	UNPAVED TRENCHING (*****) (1, 2")	355 LF		
0019	7300000000-E	1715	UNPAVED TRENCHING (*****) (2, 2")	12,800 LF		
0020	7301000000-E	1715	DIRECTIONAL DRILL (*****) (2, 2")	14,170 LF		
0021	7312000000-N	1716	JUNCTION BOX (*****) (SPECIAL OVERSIZED, HEAVY DUTY)	7 EA		
0022	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	54 EA		
0023	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	85 EA		
0024	7372000000-N	1721	GUY ASSEMBLY	330 EA		
0025	7396000000-E	1722	1/2" RISER WITH WEATHERHEAD	4 EA		
0026	7408000000-E	1722	1" RISER WITH WEATHERHEAD	14 EA		
0027	7420000000-E	1722	2" RISER WITH WEATHERHEAD	7 EA		
0028	7430000000-N	1722	HEAT SHRINK TUBING RETROFIT KIT	94 EA		
0029	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	96 EA		
0030	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	3,276 LF		
0031	7456000000-E	1726	LEAD-IN CABLE (*****) (14-2)	113,697 LF		
0032	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (24)	129,035 LF		
0033	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (48)	153,510 LF		
0034	7516000000-E	1730	COMMUNICATIONS CABLE (** FIBER) (72)	64,515 LF		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0035	7528000000-E	1730	DROP CABLE	65,285 LF		
0036	7540000000-N	1731	SPLICE ENCLOSURE	153 EA		
0037	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	3 EA		
0038	7552000000-N	1731	INTERCONNECT CENTER	150 EA		
0039	7566000000-N	1733	DELINEATOR MARKER	85 EA		
0040	7575142200-N	SP	NEW ELECTRICAL SERVICE	1 EA		
0041	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	9,330 LF		
0042	7575180000-N	1735	CABLE TRANSFER	5 EA		
0043	7636000000-N	1745	SIGN FOR SIGNALS	24 EA		
0044	7642100000-N	1743	TYPE I POST WITH FOUNDATION	15 EA		
0045	7642200000-N	1743	TYPE II PEDESTAL WITH FOUNDATION	56 EA		
0046	7684000000-N	1750	SIGNAL CABINET FOUNDATION	9 EA		
0047	7686000000-N	1752	CONDUIT ENTRANCE INTO EXISTING FOUNDATION	5 EA		
0048	7687000000-N	1752	MODIFY FOUNDATION FOR CONTROLLER CABINET	2 EA		
0049	7780000000-N	1751	DETECTOR CARD (TYPE 2070L)	1,097 EA		
0050	7901000000-N	1753	CABINET BASE EXTENDER	135 EA		
0051	7901010000-N	1753	CABINET BASE ADAPTER	1 EA		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0052	7980000000-N	SP	GENERIC SIGNAL ITEM BACKUP STORAGE SERVER	1 EA		
0053	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	3 EA		
0054	7980000000-N	SP	GENERIC SIGNAL ITEM COMPUTER WORKSTATION	3 EA		
0055	7980000000-N	SP	GENERIC SIGNAL ITEM CONTROLLER WITH CABINET AND AUX FILE (2070LX, 332 BASE MOUNTED)	144 EA		
0056	7980000000-N	SP	GENERIC SIGNAL ITEM CORE ETHERNET SWITCH	1 EA		
0057	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	30 EA		
0058	7980000000-N	SP	GENERIC SIGNAL ITEM DISTRIBUTED PROCESSING SIGNAL SYSTEM SERVER	1 EA		
0059	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	1 EA		
0060	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD ETHERNET SWITCH	154 EA		
0061	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH 2070-1C CPU MODULE	3 EA		
0062	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH 2070LX CONTROLLER	3 EA		
0063	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH AC ISOLATOR CARD	3 EA		
0064	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH BASE MOUNT 332 CABINET	3 EA		
0065	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CCTV ASSEMBLY	2 EA		
0066	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CCTV CABINET	1 EA		
0067	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CONFLICT MONITOR	3 EA		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0068	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CONFLICT MONITOR TESTER	1 EA		
0069	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH DC ISOLATOR CARD	3 EA		
0070	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH DETECTOR CARD	6 EA		
0071	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH FIELD ETHERNET SWITCH	3 EA		
0072	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH FLASH TRANSFER RELAY	3 EA		
0073	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH FLASHER MODULE	3 EA		
0074	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH INTERCONNECT CENTER	3 EA		
0075	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH LOAD SWITCH	3 EA		
0076	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH SPLICE ENCLOSURE	5 EA		
0077	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH ST PIGTAILS	5 EA		
0078	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH ST-LC HYBRID JUMPERS	10 EA		
0079	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH SURGE PROTECTOR	3 EA		
0080	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH TEST CABINET AND CONTROLLER	1 EA		
0081	7980000000-N	SP	GENERIC SIGNAL ITEM INSTALL CELLULAR MODEM AND ANTENNA	1 EA		
0082	7980000000-N	SP	GENERIC SIGNAL ITEM INTEGRATED CABINET BASE ADAPTER	1 EA		
0083	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX MARKER	7 EA		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0084	7980000000-N	SP	GENERIC SIGNAL ITEM LAPTOP COMPUTER	3 EA		
0085	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE	9 EA		
0086	7980000000-N	SP	GENERIC SIGNAL ITEM RACK CABINET	1 EA		
0087	7980000000-N	SP	GENERIC SIGNAL ITEM REMOTE ACCESS SERVER	1 EA		
0088	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE AND REPLACE TRAFFIC SIGNAL SPAN POLE	1 EA		
0089	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE EXISTING CCTV ASSEMBLY	14 EA		
0090	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE EXISTING CCTV CABINET	10 EA		
0091	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE EXISTING CCTV ELECTRICAL SERVICE	11 EA		
0092	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE EXISTING TERMINAL SPLICE CABINET	2 EA		
0093	7980000000-N	SP	GENERIC SIGNAL ITEM SIGNAL SYSTEM COMMUNICATIONS SERVER	1 EA		
0094	7980000000-N	SP	GENERIC SIGNAL ITEM UPGRADE CCTV LIGHTNING PROTECTION	11 EA		
0095	7980000000-N	SP	GENERIC SIGNAL ITEM VEHICLE PREEMPTION SYSTEM INTERSECTION EQUIPMENT	50 EA		
0096	7980000000-N	SP	GENERIC SIGNAL ITEM VEHICLE PREEMPTION SYSTEM SERVER	1 EA		
0097	7980000000-N	SP	GENERIC SIGNAL ITEM VIDEO MANAGEMENT SYSTEM SERVER	1 EA		
0098	7980000000-N	SP	GENERIC SIGNAL ITEM VPN FIREWALL	1 EA		

County: GASTON

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0099	7980000000-N	SP	GENERIC SIGNAL ITEM WIRELESS ETHERNET RADIO SYSTEM	6 EA		
0100	7985000000-N	SP	GENERIC SIGNAL ITEM BUILDING MODIFICATIONS	Lump Sum	L.S.	
0101	7985000000-N	SP	GENERIC SIGNAL ITEM COMPUTER HARDWARE INTEGRATION	Lump Sum	L.S.	
0102	7985000000-N	SP	GENERIC SIGNAL ITEM ENTERPRISE VIDEO MANAGEMENT SYSTEM SOFTWARE	Lump Sum	L.S.	
0103	7985000000-N	SP	GENERIC SIGNAL ITEM LAN INTEGRATION	Lump Sum	L.S.	
0104	7985000000-N	SP	GENERIC SIGNAL ITEM NETWORK PERFORMANCE MANAGEMENT SOFTWARE	Lump Sum	L.S.	
0105	7985000000-N	SP	GENERIC SIGNAL ITEM SIGNAL SYSTEM SOFTWARE	Lump Sum	L.S.	
0106	7985000000-N	SP	GENERIC SIGNAL ITEM TRAINING	Lump Sum	L.S.	
0107	7985000000-N	SP	GENERIC SIGNAL ITEM VEHICLE PREEMPTION SYSTEM SOFTWARE	Lump Sum	L.S.	
0108	7985000000-N	SP	GENERIC SIGNAL ITEM VIDEO WALL SYSTEM (6 MONITORS)	Lump Sum	L.S.	
0109	7985000000-N	SP	GENERIC SIGNAL ITEM VIDEO WALL SYSTEM (8 MONITORS)	Lump Sum	L.S.	
0110	7990000000-E	SP	GENERIC SIGNAL ITEM CABLE PROTECTOR	2,500 LF		
0111	7990000000-E	SP	GENERIC SIGNAL ITEM POE CABLE	4,380 LF		

1125/Jul06/Q708915/D834999392200/E111

Total Amount Of Bid For Entire Project :